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Draft Environmental Impact Statement

Proposed Revised Land Management Plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests

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Draft Environmental Impact Statement
Proposed Revised Land Management Plans
for the
Umatilla, Malheur, and Wallowa-Whitman National Forests

Baker, Crook, Grant, Harney, Malheur, Morrow, Umatilla, Union, Wallowa, and Wheeler Counties, Oregon
Asotin, Columbia, Garfield, and Walla Walla Counties, Washington

Lead Agency: USDA Forest Service

Cooperating Agencies:

Confederated Tribes of the Umatilla Indian Reservation
State of Oregon
Baker County, Oregon
Grant County, Oregon
Harney County, Oregon
Morrow County, Oregon
Umatilla County, Oregon
Union County, Oregon
Wallowa County, Oregon
Wheeler County, Oregon
Asotin County, Washington
Columbia County, Washington
Garfield County, Washington

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Abstract: This draft environmental impact statement (DEIS) documents the analysis of six alternatives (alternatives A through F) developed by the Forest Service for the programmatic management of approximately 4.9 million acres administered by the Malheur (including the portion of the Ochoco National Forest administered by the Malheur National Forest), Umatilla, and Wallowa-Whitman National Forests. For ease of reference, the accompanying proposed revised land management plan reflects the preferred alternative. The alternatives are described in appendix A. Alternative A is a no-action alternative, and would keep in place the management direction from the 1990 land and resource management plans, as amended. Alternative B is a modified version of the proposed action, and alternative E is the preferred alternative.

Alternatives B, C, D, E and F address five purpose and needs for the revised plans: (1) to more adequately protect and restore terrestrial plant and animal species and their habitats; (2) to address management of fuels and fire risk; (3) to more adequately protect and restore watersheds and aquatic habitats; (4) to address climate change; and (5) to recognize the interdependency of social and economic components with national forest management.

Alternatives B through F address new information and concerns that emerged during the implementation of the 1990 forest plans and comply with Federal laws, regulations, and policies. These alternatives also address significant issues (unresolved conflicts with the proposed action) that were identified from comments received during the scoping and public involvement period.

The Forest Service will use the "predecisional administrative review process," also referred to as the "objection process" described in 36 CFR 219 Subpart B of the 2012 Planning Rule. This process gives an individual or entity an opportunity for an independent Forest Service review and resolution of issues before the approval of a plan revision, this subpart identifies shows may file objections to a plan revision; the responsibilities of the participants in an objection; and the procedures that apply to the review of the objection. §219.53 describes who may file an objection. Individuals and entities who have submitted substantive formal comments related to this plan revision during the opportunities for public comment for this decision may file an objection.

It is important that reviewers provide their comments at such times and in such a way that they are useful to the agency's preparation of the final EIS and Revised Plans. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative or judicial review. Comments received in response to this solicitation, including names and addresses of those who comment, will be part of the public record for this proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative or judicial reviews. Comments on the DEIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to: http://www.fs.usda.gov/goto/BlueMountainForestPlanRevisionComments

OR

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Date Comments Must Be Received: Within 90 days following publication of the notice of availability of the DEIS in the Federal Register. The notice is expected to be published on or around March 14, 2014; however, it is the commenter's responsibility to calculate the end of the 90-day period.

Summary

Introduction and Background

The three Blue Mountains national forests began efforts to revise their forest plans in 2003. Since then, national planning rules that govern revising forest plans have been in flux. The final plans for the Malheur (and the portion of the Ochoco, administered by the Malheur), Umatilla, and Wallowa-Whitman National Forests have been prepared using transition language in the recently approved planning regulations (36 CFR 219, 2012), which has provisions that allow forest plan revisions started under the 1982 planning regulations to finish using the 1982 process.

The Analysis of the Management Situation (reflected in the 2004 Current Management Situation (CMS)) for the Hells Canyon National Recreation Area showed that there was no need for change in this area of the Wallowa-Whitman National Forest; therefore, this area was not analyzed in this EIS. The 2003 Hells Canyon Comprehensive Management Plan will be the guiding document for this portion of the Wallowa-Whitman, which is tiered to the 1990 Wallowa-Whitman National Forest Plan.

Purpose and Need

The existing forest plans are 20 years old. Economic, social, and ecological conditions changed during that time; new laws, regulations and policies are in place; and new information based on monitoring and scientific research is available. The Malheur, Umatilla, and Wallowa-Whitman National Forests are revising their 1990 forest plans to meet the legal requirements of the National Forest Management Act (NFMA) of 1976; to address changed conditions and provide consistent management direction (as appropriate) across the three national forests; to incorporate changes in law, regulation, and policy; and to use new scientific information. In particular, the interdisciplinary planning team intends to address the following areas in the revised forest plans:

1. To more adequately protect and restore terrestrial plant and animal species and their habitats.
2. To address management of fuels and fire risk.
3. To more adequately protect and restore watersheds and aquatic habitats.
4. To address climate change.
5. To recognize the interdependency of social and economic components with national forest management.

Proposed Action

The proposed action is a revision of the land management plans for the Malheur (including the portion of the Ochoco National Forest adjacent to and administered by the Malheur National Forest), Umatilla and Wallowa-Whitman National Forests designed to meet the purpose and need. It includes revised goals (desired conditions), objectives, standards, guidelines, suitable uses and activities, management area designations including special areas, and monitoring items.

Issues and Alternatives

The Blue Mountains forest plan revision team distributed the proposed action for public review in 2010, and the following issues were developed to respond to public concerns expressed during the review.

Issue 1: Access

Concern Statement: Some people suggested allocating additional areas to undeveloped backcountry to satisfy needs, such as solitude and nonmotorized recreation, while others requested that additional areas be designated to allow motor vehicle recreation and requested that what is currently available not be reduced.

Issue 2: Economic and Social Well-being

Concern Statement: Many people stressed the importance of economic and social contributions of the national forests to the surrounding communities. One concern is the importance of maintaining the infrastructure in local communities (e.g., mills, roads, equipment, and skilled labor force), so that the Forest Service can draw upon that infrastructure to accomplish restoration goals as well as contribute to the economic and social well-being of communities. Another concern is the potential effects of large disturbances, such as insects and disease or wildland fire, on the economic and social well-being of local communities. Other people stressed ecological values and suggested that a more cautious approach and mix of restoration activities is necessary to protect those values that also contribute to economic and social well-being.

Issue 3: Livestock Grazing and Grazing Land Vegetation

Concern Statement: Several people expressed concern about how revised forest plan direction will affect livestock operations and livelihoods and the potential that further restrictions on allotments would have significant financial and social effects. Other comments were directed to the effects of permitted livestock grazing on National Forest System lands and resources and revolved around riparian area livestock use and its effect on fisheries, biodiversity, and water quality. The potential for disease transmission between domestic sheep and bighorn sheep is also a concern.

Issue 4: Old Forest

Concern Statement: Many people suggested an active approach to reducing the risk of loss from insects and disease and wildland fire within old forest stands and accelerating the development of old forest structure. Other people prefer the use of nonmechanical means to restore old forest stands and the designation of old forest management areas.

Issue 5: Recommended Additions to the National Wilderness Preservation System

Concern Statement: Many people asked that additional areas be proposed for wilderness designation to protect the values that they attach to wilderness areas. Others requested that no additional areas be proposed for wilderness designation because this would prevent them from participating in the activities that they currently enjoy within those areas. Wilderness designation would also limit management activities that could provide economic benefits while reducing the risks of uncharacteristic wildland fire, insect, and disease disturbances.

Issue 6: Ecological resilience

Concern Statement: There is concern about the type and extent of management activities for restoring ecological resilience that are included in the proposed action. Based on perceptions of current vegetation conditions and resilience, some respondents stated that the proposal is too aggressive, while others stated that the restoration proposal is not aggressive enough. Public concern is heightened because the management approach to restoring ecological resilience will determine the ecosystem services the Blue Mountains national forests provide.

Alternatives

Six alternatives, including continuing under current management direction (no action) and modifications to the proposed action (the "action" alternatives) were developed to address the range of public comments received during the scoping process. The following summarizes the key concepts used in developing the action alternatives. Table S-1 also provides a comparison of how the issues are addressed by alternative. The desired conditions are the same for each of the action alternatives, with the exception of roads and trails, which has a range of desired conditions.

Alternative B (modified proposed action). This alternative focuses on restoring landscape functions and processes, and ecosystem resilience to climate change.

- **Access**. Road density would change from a standard and guideline to a desired condition. The most backcountry limited motor vehicle use management areas (618,800 acres) and some backcountry nonmotorized (78,600 acres) would be designated. No wildlife corridor would be designated.
- **Ecological resilience**. There would be moderate management actions to restore ecological resilience, and no change to treatments to restore forested vegetation. The combination of vegetation treatments, roads treatments, and grazing practices would result in improvements in watershed condition in 4 to 23 subwatersheds.
- **Economic and social well-being**. The predicted annual timber harvest would be 87 million board feet, resulting in an estimated 600 jobs associated with timber harvest and primary wood products manufacturing. The estimated number of jobs from timber, range, ecosystem restoration and forest employees would be 3,737.
- **Livestock grazing/grazing land vegetation**. There would be slightly lower objective levels than today's numbers and locations for both cattle and sheep, primarily to reduce the risk of disease spread from domestic sheep to big horn sheep.
- **Old forest**. There would be no designated old forest management areas. Old forest would be managed where it occurs on the landscape. Restrictions on large tree harvest (trees greater than 21-inch diameter) would be included but exceptions would be allowed for safety, wildland-urban interface, maintaining open ponderosa pine stands, as well as reducing competition in hardwood stands and special habitats. There would be progress towards developing old forest habitat by thinning.
- **Recommended wilderness area**. A limited amount of acreage (13,400 acres) would be identified as recommended wilderness area.

Table S-1. Comparison of how each alternative addresses the issues

Issue	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Access	• Road density changed from a standard and guideline to a desired condition. • Designates the most backcountry limited motor vehicle use management areas (618,800 acres) and some backcountry nonmotorized (78,600 acres). • No wildlife corridor designated.	• Road density changed from a standard and guideline to a desired condition. • Management areas feature backcountry nonmotorized (586,300 acres) and wildlife connectivity (502,000 acres). • No backcountry motorized. • One mile per square mile open route density in wildlife corridor.	• Road density changed from a standard and guideline to a desired condition. • Retains the areas that currently are generally suitable for motor vehicle use, resulting in more area suitable for summer and winter motor vehicle use compared to the other alternatives.	• Road density changed from a standard and guideline to a desired condition. • Management areas feature backcountry nonmotorized (228,100 acres), backcountry motorized (425,200 acres), and connective wildlife corridors (28,100 acres).	• Road density changed from a standard and guideline to a desired condition. • Management areas feature backcountry nonmotorized (228,100 acres), backcountry motorized (425,200 acres), and connective wildlife corridors (28,100 acres).
Ecological resilience	• Moderate level of management actions to restore ecological resilience. • No change to treatments to restore forested vegetation. • The combination of vegetation treatments, roads treatments, and grazing practices results in improvements in watershed condition in 4-23 sub-watersheds.	• Highest level of resource-specific objectives for managing some wildland fires to meet desired landscape conditions and watershed restoration. • Emphasizes improving hydrologic function and connectivity within anadromous and bull trout Key Watersheds.	• Highest level of resource-specific objectives for forest vegetation restoration. • Management allocations emphasize areas where active forest management may occur.	• Higher level of objectives for watershed restoration and emphasis on improving hydrologic function and connectivity within anadromous and bull trout Key Watersheds. • Includes specific objectives for managing wildland fires to meet desired landscape conditions and aggressive objectives for treating invasive plants.	• Higher level of objectives for watershed restoration and emphasis on improving hydrologic function and connectivity within anadromous and bull trout Key Watersheds. • Includes specific objectives for managing wildland fires to meet desired landscape conditions and aggressive objectives for treating invasive plants.

Issue	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Economic and social well-being	• Predicted annual timber harvest: 87 MMBF, 650 jobs. • Expected number of jobs from timber, range, ecosystem restoration: 3,737.	• Predicted annual timber harvest: 47 MMBF, 288 jobs. • Expected number of jobs from timber, range, ecosystem restoration:2,822.	• Predicted annual timber harvest: 243 MMBF, 2,040 jobs. • Expected number of jobs from timber, range, ecosystem restoration: 5,413.	• Predicted annual timber harvest: 162 MMBF, 1,330 jobs. • Expected number of jobs from timber, range, ecosystem restoration: 4,496	• Predicted annual timber harvest: 107 MMBF, 838jobs. • Expected number of jobs from timber, range, ecosystem restoration: 3,909
Livestock grazing/ grazing land vegetation	• Slightly lower objective levels than existing numbers and locations for cattle and sheep. • Reduces the risk of disease spread from domestic sheep to big horn sheep.	• Significantly reduces the number of cattle and sheep AUMs. • Classifies riparian areas and subwatersheds with habitat for listed fish species as generally unsuitable for cattle grazing.	• Objective levels similar to existing numbers and locations for cattle and sheep. • Reduces the risk of disease spread from domestic sheep to big horn sheep, but allows grazing to occur in previously vacant allotments.	• Livestock levels the same as the proposed action. • Standards and guidelines for sage grouse protection are included.	• Livestock levels the same as the proposed action. • Standards and guidelines for sage grouse protection are included.

Issue	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Old forest	• No designated old forest management areas. • Old forest managed where it occurs on the landscape. • Desired conditions provide old forest management direction. • Restrictions on large tree harvest (trees greater than 21-inch d.b.h.) are included but exceptions allowed for safety, wildland-urban interface, maintaining open ponderosa pine stands, as well as reducing competition in hardwood stands and special habitats.	• Designates old forest management areas (390,900 acres). • Only trees 8 inches d.b.h. or less authorized for timber harvest in this management area. • Management activities outside old forest stands retain live old forest trees (greater than 21-inch d.b.h.). • Desired conditions provide old forest management direction. • Vegetation treatments emphasize wildland fire (wildfires or prescribed fires) rather than mechanical treatments rather than.	• No designated old forest management areas. • Old forest managed where it occurs on the landscape. • No standard or guideline prohibiting the harvest of trees greater than 21-inch d.b.h. or trees with old forest characteristics. • Desired conditions provide old forest management direction. • Vegetation treatments emphasize mechanical treatments rather than wildland fire (wildfires or prescribed fires).	• No designated old forest management area. • Retains trees with old forest characteristics across the landscape. • No standard or guideline prohibiting the harvest of trees greater than21 inch d.b.h. • Desired conditions provide old forest management direction. • Vegetation treatments would emphasize both mechanical treatments and prescribed fire.	• No designated old forest management area. • Retains trees >150 years old. • No standard or guideline prohibiting the harvest of trees greater than21 inch d.b.h. • Desired conditions provide old forest management direction. • Vegetation treatments would emphasize both mechanical treatments and prescribed fire.
Wilderness	• Recommended wilderness:13,400 acres	• Recommended wilderness: 505,000 acres	• No wilderness recommended.	• Recommended wilderness: 91,000 acres	• Recommended wilderness: 91,000 acres

Alternative C. This alternative addresses the issues of increased recommended wilderness areas, passively improved ecological resilience and limited access by emphasizing the role of natural processes in forest restoration.

- **Access.** Management allocations would emphasize backcountry nonmotorized areas (586,300 acres) and wildlife connectivity (502,000 acres) with limited harvest. There would not be any backcountry motorized areas. There would be one-mile per square mile of open route density in wildlife corridors.
- **Ecological resilience.** The highest levels of resource-specific objectives would be established for managing some wildland fires to meet desired landscape conditions and watershed restoration; emphasizing improving hydrologic function and connectivity within anadromous and bull trout key watersheds.
- **Economic and social well-being.** Annual timber harvest would be reduced to 54 million board feet, resulting in about 270 jobs associated with timber harvest and primary wood products manufacturing. The estimated number of jobs from timber, range, ecosystem restoration and forest employees would be 2,822.
- **Livestock grazing and grazing land vegetation.** The number of cattle and sheep AUMs is significantly reduced, by classifying riparian areas and subwatersheds with habitat for listed fish species as generally unsuitable for cattle grazing.
- **Old forest.** Old forest management areas (390,900 acres) would be designated. Only trees 8 inches d.b.h. or less would be authorized for timber harvest in this management area. Management activities outside old forest stands would retain live old forest trees (21 inches d.b.h. or larger).
- **Recommended Wilderness Area.** The highest level of recommended wilderness areas (505,000 acres) would be provided. Recommended wilderness area additions would not only expand existing wilderness areas, but also establish new wilderness areas.

Alternative D. This alternative addresses the issues of increased access, actively improved ecological resilience, and increased economic and social well-being.

- **Access.** The areas that currently are generally suitable for motor vehicle use would be emphasized, resulting in more area suitable for summer and winter motor vehicle use than proposed by other alternatives.
- **Ecological resilience.** Management allocations would emphasize areas where active forest management may occur.
- **Economic and social well-being.** The predicted annual timber harvest for the three national forests would be 243 million board feet, resulting in about 1,870 jobs associated with timber harvest and primary wood products manufacturing. The expected number of jobs from timber, range, ecosystem restoration and forest employees would be 4,496 jobs.
- **Livestock grazing and grazing land vegetation.** There would be similar objective levels to today's numbers and locations for both cattle and sheep, reducing the risk of disease spread from domestic sheep to big horn sheep, but grazing would be allowed to occur in previously vacant allotments.
- **Old forest.** No old forest management areas would be designated. There would not be any standard or guideline prohibiting the harvest of trees larger than 21 inches d.b.h. or trees with old forest characteristics. Desired conditions would be used to provide old forest management direction. Vegetation treatments would emphasize mechanical treatments rather than wildland fire use (wildfires or prescribed fires).

- **Recommended wilderness area.** No designated recommended wilderness area.

Alternative E (Preferred Alternative). This alternative addresses the issues of increased access, actively improved ecological resilience, and increased economic and social well-being.

- **Access.** Management areas would feature backcountry nonmotorized areas (228,100 acres), backcountry motorized vehicle areas (425,200 acres) and connective wildlife corridors (28,100 acres).
- **Ecological resilience.** A higher level of objectives would be provided for watershed restoration with an emphasis on improving hydrologic function and connectivity within anadromous and bull trout key watersheds. There would also be specific objectives for managing some wildland fires to meet desired landscape conditions and aggressive objectives for treating invasive plants.
- **Economic and social well-being.** Annual timber harvest would be about 162 million board feet, resulting in about 1,220 jobs associated with timber harvest and primary wood products manufacturing. There would be an estimated 266,600 cattle and sheep AUMs, supporting about 170 jobs. Forest Service ecosystem restoration expenditures would be about $25 million, supporting about 470 jobs. Forest Service budget expenditures would be about $61.4 million, supporting about 1,150 jobs. The total number of jobs expected would be 4,496 jobs.
- **Livestock grazing and grazing land vegetation.** Livestock levels would be the same as the proposed action; standards and guidelines for sage grouse protection would be included.
- **Old forest.** Trees with old forest characteristics would be retained across the landscape. There would not be any standard or guideline prohibiting the harvest of trees 21 inches d.b.h. or larger. Desired conditions would provide old forest management direction. There would not be any designated old forest management areas. Vegetation treatments would emphasize both mechanical and wildland fire treatments rather than wildland fire use.
- **Recommended wilderness area.** Recommended wilderness areas (91,000 acres) would be designated in strategic locations (expanding wilderness areas or in areas in cooperation with other landownership wilderness designations (such as BLM land)).

Alternative F. This alternative is very similar to alternative E, having essentially the same emphasis and management allocations. The primary distinction is the level of restoration activity would be closer to the level predicted in the proposed action, alternative B. The differences would be primarily in the contribution to economic and social well-being and old forest guidelines.

Comparing Alternatives

The alternatives are appropriately compared by how each affects long-term trends of key environmental indicators and considerations. Measurement indicators have been determined, and chapter 3 includes detailed documentation of the anticipated environmental effects for each alternative.

The Blue Mountains national forests have identified three primary goals. These goals create the framework for the plan. Each goal identifies a set of desired conditions, standards, guidelines, and objectives. The desired conditions describe in general terms what we (the public and the Forest Service) desire the forests to look like and the goods and services we want them to provide. Desired conditions are broad and may only be achievable over long periods of time. Objectives are concise, time-specific statements of measurable, planned results that make

progress toward or maintain desired conditions. Variation in achieving objectives may occur during the life of the plan because of factors such as changes in environment conditions or available budgets. The Forest Service will manage the land and resources of the planning area to achieve or maintain the goals and desired conditions, allowing the national forests to contribute to a range of outcomes now and in the future. The goals, and desired conditions, standards, guides, and objectives specific to each alternative, are discussed in detail in appendix A to the DEIS.

Goal 1: Promote Ecological Integrity

Ecological integrity is a condition that sustains the wholeness or completeness of ecosystem structure, composition, and function. The national forests' contribution to ecological function is described by watershed function, species diversity, productive capacity, disturbance processes, and invasive species. Ecological structure and composition is described by structural stages; plant species composition; and stand density. Landscape patterns, special habitats, and snags and down wood are also indicators of sustainability in the Blue Mountains national forests. Although the primary focus of this section is ecological integrity, this goal and the desired conditions are interrelated with the social and economic components of sustainability.

Goal 2: Promote Social Well-being

Social well-being contributes to national forest resilience by promoting public use patterns and restoration strategies that support human communities, livelihoods, cultures, and social values. National forests contribute to community resilience by providing jobs, ecosystem services, scenery, and recreational opportunities. Each individual's ties to the land, traditional cultures, and communities help characterize social well-being, and attachments to places reflect core values. These ties can be reflected in the values different people place on biodiversity, scenery, economic opportunities, self-reliance, tradition, and ecological integrity.

A diverse and complex set of values that contribute to one's social well-being can be tied to natural resources-related work, including restoration, ranching, and recreation. This work allows people to live in communities that are adjacent to the national forests. These values may include viewing or hunting wildlife, being able to do natural resource-related work, knowing that restoration efforts are supporting fish populations, and being part of an environment where human traditions and cultures can be maintained.

Goal 3: Promote Economic Well-being

Economic well-being is a condition that enables people to work, provide income for their families, and support the economies of local communities, American Indian tribes, the region, and the Nation. The contributions of the national forests to economic well-being are described for capital and wealth and for the economic production of goods and services. However, there are many other values, benefits, and costs not addressed in discussions of economic well-being because they are not traded in the marketplace. These values are difficult to express in monetary terms or other quantitative measures, but are an important part of social and economic sustainability.

Historically, the national forests of the Blue Mountains made significant contributions to area communities, both socially and economically. However, the national forests are not the sole providers of economic stability for communities in the area. Local economic conditions are interrelated with changes in the economies of Oregon, Idaho, and Washington, as well as with changes in regional, national, and global economies. Recognizing the interdependence between

the Forest Service's need for forest management work and the degree to which local industries, infrastructure, and people provide for this need is important to sustaining and restoring the ecological integrity of the national forests and social and economic conditions of the communities.

Preferred Alternative

Alternative E has been identified as the preferred alternative for revising the forest plans for the Blue Mountains national forests.

Comparison of Key Indicators

Based on proposed objectives, tables S-2 through S-4 on the following pages display the projected accomplishments for the key indicators for each action alternative. The figures displayed for alternative A represent the existing condition. See appendix A for a detailed description, including objectives, of the alternatives.

Table S-2. Issues and key indicators for each alternative for the Malheur National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 1: Access (Malheur NF)						
Miles of road maintained annually	1,152	1,136	235	1,604	1,313	1,313
Percent change in area available for route designation for summer motor vehicle use	0%	7%	minus-38%	11%	8%	8%
Percent change in area available for winter over-the-snow vehicle use	0%	negligible	minus-28%	2%	minus-1%	minus-1%
Issue 2: Economic and social well-being (Malheur NF)						
Timber harvest jobs	133	142	67	418	263	170
Timber harvest income	$7,214M	$7,674M	$3,625M	$22,660M	$14,224M	$9,238M
Livestock grazing jobs	389	398	187	439	395	389
Livestock grazing income	$5,195M	$5,316M	$2,550M	$5,881M	$5,276M	$5,195M
Recreation jobs	233	233	233	233	233	233
Recreation income	$4,589M	$4,589M	$4,589M	$4,589M	$4,589M	$4,589M
Ecosystem restoration jobs	68	68	41	125	85	62
Ecosystem restoration income	$2,066M	$2,066M	$1,252M	$3,790M	$2,575M	$1,867M
Predicted harvest levels/TSPQ (MMBF/year)	30	31	16	87	56	37
Allowable sale quantity (MMBF/year)	55	55	34	88	55	55
Issue 3: Livestock grazing and grazing land vegetation (Malheur NF)						
Acres suitable for permitted cattle grazing	1,197,000	1,225,000	620,000	1,216,000	1,197,000	1,197,000
Acres suitable for permitted sheep grazing	102,000	101,000	55,000	101,000	101,000	101,000
Permitted animal unit months (cattle)	117,000	120,000	61,000	119,000	117,000	117,000
Permitted animal unit months (sheep)	6,500	6,500	1,200	6,500	6,500	6,500
Rate of progress towards achieving rangeland vegetation desired condition	slow to moderate	slow to moderate	fastest	slow	moderate to fastest	moderate to fastest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 4: Old Forest (Malheur NF)						
Acres of old forest within management area allocations with limited management activity	78,000	81,000	350,000	73,000	85,000	85,000
Acres of vegetation treatments per year in old forest	500	800	0	4,800	1,600	1,000
Percent old forest at year 50 (all potential vegetation groups)	33	31	31	30	30	30
Percent dry upland forest old forest single story at year 50	13	11	10	16	16	12
Issue 5: Preliminary Administratively Recommended Additions to the National Wilderness Preservation System (Malheur NF)						
Acres of MA 1B	0	1,200	83,800	0	30,400	30,400
Issue 6: Ecological Resilience (Malheur NF)						
Annual forested vegetation active restoration activities (acres)	18,100	18,700	14,300	25,100	24,800	20,100
Miles of road treatments	260	260	600	650	290	310
Forage use intensity	15.9%	15.9%	3.8%	17.0%	15.9%	15.9%
Miles of riparian area improvement	300	300	600	300	450	400
Number of subwatersheds in improved condition	16	16	42	18	21	21
Improvement in the dry upland forest potential vegetation groups FRCC departure score at year 50 (percent)	24	27	23	47	42	31

Table S-3. Issues and key indicators for each alternative for the Umatilla National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 1: Access (Umatilla NF)						
Miles of road maintained annually	427	427	209	910	540	540
Percent change in area available for route designation for summer motor vehicle use	0%	7%	minus-45%	9%	minus-5%	minus-5%
Percent change in area available for winter over-the-snow vehicle use	0%	negligible	minus-30%	2%	minus-4%	minus-4%
Issue 2: Economic and social well-being (Umatilla NF)						
Timber harvest jobs	243	263	117	777	561	339
Timber harvest income	$13,882M	$15,006M	$6,707M	$44,365M	$32,058M	$19,388M
Livestock grazing jobs	153	130	19	127	127	127
Livestock grazing income	$1,874M	$1,674M	$219M	$1,631M	$1,631M	$1,631M
Recreation jobs	187	187	187	187	187	187
Recreation income	$4,527M	$4,527M	$4,527M	$4,527M	$4,527M	$4,527M
Ecosystem restoration jobs	75	75	56	143	102	75
Ecosystem restoration income	$2,907M	$2,907M	$2,163M	$5,511M	$3,946M	$2,889M
Predicted harvest levels/TSPQ (MMBF/year)	27	29	16	76	56	36
Allowable sale quantity (ASQ)) (MMBF/year)	51	51	31	73	51	51
Issue 3: Livestock grazing and grazing land vegetation (Umatilla NF)						
Acres suitable for permitted cattle grazing	284,000	298,000	30,000	284,000	284,000	284,000
Acres suitable for permitted sheep grazing	60,000	28,000	13,000	42,000	42,000	42,000
Permitted animal unit months (cattle)	30,000	31,000	3,000	30,000	30,000	30,000
Permitted animal unit months (sheep)	7,800	4,600	1,200	5,800	5,800	5,800
Rate of progress towards achieving rangeland vegetation desired condition	slow to moderate	slow to moderate	fastest	slow	moderate to fastest	moderate to fastest
Issue 4: Old Forest (Umatilla NF)						
Acres of old forest within management area allocations with limited management activity	142,000	188,000	322,000	176,000	191,000	191,000
Acres of vegetation treatments per year in old forest	300	500	0	2,900	1,000	500

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Percent old forest at year 50 (all potential vegetation groups)	29	28	28	26	27	27
Percent dry upland forest old forest single story at year 50	15	12	11	14	15	13
Issue 5: Preliminary Administratively Recommended Additions to the National Wilderness Preservation System (Umatilla NF)						
Acres of MA 1B	0	1,400	248,500	0	40,100	40,100
Issue 6: Ecological Resilience (Umatilla NF)						
Annual forested vegetation active restoration activities (acres)	16,950	17,400	14,000	20,100	23,400	18,700
Miles of road treatments	260	260	450	800	300	270
Forage use intensity	11.4%	10.6%	0.8%	13.8%	10.6%	10.6%
Miles of riparian area improvement	150	150	300	150	225	210
Number of subwatersheds in improved condition	23	23	25	25	23	23
Improvement in the dry upland forest potential vegetation groups FRCC departure score at year 50 (percent)	20	23	17	35	35	28

Table S-4. Issues and key indicators for each alternative for the Wallowa-Whitman National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 1: Access (Wallowa-Whitman NF)						
Miles of road maintained annually	444	444	204	700	359	359
Percent change in area available for route designation for summer motor vehicle use	0%	minus-1%	minus-53%	minus-1%	minus-10%	minus-10%
Percent change in area available for winter over-the-snow vehicle use	0%	negligible	minus-38%	minus-2%	minus-8%	minus-8%
Issue 2: Economic and social well-being (Wallowa-Whitman NF)						
Timber harvest jobs	201	245	104	845	506	329
Timber harvest income	$11,112M	$13,526M	$5,723M	$46,722M	$28,000M	$17,716M
Livestock grazing jobs	258	242	102	267	258	258
Livestock grazing income	$3,435M	$3,241M	$1,304M	$3,556M	$3,435M	$3,435M
Recreation jobs	397	397	397	397	397	397
Recreation income	$7,678M	$7,678M	$7,678M	$7,678M	$7,678M	$7,678M
Ecosystem restoration jobs	81	81	45	156	98	69
Ecosystem restoration income	$2,582M	$2,582M	$1,449M	$5,001M	$3,143M	$2,215M
Predicted harvest levels/TSPQ (MMBF/year)	24	27	15	80	50	34
Allowable sale quantity (ASQ)) (MMBF/year)	46	46	22	75	46	46
Issue 3: Livestock grazing and grazing land vegetation (Wallowa-Whitman NF)						
Acres suitable for permitted cattle grazing	408,000	393,000	135,000	422,000	408,000	408,000
Acres suitable for permitted sheep grazing	25,000	22,000	22,000	25,000	25,000	25,000
Permitted animal unit months (cattle)	77,000	74,000	26,000	80,000	77,000	77,000
Permitted animal unit months (sheep)	4,500	3,500	3,500	4,500	3,500	3,500
Rate of progress towards achieving rangeland vegetation desired condition	slow to moderate	slow to moderate	fastest	slow	moderate to fastest	moderate to fastest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 4: Old Forest (Wallowa-Whitman NF)						
Acres of old forest within management area allocations with limited management activity	144,000	152,000	290,000	143,000	153,000	153,000
Acres of vegetation treatments per year in old forest	200	300	0	2,900	700	500
Percent old forest at year 50 (all potential vegetation groups	22	21	21	20	21	21
Percent dry upland forest old forest single story at year 50	9	8	7	11	11	9
Issue 5: Preliminary Administratively Recommended Additions to the National Wilderness Preservation System (Wallowa-Whitman NF)						
Acres of MA 1B	0	10,800	172,700	0	20,300	20,300
Issue 6: Ecological Resilience (Wallowa-Whitman NF)						
Annual forested vegetation active restoration activities (acres)	17,650	18,150	14,450	22,650	23,450	19,850
Miles of road treatments	260	260	400	800	300	270
Forage use intensity	12%	12%	3%	17%	12%	12%
Miles of riparian area improvement	250	250	500	250	375	350
Number of subwatersheds in improved condition	4	4	14	2	5	4
Improvement in the dry upland forest potential vegetation groups FRCC departure score at year 50 (percent)	5	7	4	16	16	11

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Chapter 1. Purpose of and Need for Action

Introduction

The U.S. Department of Agriculture (USDA), Forest Service, has prepared this draft environmental impact statement (DEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This DEIS discloses the environmental consequences that could result from the proposed action and alternatives. The document is organized into four chapters.

Document Structure

Chapter 1. Purpose of and Need for Action: This chapter includes information on the history of the proposal, the purpose of and need for the action, and the Agency's proposal for achieving that purpose and need. This chapter also describes the public involvement process.

Chapter 2. Alternatives, including the Proposed Action: This chapter describes the alternatives developed to address the purpose and need for change. It also describes alternatives not considered in detail. A summary comparison of alternatives is provided at the end of the chapter.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes current conditions on the Malheur (including the portion of the Ochoco administered by the Malheur), Wallowa-Whitman and Umatilla National Forests and the environmental consequences of implementing each alternative at a programmatic level.

Chapter 4. List of Preparers, Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during the development of the DEIS.

Glossary and Acronyms: The glossary provides definitions of terms used in this document and shows acronyms related to those terms.

References: The references section provides a list of all the literature and other source materials cited within the text.

Appendices: The appendices provide additional detailed information in support of the analyses presented in the DEIS. Appendix A provides a description of the alternatives including the no-action alternative. Appendix B provides methodology and assumptions. Appendix C provides a list of the cumulative effects. Appendix D provides detailed descriptions of the Laws and Regulations. Appendix E documents the wild and scenic river eligibility evaluation for the Blue Mountains forests plan revision. Appendix F describes the process used to evaluate the wilderness potential of 76 areas within the Blue Mountains forests plan revision area. Appendix G displays the total acres suitable for cattle or sheep grazing in each allotment.

Map packet: The map packet is a separate packet that includes management area maps for each action alternative.

Background

Efforts to revise forest plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests began in 2003. Since then, national planning rules that govern revising forest plans have been in

flux. The original planning rule was established in 1982. This revision process for the revised forest plans has fallen under the 2000, 2004, 2008 and 2012 planning rules. This revision process was conducted under the legal framework of the National Forest Management Act, and the provisions of the 1982 Planning Rule, as allowed by the 2012 Planning Rule language (36 CFR 219.7(b)(3)).

The primary needs or goals of forest management expressed in a forest plan are established by the National Forest Management Act, Multiple Use Sustained Yield Act, and Organic Act. Goals from these acts that are applicable to this revision effort include:

- Provide for biodiversity through habitat restoration or maintenance to assure species viability
- Provide clean and cold water, to the extent feasible, for domestic uses and habitat needs
- Sustain ecological processes from which ecosystem health is derived
- Provide sustainable vegetation, thus habitat conditions
- Assure resistance and resilient response to threats, such as climate change, uncharacteristic fires, and broad scale insects and disease infestations and epidemics
- Contribute to social and economic well-being through sustainable levels of goods and services

While the 1990 forest plans addressed these goals and needs, there is a need to update the management strategies used to meet them. Revisions to the 1990 forest plans come from many sources, including forest plan monitoring; new scientific information, particularly from the Interior Columbia Basin Ecosystem Management Project (ICBEMP); new national policy, direction, and initiatives; and watershed assessments.

The NFMA states that the land management plan is to be revised from time to time when the secretary finds conditions in a unit have significantly changed, but at least every 15 years (NFMA) (16 U.S.C. 1604 (f) (5) (A)). Revision of the 1990 forest plans is needed because the plans are beyond the 10 to 15 year revision timeframe and because conditions and demands have changed.

The Forest Service has amended the 1990 forest plans many times to respond to changes in conditions and demands and to update management direction. The Malheur National Forest now includes greater than 60 plan amendments, the Umatilla National Forest greater than 30, and the Wallowa-Whitman National Forest greater than 40. Region wide amendments account for five of each total, while the remaining amendments address nonsignificant plan amendments or forest specific management direction. Plan amendments address changes related to four general categories:

1. **Establishing management plans for special areas,** including management plans and boundary establishment for wild and scenic rivers and establishment of research natural areas
2. **Adopting management strategies for selected resources:** use of natural fire for resource benefits, management of competing and unwanted vegetation, stewardship of the Eagle Cap Wilderness Area, and management of bighorn sheep
3. **Addressing changing perspectives on management of controversial resources**, such as old forest and anadromous and inland threatened or endangered fish species
4. **Authorizing project-specific changes**, which comprise the vast majority of the amendments

These regionwide amendments referenced in item 3 include the Eastside Screens, PACFISH, and INFISH. Initially intended as interim direction to stay in place as work on ICBEMP was completed, these amendments evolved into long-term direction when the decision was made to limit the ICBEMP effort to scientific reference rather than management direction. This interim direction placed constraints on management activities by limiting removal of trees 21 inches d.b.h. or larger and allowing limited situations where harvest in late and old structure stands may occur. PACFISH and INFISH defined stream buffers referred to as riparian habitat conservation areas (RHCAs) and limited the management activities that could occur within them.

As referenced in item four, project specific amendments were plentiful. Some applied to standards and guidelines and management area boundaries to account for unexpected conditions, such as those created by wildland fire. Others made adjustments in response to unexpected projects, such as land exchanges. As it became evident that the Eastside Screens, PACFISH, and INFISH would become long-term direction, some projects included specific amendments to this interim direction. Those amendments permitted activities that include limited removal of trees 21 inches d.b.h. or larger, selected harvest in late and old structure stands, and vegetation manipulation in RHCAs associated with specific project areas.

A common need for change that can be derived from these amendments is that the 1990 forest plans were relatively inflexible and tended to respond poorly to the dynamic nature of natural resource systems. Therefore, this revision effort provides an opportunity to address a need for more flexible and adaptive management plans.

Since the Eastside Screens, PACFISH, and INFISH were originally prescribed as interim direction, the resulting changes to outputs of goods and services from these amendments were not determined through the amendment process. As the interim direction evolved into long-term direction, the impact on outputs was and is greater than anticipated. NFMA instructs the Forest Service to provide the public with information about expected outputs (within the capability of the land), and this revision effort provides an opportunity to address that obligation.

Although the 1990 forest plans were completed at the same time, they were developed independently of each other and by three interdisciplinary teams. As a result, there are similarities between the plans, but distinct differences resulted from the work of separate teams. This forest plan revision effort provides an opportunity to coordinate these plans and strategically define what management direction should be consistent across the three national forests and what direction should be distinct for each national forest.

While the forest plan revision effort is based on the need for change, an opportunity exists to incorporate emerging climate change information, reclassify standards and guidelines as desired conditions where appropriate, update processes and models, and reduce duplication of Forest Service Handbook and Manual direction and existing laws, regulations, and policies.

Purpose and Need

The existing forest plans are 20 years old. Economic, social, and ecological conditions changed during that time; new laws, regulations and policies are in place; and new information based on monitoring and scientific research is available. The Malheur, Umatilla, and Wallowa-Whitman National Forests are revising their 1990 forest plans to meet the legal requirements of the National Forest Management Act (NFMA) of 1976; to address changed conditions and provide consistent management direction (as appropriate) across the three national forests; to incorporate

changes in law, regulation, and policy; and to utilize new scientific information. In particular, the interdisciplinary planning team intends to address the following areas in the revised forest plans:

1. **To more adequately protect and restore terrestrial plant and animal species and their habitats.** Two objectives in the Strategic Plan for the Forest Service are to "provide ecological conditions to sustain viable populations of native and desired nonnative species and to achieve objectives for management indicator and focal species." The Columbia Basin Strategy (2000) identifies key elements to be addressed in planning efforts, such as source habitats, that are not addressed in the 1990 forest plans. The structural arrangement of vegetation, both vertical and horizontal, and the size and arrangement of trees, grasses, and shrubs are important components of wildlife habitat. Many changes to forest stand structure have occurred due to disturbances such as fire, timber harvest, and insects and disease. There has been a loss of large (20 inches d.b.h. and greater) and medium (15 to 20 inches d.b.h.) trees across the landscape. Within the dry upland forest, the amount of old forest single story has been greatly reduced from pre-1900 levels. Some of the most significant changes in forested structural stages have occurred in the dry upland forest environment. All of these changes have led to reductions in habitat for some species and increases for others. The 1990 forest plans need to be updated to reflect current science relating to plant and animal species and their habitats.

2. **To address management of fuels and fire risk.** Changing vegetative conditions have made forests more susceptible to disturbances, such as uncharacteristically severe fires, insects and disease. Several factors have contributed to the changes, including the cumulative effects of a periodic and sometimes extended drought, climate change, increasing vegetative density, shifts in forest species composition, and modified landscape patterns. Forested areas on the three national forests are dominated by dense, multi-storied conifer stands with tree species that are not well suited for the area. The 1990 forest plan standards and guidelines do not adequately address the multiple factors that have created the existing uncharacteristic conditions nor do they adequately address the varied nature of the landscape. Neither do they address the need for management strategies that recognize the unique qualities of various landscapes. An integrated strategy that recognizes multiple risk factors and addresses variability in conditions and site potentials is needed.

3. **To more adequately protect and restore watersheds and aquatic habitats.** The Columbia Basin Strategy (2000) emphasizes restoring the processes responsible for creating and maintaining aquatic and riparian habitats and restoring naturally functioning riparian ecosystems. It also outlines specific components to be included in revised forest plans. The 1990 forest plans include, by amendment, interim direction (i.e., PACFISH, INFISH, and the Eastside Screens) for management of threatened or endangered fish species. However, the 1990 plan language was never changed to integrate this interim direction or resolve conflicts between the existing plan language and the interim direction language. The 1990 forest plans do not adequately provide integrated management strategies for maintenance and restoration of properly functioning watersheds that provide a range of benefits on and off the national forests. These include, but are not limited to, providing habitat for terrestrial, aquatic, and riparian-dependent species; maintaining water quality; providing channel stability; reducing erosion; moderating floods; and maintaining reliable stream flows for downstream users.

4. **To address climate change.** The 1990 forest plans do not address climate change. Climate change is expected to affect plant species range and composition and alter competitive relationships between plant species. Changes in the composition and structure of plant

communities will, in turn, alter the character and distribution of wildlife habitats. Future conditions may be more favorable to some undesired nonnative plant and animal species. The full extent of changes in response to climate change on natural resources in the Blue Mountains is uncertain, but integrated management direction is needed to maintain or increase the resilience of the national forests in the face of these changes.

5. **To recognize the interdependency of social and economic components with national forest management.** The relationship between the national forests and the people who live, work, and play in them is not adequately recognized in the 1990 forest plans. National forests provide a variety of recreation opportunities, work opportunities, and opportunities to exercise cultural and spiritual traditions. Local communities provide infrastructure that contributes to the ability of the national forests to restore and maintain ecological systems. In eastern Oregon in particular, the tie between national forest management and the social and economic well-being of local communities is particularly important. With historically high unemployment rates and many small communities poorly positioned to attract new industries providing family wage jobs, logging and wood processing jobs are essential to maintaining and improving social and economic conditions. In addition, many of the actions needed to improve forest structure, reduce fuel loadings and conduct other restoration activities in eastern Oregon and Washington are dependent on the workforce and infrastructure associated with logging and wood processing.

About the Planning Area

The three Blue Mountains national forests in northeast Oregon and southeast Washington provide the setting for the proposal (Figure 1). The project area (also called the plan area throughout this DEIS) consists of 4.9 million acres of National Forest System lands. The Forest Service administers the 1.5 million-acre Malheur National Forest and an adjoining 242,000-acre portion of the Ochoco National Forest as one unit; the 1.4 million-acre Umatilla National Forest; and the 2.4 million-acre Wallowa-Whitman National Forest. All of these National Forest System lands are in Oregon with the following two exceptions: the Umatilla National Forest includes 311,000 acres in southeast Washington and the Wallowa-Whitman National Forest includes the Hells Canyon National Recreation Area (HCNRA), which straddles the Oregon-Idaho border. The Analysis of the Management Situation (reflected in the 2004 Current Management Situation (CMS)) for the Hells Canyon National Recreation Area showed that there was no need for change in this area of the Wallowa-Whitman National Forest and therefore this area was not analyzed in this EIS. The 2003 Hells Canyon Comprehensive Management Plan EIS would be the guiding document for this portion of the Wallowa-Whitman, which is tiered to the 1990 Wallowa-Whitman National Forest Plan.

Decisions to be Made

The regional forester for the Forest Service Pacific Northwest Region is the responsible official who will approve and sign three record of decisions, one for each National Forest—Malheur (including the portion of the Ochoco administered by the Malheur), Wallowa-Whitman and Umatilla National Forests.

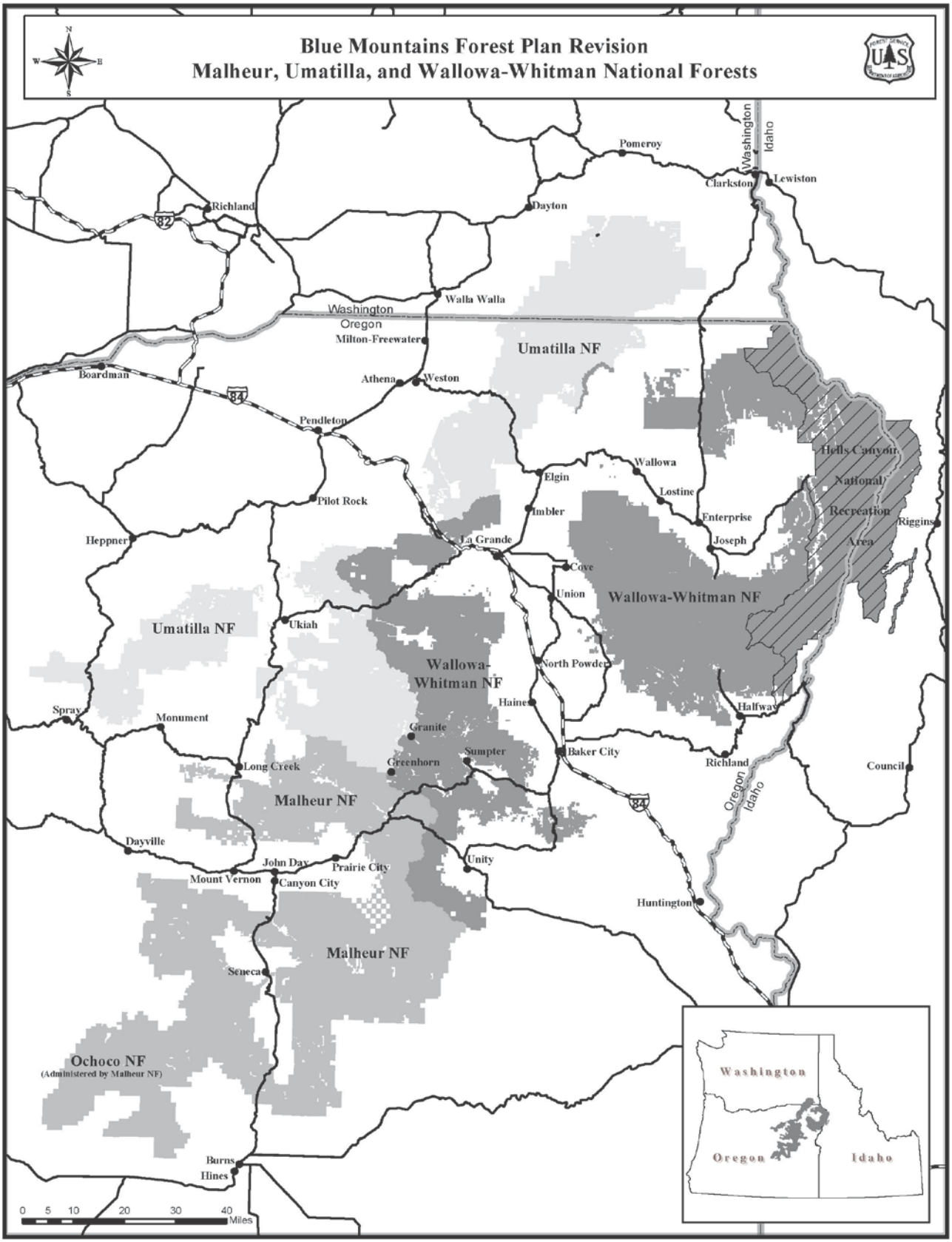

Figure 1. Vicinity map of the Blue Mountains national forests

Planning for units of the National Forest System involves two levels of decision making. The first level of planning involves the development of a forest plan that provides direction for resource management of the entire planning unit. Forest plans set out forestwide and management area direction with standards and guidelines for future decision making and are adjustable through amendment and revision. Forest plan management area and forestwide direction are the zoning ordinances under which future decisions are made. Forest plan approval establishes multiple-use goals, desired conditions, and objectives for the planning unit. Forest plan level actions are approval (16 USC 1604(d) and (j), amendment (16 USC 1604(f)(4)) and revision (16 USC 1604(f)(5)).

Forest plan approval results in:

- Establishment of desired conditions, forest multiple-use goals and objectives (1982 rule provision 36 CFR 219.11(b))
- Establishment of standards and guidelines applying to future activities (1982 rule provision 36 CFR 219.13 to 219.27)
- Establishment of management areas and management area direction applying to future activities in that management area, including the suitability of lands for resource management (16 USC 1606(g)(2)(A) and 1982 rule provision 36 CFR 219.11(c))
- Designation of suitable timber land (16 USC 1604(k) and 1982 rule provision 36 CFR 219.14) and establishment of allowable timber sale quantity (16 USC 1611 and 1982 rule provision 36 CFR 219.16)
- Recommendation to Congress of areas eligible for wilderness designation as required (36 CFR 219.17) and rivers eligible for inclusion in the National Wild and Scenic Rivers System as required (16 USC 1271-1287, 36 CFR 297, and 47 FR 39454)
- Establishment of monitoring and evaluation requirements (1982 rule provision 36 CFR 219.11(d))

For the Wallowa-Whitman National Forest, forest plan approval would complete the two wild and scenic rivers suitability analyses.

The second level of planning involves the analysis and implementation of management practices designed to achieve the goals, desired conditions, and objectives of the forest plan. Projects and activities are proposed, analyzed, and carried out within the framework of a forest plan and must be consistent with it. This second level involves site-specific analysis to meet NEPA requirements for decision making. The Blue Mountains forest plan revision does not include this second level of decision making.

Decision Criteria

Decision criteria were identified by the forest supervisors for the Blue Mountains national forests and approved by the regional forester. These criteria will be used to evaluate the alternatives and determine which alternative ultimately will be selected:

- Meeting all applicable laws and regulations and be aligned with Forest Service policy
- Determining the balance between meeting the purpose and need with addressing the significant issues raised during the NEPA process
- Providing a mix of benefits to address the needs for change by:

  - Leading to more resilient and sustainable terrestrial ecosystems
  - Accelerating improvement of watershed and aquatic/riparian conditions
  - Restoring and maintaining scenery, cultural and recreation resources, treaty resources, and wildland-urban interface
- Minimizing conflicts between revised forest plans and travel management decisions
- Maintaining or enhance biological diversity and the long-term health of the national forests
- Contributing to economic and social needs of people, cultures, and communities

Best Available Science

The best available science factors heavily into the decision. What constitutes best available science might vary over time and across scientific disciplines. As a general matter, we show consideration of the best available science when we insure the scientific integrity of the discussions and analyses in the project NEPA document. Specifically, the NEPA document should identify methods used, reference scientific sources relied on, discuss responsible opposing views, and disclose incomplete or unavailable information, scientific uncertainty, and risk. See 40 CFR, 1502.9 (b), 1502.22, 1502.24.

The Forest Service has a long history of science-based decision-making. Using scientific information in planning provides the responsible official with the knowledge, methods, and expert review needed to make an informed decision. To ensure that land management planning decisions help contribute to sustainable stewardship and ecological integrity of the nation's national forests, the agency has taken into account the best available scientific information pertaining to the economic and social conditions and ecosystem composition, structure, and function. In addition to other research, the scientific studies conducted by the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (Quigley et al. 1996, Quigley et al. 1997) were considered in the development of this forest plan.

Project Record

This DEIS incorporates by reference the project record (40 CFR 1502.21). The project record contains specialist reports and other technical documentation used to support the analysis and conclusions in this DEIS. The project record is available for review at the Wallowa-Whitman National Forest, Forest Supervisor's Office, 1550 Dewey Ave., Baker City, Oregon 97814.

Proposed Action

The Forest Service proposes to revise the Malheur, Umatilla, and Wallowa-Whitman National Forests forest plans in accordance with the National Forest Management Act of 1976 and the 1982 planning regulations. The use of the 1982 planning regulations is allowed by the 2012 planning rule, which states at 36 CFR 219.35 that a responsible official may elect to continue or to initiate new plan amendments or revisions using the 1982 planning regulations.

The proposed action distributed for public review in March 2010 has been modified and is presented as alternative B and is described in chapter 2, and specific alternative components are provided in appendix A.

Public Involvement

The notice of intent (NOI) to prepare this DEIS was published in the Federal Register on March 29, 2010 (FR, Vol. 75, No. 59). The NOI asked for public comment (written) on the proposal by May 25, 2010. In addition, the Forest Service held one round of public meetings during the scoping period in several towns in Oregon and Washington. Numerous collaborative meetings were held throughout the forest plan revision process (prior to the scoping period), which included several field trips. During the scoping period, the Blue Mountains forest plan revision team received 4,174 total responses to the request for comment and included in this total are 110 unique and substantially different comment letters and 4,025 organized form letters. The content analysis report analyzing all the comments received is located in the project record.

Additionally, alternative development meetings were held with representatives of industry and special interests groups, including wilderness advocates, conservation groups, and snowmobile enthusiasts, such as John Day-Snake River Resource Advisory Committee, Wallowa County Natural Resource Advisory Committee, Blue Mountains Forest Partners, Hells Canyon Preservation Council, etc. the details are available in the project record. Chapter 4 provides more information regarding consultation and coordination with the public, federal, state and tribal government entities.

Issue Statements

The Blue Mountains forest plan revision team solicited comments from three primary sources and identified issues after reviewing the comments. The sources include:

1. The public via open houses, scoping letters, conversations, and meetings with special interest groups
2. Cooperating agencies, American Indian tribes, state and federal agencies, and collaborators, including the John Day-Snake Resource Advisory Committee and the Southeastern Oregon Resource Advisory Committee
3. Internal agency sources where discussions centered around changes in law and policy, changed conditions, and resource needs along with reviews of the proposed action

Potential issues were separated into groups per Council on Environmental Quality (CEQ) regulations (40 CFR 1500.1(b), 40 CFR 1500.2(g), and 40 CFR 1502.2(b)).

Issues

Issues (cause-effect relationships) serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. To resolve concerns brought forward in the scoping process, the interdisciplinary team formulated alternatives, prescribed mitigation measures, or analyzed additional environmental effects that were not previously identified. At the forestwide planning level, mitigation measures are incorporated into management direction (goals and objectives, desired conditions, standards and guidelines) or management prescriptions that influence the type, amount, and intensity of management actions that implement the forest plan or covered by laws, rules and regulations not addressed in the forest plan. The issues were developed to respond to conflicts with the proposed action that was distributed for public review in 2010. The responsible official selects issues for revision based on one or more of the following criteria:

- Would these issues be used to help develop management alternatives or management direction or would they be used in the allocation of management prescriptions?
- Would management alternatives, direction, or prescriptions have discernible effects on the issues or related resources?
- Would effects to the issues be sufficiently different by alternative to provide the responsible official with rationale for choosing a preferred or selected alternative?

Key Indicators

Key indicators are measureable indicators of change linked to significant issues. Indicators associated with each issue have a cause-and-effect relationship and provide means to assess how the alternatives respond to those issues.

Issues that Drive Alternative Development

Issue 1: Access

Public Concern: While some people suggested allocating additional areas to undeveloped backcountry to satisfy needs, such as solitude and nonmotorized recreation, others requested that additional areas be designated to allow motor vehicle recreation and requested that what is currently available not be reduced.

Statement: While the forest plan will not change designations of roads and trails for motor vehicle use, it will provide direction for future planning of motor vehicle routes and areas. In addition, the forest plan designates areas where the dominant uses are nonmotorized, which restricts the potential for development of motor vehicle access. It also designates areas where development for motor vehicle use could be considered. Motor vehicles are used for hunting and fishing, summer and winter recreation, private land access, management activities, and fire suppression. Nonmotorized areas are used for hunting and fishing, summer and winter recreation, secluded wildlife habitat, and biological reserves. The number of acres suitable for motor vehicle use and the desired conditions for open motor vehicle route density will influence the future transportation system and future road closure or development opportunities. These acres are an important factor affecting the health of terrestrial, aquatic, and riparian habitats. With the exception of wilderness areas, the forest plans for the Wallowa-Whitman and Malheur National Forests include little management direction to distinguish motor vehicle use allocations from nonmotorized use allocations, although the forest plan for the Umatilla National Forest included detailed management direction related to motor vehicle use. Subsequent to the Umatilla National Forest 1990 land management plan decision, each District on the Umatilla National Forest made Access and Travel Management Decisions, leading to the production of a forestwide Motor Vehicle Use Map (USDA Forest Service 1990, 1992, 1993a and 1993b). An additional concern with regards to access is that the road maintenance projections for the 1990 forest plans were not accomplished. Objectives for maintenance of the road system that are consistent with expected budgets are needed.

Key Indicators:

- Road maintenance funds projected to be available to maintain the transportation system
  - Projected road maintenance for each road maintenance level (miles)
- National Forest System lands that would be suitable for motor vehicle route designation and use or suitable only for nonmotorized use (acres)

- Change in acres suitable for summer motor vehicle route designation and use
- Change in acres suitable only for summer nonmotorized use (where motor vehicle use would be prohibited)
- Change in area suitable for winter over-the-snow motor vehicle use

Issue 2: Economic and Social Well-being

Public Concern: Many people stressed the importance of economic and social contributions of the national forests to the surrounding communities. One concern is the importance of maintaining the infrastructure in local communities (e.g., mills, roads, equipment, and skilled labor force), so that the Forest Service can draw upon that infrastructure to accomplish restoration goals as well as contribute to the economic and social well-being of communities. Another concern is the potential effects of large disturbances, such as insects and disease or wildland fire, on the economic and social well-being of local communities. Other people stressed ecological values and suggested that a more cautious approach and mix of restoration activities is necessary to protect those values that also contribute to economic and social well-being.

Statement: Forest plan decisions create the framework for the range of uses and products and services provided by the Blue Mountains national forests that contribute to the economic and social well-being of local communities, counties, and American Indian tribes. The quantity and quality of forest products and services provided by the national forests contribute to the local economy and the maintenance of local infrastructure. Infrastructure and the local workforce, in turn, play a critical role in the capacity of national forests to conduct forest management activities. The mix of uses, products, and services the Forest Service expects to provide over time will be stated in the forest plans.

Key Indicators:

- Jobs and income for the following sectors:
  - Timber
  - Grazing
  - Recreation
  - Ecosystem restoration
- Predicted harvest levels
- Allowable sale quantity

Issue 3: Livestock Grazing and Grazing Land Vegetation

Public Concern: Several people expressed concern about how revised forest plan direction will affect livestock operations and livelihoods. They expressed that further restrictions on allotments that are already financially overburdened due to high maintenance and operation costs would have significant financial and social effects. Other comments were made about the effects of permitted livestock grazing on National Forest System lands and resources. Most concerns revolved around riparian area livestock use and its effect on fisheries, biodiversity, and water quality. The viability of bighorn sheep due to the potential for disease transmission between domestic sheep and bighorn sheep is also a concern.

Statement: Suitability of areas for livestock grazing (both cattle and sheep) is identified in forest plans. Forest plans also set limitations on activities, including permitted livestock grazing, for the protection of resources. The decisions made in forest plans do not determine the number of

permitted livestock or the season, timing, or duration of use. The number of acres suitable for livestock grazing, along with the need to maintain and restore upland and riparian conditions and viable populations of fish and other species, may influence the location and amount of domestic livestock grazing that occurs on the national forests. Actual decisions regarding permitted livestock grazing will be made at the site-specific project level.

Key Indicators:

- Area suitable for permitted cattle and sheep grazing (acres)
- Permitted cattle and sheep animal unit months (AUMs)
- Rate of progress towards achieving rangeland vegetation desired conditions

Issue 4: Old Forest

Public Concern: Many people suggested an active approach to reducing the risk of loss from insects and disease and wildland fire within old forest stands and accelerating the development of old forest structure. Other people prefer the use of nonmechanical means to restore old forest stands and the designation of old forest management areas.

Statement: Old forests are unique components of a diverse vegetative community. They are important for their aesthetic qualities, wildlife habitat, carbon storage, ecological importance, and value as commercial products. Restrictions on harvesting large trees are in place from the 1990 forest plans and the Eastside Screens. The Blue Mountains national forests generally have less old forest than what occurred historically, especially in the dry upland forest, single story, open canopy stage. The forest plan will determine how much old forest the Blue Mountains national forests should have in the future and how it should be managed to ensure the ecological, social, and economic values it provides.

Key Indicators:

- Acres of old forest within management area allocations with limited management activity
- Acres of vegetation treatments within old forest
- Change in old forest structure through time

Issue 5: Preliminary Administratively Recommended Additions to the National Wilderness Preservation System

Public Concern: Many people asked that additional areas be proposed for wilderness designation to protect the values that they attach to wilderness areas. Others requested that no additional areas be proposed for wilderness designation because this would prevent them from participating in the activities that they currently enjoy within those areas. Wilderness designation would also limit management activities that could provide economic benefits while reducing the risks of uncharacteristic wildland fire and insects and disease disturbances.

Statement: Wilderness area designation is an allocation of land to a specific use. Proposals are preliminary administrative recommendations that require further review and possible modification by the Chief of the Forest Service, Secretary of Agriculture, and the President of the United States. Congress has reserved the authority to make final decisions on wilderness area designation. Wilderness area designation precludes the use of motor vehicles and motorized and mechanized equipment and most management activities. Wilderness areas offer human visitors solitude and opportunities for challenge, risk, and primitive recreation. Natural processes, including disturbances and ecological succession, operate without human intervention. Plant and

animal habitats are undisturbed by human uses. The 1990 forest plans do not include recommendations for wilderness designation. Based on a review of the 1990 forest plans with respect to management of existing wilderness areas, the ID team did not recommend, nor did the forest supervisors determine a need for change. Refer to the analysis file for documentation of this review.

Key Indicator:

- Acres allocated to MA 1B Preliminary Administratively Recommended Wilderness Areas

Issue 6: Ecological Resilience

Public Concern: There is concern about the type and extent of management activities for restoring ecological resilience that are included in the proposed action. Based on perceptions of current vegetation conditions and its resilience, some respondents stated that the proposal is too aggressive, while others stated that the restoration proposal not aggressive enough. Public concern is heightened because the management approach to restoring ecological resilience will determine the ecosystem services the Blue Mountains national forests provide.

Statement: Agency policy to reestablish and retain ecological resilience (FSM 2020) was developed subsequent to the approval and signing of the 1990 forest plans. Resilience is defined as the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change (FSM 2020 interim directive). While the foundational policy for the national forests is to achieve sustainable management and provide a broad range of ecosystem services, forest plans determine the management approach by defining objectives, desired conditions, standards and guidelines, and predicting outcomes. Climate change is likely to result in consequences for all resources and is part of the baseline condition. Climate change is included in the cumulative effects analyses throughout chapter 3 of this DEIS.

Key Indicators (to reflect the level of management activity):

- Annual forested vegetation active restoration activities (acres)
- Roads treatments in priority watersheds (miles)
- Forage use in priority watersheds (intensity)
- Improved riparian areas (miles)

Key Indicators (to reflect resilient conditions)

- Watersheds in improved conditions
- Improvement in the dry upland forest potential vegetation group fire regime condition class departure score at year 50 and change from existing condition

Other Resource Area Concerns Addressed in the Plan

Eligible Wild and Scenic Rivers

Many people expressed the desire for additional designations in accordance with the Wild and Scenic Rivers Act. The 1990 forest plans were challenged by the American Rivers and the Pacific Rivers Council with respect to how the plans addressed rivers and streams with potential to be included in the Wild and Scenic River System. To resolve those challenges, various eligibility and suitability studies were completed by the Forest service.

Determination of eligibility is an inventory process that follows agency procedures available from the Forest Service Handbook 1909.12, chapter 82. These eligibility inventories will remain in place until changed by subsequent reinventory. These inventories do not require NEPA analysis unless eligible lands from the inventory are assigned to a management area. Based on those eligibility inventories, this plan revision effort would allocate lands adjacent to eligible rivers to MA 2A (Designated and Eligible Wild and Scenic Rivers) in the action alternatives described in chapter 2 and appendix A.

Determination of suitability is a decision process that follows agency procedures available from the Forest Service Handbook 1909.12, chapters 82 and 83. The suitability process and decision may occur as part of a forest plan revision or may be deferred to a subsequent analysis. In 1996 and 1997, the Forest Service analyzed the suitability of additional eligible rivers on the Wallowa-Whitman National Forest; determining that 3 of 11 rivers were suitable for recommendation to Congress for inclusion in the Wild and Scenic River System. There are currently 10 Wild and Scenic Rivers on the Wallowa-Whitman National Forest. In response to the proposed action, public comments supported including additional suitability determinations in the revision effort. Such efforts will be deferred and are not part of the scope of this analysis.

Climate Change

Climate change concerns were included in several comments. It is Forest Service policy to consider the effects of climate change during forest plan revisions. Climate change analysis is part of the design of the ecological desired conditions for all alternatives. Climate change is likely to impact all vegetation types and result in consequences for all resources and is part of the evolving baseline condition. Climate change is included in cumulative effects analyses throughout chapter 3 of this DEIS.

Energy Development

Some people expressed concern about potential energy developments within the national forests. Wind energy development is of the highest concern. Wind energy development is considered a special use of the national forests. All special uses must be consistent with forest plan components, including desired conditions for scenery, watershed function, species diversity, cultural resources, and water quality. Special use proposals must undergo site-specific analyses that will determine their consistency with the forest plan. A few people commented on the potential for oil and gas development on the national forests. Oil and gas availability and leasing determinations are not made during forest plan revision and are not a forest plan decision. A suitability determination for energy development will be included in the forest plan.

Rocky Mountain Elk

Rocky Mountain elk are an important resource within the Blue Mountains national forests, both biologically and socially. The action alternatives address Rocky Mountain elk by proposing a common desired condition to move the landscape, and thus elk habitat, toward the natural range of variability. Cooperation with state wildlife agencies is needed to manage Rocky Mountain elk populations in the manner needed to achieve the desired condition. Even though the alternatives share a common desired condition, the analysis displays a wide range of effects on elk as significant issues are responded to in different ways. The effects of habitat patterns and how the absence or presence of motor vehicles relate to Rocky Mountain elk for each alternative are discussed in chapter 3. Since Rocky Mountain elk are considered a habitat generalist and because each alternative addresses the significant issues differently and provides varying levels of habitat and security for Rocky Mountain elk, they are not considered a significant issue.

Wildlife Habitat Connectivity

People expressed concern about the need to identify wildlife habitat connectivity in the forest plan. This concern was addressed in several different ways in the proposed action. Areas where most types of active management are generally not suitable will provide varying amounts of wildlife habitat connectivity. Riparian management areas also function as wildlife corridors for some species. Alternative C includes designation of a management area to provide for wildlife corridors. Alternatives E and F also have minor acreages identified for management as connections of wildlife habitat. The effects analysis in chapter 3 describes how each alternative contributes to the connectivity of habitats for various wildlife species.

Access for People with Disabilities

Many people commented that denial of motor vehicle access to people with disabilities violates the Americans with Disabilities Act (ADA). ADA defers to Section 504 of the Rehabilitation Act of 1973, which says that no person with a disability can be denied participation in a Federal program available to all other people solely because of his or her disability. In conformance with section 504, wheelchairs or mobility devices are welcome on all National Forest System lands that are open to foot travel, and they are specifically exempted from definition as a motor vehicle in section 212.1 of the Travel Management Rule (36 CFR 212.1). There is no legal requirement to allow people with disabilities to use off highway vehicles (OHVs) or other motor vehicles on roads, trails, and areas closed to motor vehicle use. Reasonable restrictions on motor vehicle use, applied consistently to everyone, are not discriminatory. This concern has been decided by law.

Budget

Many people commented that the objectives in forest plans should not be constrained by budget, but rather should state levels needed to achieve the desired conditions. They expressed fears that budget-constrained objectives will create a ceiling and will not clearly outline the restoration needs. It is not realistic or reasonable to ignore expected funding levels. Increases in budgets beyond expected levels could result in a faster rate of achievement of the desired conditions than those projected. Recent budget trends are essentially level or slightly declining and those trends are expected to continue. The forest plan does not influence or control the budgets for the national forests, but the alternatives analyzed in this document include varying budget levels for some program areas based upon the themes of the alternatives and how the alternatives would address the various issues.

Fees

The topic of fees for a variety of national forest products and uses was raised by some people. Fees are an administrative decision and are outside the scope of a forest plan.

Revised Statute (RS) 2477 Public Right of Way

Some people commented that some roads on the national forests are public roads under RS 2477 and should be recognized as such. The Forest Service recognizes legally documented rights-of-way held by state, county, or other public authorities. This includes rights-of-way under RS 2477 that have been adjudicated through the Federal court system or otherwise formally established, such as easements under the Federal Roads and Trails Acts (FRTA). The only means to conclusively establish the existence of a RS 2477 right-of-way across Federal land is by obtaining a judgment from a Federal court under the Quiet Title Act (28 U.S.C. section 2409a).

Since an assertion on National Forest System lands is a claim of title against the Federal government, an RS 2477 claim must be asserted by a state or county government that manages a public road system. Individuals who wish to pursue an RS 2477 claim must present their request to the local county government for consideration. The Forest Service may manage or agree to manage (in accordance with the local public road agency) any road declared under a validated claim consistent with a Forest Service approved travel management plan. Management may include a range of options, including designation for highway legal vehicle or OHV use; changing the level, type, or season of use; or removing these routes from designation in the Forest Service approved travel management plan. This would not preclude establishment of the route as a public right-of-way in the future if a court were to make a determination of validity. Due to the limited role of RS 2477 rights-of-way in the forest plan revision process, this issue does not involve discernible effects and is outside the scope of this analysis.

Travel Management Planning

Many people asked that the Travel Management Rule be set aside or that the Forest Service modify decisions being made outside of forest plan revision to designate roads, trails, or areas for motor vehicle use. Some people would like the national forests to allow cross-country travel. The Travel Management Rule (36 CFR 212, Subpart B) directs each national forest to designate roads, trails, or areas for motor vehicle use. The Forest Service has completed Travel Management Rule Subpart B designations for the Umatilla, while travel management planning and compliance with Subpart B of the rule is ongoing for the Wallowa-Whitman and Malheur National Forests. This designation of roads, trails, or areas for motor vehicle use is site-specific. The forest plan does not make the site-specific decisions required by the Travel Management Rule, and it cannot set the rule aside or ignore it. The revised forest plans will provide the framework for future transportation system decisions to be made but will not make decisions that designate roads, trails, or areas for motor vehicle use. Look for further explanation under the legal and regulatory framework section.

Legal and Regulatory Framework

Over time, a framework of laws, regulation, and guiding legislation that works to guide the management of National Forest System lands has been enacted. Legal mandates governing national forest management date back to the Organic Act of 1897, which provided that national forests would be managed for the dual purpose of protecting water flows and providing a continuous supply of timber for the American public. The Multiple Use Sustained Yield Act (1960) provides for the sustainability of the multiple uses of natural resources in ways that best meet the needs of the public while maintaining the long-term productivity of the land for multiple uses and in such a manner that these lands are available to future generations. The magnitude and intensity of any effects are disclosed to the public, and the public has the opportunity to comment on the actions proposed. The National Forest Management Act 1976 and its accompanying legislation guides the creation, revision, and amendment of National Forest Land Management Plans, and the Forest and Rangeland Renewal Resources Planning Act of 1974 directs that the suitability of lands for resource management be identified and a process for the revision of land and resource management plans established. This revision process was conducted under the legal framework of the National Forest Management Act, and the provisions of the 1982 Planning Rule, as allowed by the 2012 Planning Rule language (36 CFR 219.7(b)(3)). NFMA requires forest plans to be revised at least every 10 to 15 years or sooner if warranted by changed conditions. The multiple-use desired conditions and objectives, design criteria (standards and guidelines), and monitoring all work together to define management

direction for the three Blue Mountains national forests. However, successful implementation of the management direction and the rate of accomplishment of desired conditions are dependent upon the congressional budget process and other factors.

The National Environmental Policy Act (NEPA) of 1969 requires that all major Federal actions significantly affecting the human environment be analyzed, and the consequences to the quality of the human environment from proposed management actions are to be considered. The regulations implementing the NEPA further require that agencies prepare environmental impact statements concurrent and integrated with environmental analysis and related surveys and studies required by such laws as the Endangered Species Act of 1973, the National Historic Preservation Act of 1966, the Wilderness Act of 1964, and the Wild and Scenic Rivers Act of 1968. Other environmental review laws and executive orders, such as the Clean Air Act of 1977 and the Clean Water Act of 1948 are also considered.

The revised forest plans will continue to honor American Indian reserved rights through consultation and coordination, and will maintain a government-to-government relationship with federal recognized tribal governments.

Additional direction for managing National Forest System lands comes from a variety of sources, including Executive Orders (EOs), the Code of Federal Regulations (CFRs) and the Forest Service directive system, which includes the Forest Service Manual (FSM) and the Forest Service Handbook (FSH). This management direction is generally not repeated in the forest plan.

Appendix D of this DEIS lists many of the laws, regulations, executive orders, and other guiding direction for the scope and content of analysis for each section of chapter 3.

Relationship to Other Assessments

There are broad scale assessments in place that affect management decisions for the Blue Mountains national forests. These assessments are referenced in this chapter to explain the revision process in the context of these larger analyses. National Forest System lands within the Blue Mountains plan area were considered along with lands managed by other Federal agencies, tribal lands, state, and private lands to the extent possible for all resources.

National Scale

The Department of Energy, Bureau of Land Management (Department of the Interior), the Forest Service (Department of Agriculture), and Department of Defense issued a final programmatic environmental impact statement (PEIS) that documents the evaluation of issues associated with the designation of energy corridors on Federal public lands in 11 western states. Based on the PEIS findings, no energy corridors were identified on national forest lands within the Blue Mountain national forests. The subsequent USDA record of decision (USDA Forest Service 2009) did not amend the Blue Mountain national forest's land and resource management plans to reflect the PEIS energy corridor designation. Further information about the PEIS is available at http://corridoreis.anl.gov.

Regional Scale

The Interior Columbia Basin Ecosystem Management Project (ICBEMP) responds to presidential direction to develop a scientifically sound, ecosystem-based strategy for management of 64 million acres of lands administered by the Forest Service and the Bureau of

Land Management within the Columbia River Basin and portions of the Klamath and Great basins in Oregon. ICBEMP analysis also responds to concerns about forest and rangeland health, uncharacteristically intense wildland fires, threats to certain fish and wildlife species, and concerns about local community social and economic well-being. In addition, there was little broad-scale scientific knowledge of the ecological, biophysical, social, and economic conditions, trends, risks, and opportunities within the plan area.

The Eastside Ecosystem Management Project Charter was the catalyst for ICBEMP in January 1994. The charter, signed by the Chief of the Forest Service and the Director of the Bureau of Land Management, directed the agencies to develop and adopt a scientifically sound, ecosystem-based strategy for managing all Forest Service and BLM administered lands within the basins. A scientific assessment of the basins provides a better understanding of the scope and possible broad-scale causes of current resource conditions. The scientific findings formed the basis for management strategies evaluated for ICBEMP.

A final environmental impact statement and proposed decision were published in December 2000. Rather than prepare a record of decision, in 2002, the BLM state directors and Forest Service regional foresters chose to incorporate ICBEMP's scientific data and resource information into land and resource management plans and project implementation (FS Agreement No. 03-RMU-11046000-007).

Forestwide Scale

Analysis of the Management Situation

An analysis of the management situation (AMS) was completed for the Blue Mountains national forests. The AMS summarizes information about the conditions of the land and peoples' uses and values associated with it. This provides the foundation for developing a proposal for future management of the Blue Mountains national forests. It paints a picture of the current social, ecological, and economic setting and helps define the decision space. It identifies where and why there is a need to change the 1990 forest plans and what needs to be addressed in this revision.

The AMS is not a decision document. It has been prepared in accordance with the requirements of the 2012 planning rule (1982 planning rule provisions 36 CFR 219) and the Forest Service Handbook (FSH 1909.12) that require an analysis of the management situation. It documents the current management situation, conditions, and trends with regard to the components of the 1990 forest plans and it identifies any need for change in those plan components.

Oil and Gas Leasing

A potential natural gas resource occurs in Mesozoic age rocks beneath the Malheur and Umatilla National Forests. As required by Forest Service regulations, an analysis was completed in 1997 that identified lands administratively available for oil and natural gas leasing within the Malheur and Umatilla National Forests. This decision is incorporated into the existing forest plans by amendment. Lands excluded from the analysis include lands withdrawn from mineral entry or leasing. Wilderness areas, recommended wilderness areas, and wilderness study areas are legally unavailable for leasing. Those parts of the Snake River basin within the Umatilla National Forest and congressionally designated areas of the national forests are also unavailable. All other lands within these national forests are considered administratively available for oil and gas leasing, subject to one or more of four basic lease stipulations: no surface occupancy, seasonal use, controlled surface use, or standard lease stipulations. The 1997 leasing decision will be carried

forward into the revised plans for the Malheur and Umatilla National Forests; however, when specific lands are proposed for lease, the Forest Service would review the existing leasing decision to ensure adequacy of NEPA compliance, consistency with the forest plan, and proper application of lease stipulations.

Hells Canyon National Recreation Area

The Hells Canyon National Recreation Area Act (Public Law 94-199) required that a separate management plan be developed for the Hells Canyon National Recreation Area. The Hells Canyon National Recreation Area Comprehensive Management Plan was subsequently developed and was approved on April 30, 1982. When the 1990 forest plan for the Wallowa-Whitman National Forest was approved, this HCNRA CMP was carried forward without amendment under the provisions of the 1982 planning rule (1982 rule provision 36 CFR 219.12(b)) which state that "(if), in a particular case, special area authorities require the preparation of a separate special area plan, the direction of any such plan may be incorporated without modification in plans prepared under (these regulations)." In 2003, the HCNRA CMP was revised and, by amendment, became part of the 1990 forest plan for the Wallowa-Whitman National Forest. This 2003 Hells Canyon National Recreation Area Comprehensive Management Plan is being carried forward without modification and will continue to be a part of the forest plan for the Wallowa-Whitman National Forest.

The 662,000-acre Hells Canyon National Recreation Area includes about 30,000 acres of lands that are not part of the National Forest System. The Hells Canyon National Recreation Area is managed via its own enabling legislation and comprehensive management plan EIS (USDA Forest Service 2003). The Hells Canyon National Recreation Area Comprehensive Management Plan EIS was reviewed by the plan revision interdisciplinary team in 2004 to determine if there was a need for change to revise that plan. The Analysis of the Management Situation (reflected in the 2004 Current Management Situation (CMS)) for the Hells Canyon National Recreation Area showed that there was no need for change in this area of the Wallowa-Whitman National Forest and therefore this area was not analyzed in this EIS. Based on the recommendation of the interdisciplinary team, the Wallowa-Whitman National Forest's forest supervisor and the Region 6 regional forester determined that no new information or changed conditions existed that would provide a need to revise the Hells Canyon National Recreation Area Comprehensive Management Plan EIS. Thus, that management direction would remain unchanged by this revision effort. The 2003 Hells Canyon National Recreation Area Comprehensive Management Plan EIS would be the guiding document for this portion of the Wallowa-Whitman, which is tiered to the 1990 Wallowa-Whitman National Forest Plan. The 4.9 million-acre project area referred to throughout this DEIS excludes the HCNRA. Where appropriate (for instance, in the analysis of cumulative effects for some resources), the resources within HCNRA were included.

Wilderness, Wild and Scenic River and Other Plans

Some amendments to the 1990 forest plans and other resource management decisions resulted in the creation of management and activity plans for specific designated management areas. These would be carried forward in this revision effort unchanged. These plans are currently tiered to the 1990 forest plan, but once the revised forest plan decision is in place, those plans would tier to the revised forest plans. These plans include wilderness plans, wild and scenic river plans, research natural area plans, and so forth. The one exception to this is the Hells Canyon Wilderness Area Plan, which would continue to be tiered to the 1990 forest plan, for the reasons previously discussed. These various plans continue to be effective at maintaining, enhancing, and protecting the specific designated management areas. In this planning effort, the forests brought

forward many of the plan components that were in the individual plans. Unless specifically identified in the revised forest plan, the actions of these management plans would continue to be used for the future management of these specific designated management areas.

Invasive Plant Treatment Projects

In 2005, the Pacific Northwest Regional Forester amended all forest plans in Region 6, adding new management direction, including an emphasis on early detection, and effective integrated treatment of invasive plants. EISs and associated decisions have been prepared on the Wallowa-Whitman and the Umatilla National Forests to allow the Forests to control invasive plant species using the amended forest plan direction. These decisions allow for effective treatment of invasive plants on all sites currently mapped and those that may be detected in the future. Initial treatments rely more heavily on herbicides; but the goal, as invasive plant objectives are met, is to reduce the use of herbicides over time. The Malheur National Forest Site-Specific Invasive Plants Treatment is currently underway.

Travel Management Planning

Land management plans are strategic and aspirational, establishing desired conditions, objectives, suitability of areas for various uses, and guidelines (FSM 1920). Travel management decisions are made at the project level; they are site-specific decisions that are not typically made in land management plans, which are programmatic documents. Travel analysis (36 CFR 212.51(a)) provides a bridge between the strategic guidance in land management plans and travel management decisions made at the project level.

In December 2005, the Forest Service issued a regulation known as the Travel Management Rule (36 Code of Federal Regulations (CFR) Parts 212, 251, 261, and 295). The Travel Management Rule clarifies current Forest Service policy regarding motor-vehicle use and provides management direction that allows sustainable access by motor vehicles, including OHVs, on national forests and grasslands.

The Travel Management Rule requires each national forest and grassland that does not have a designated motorized travel system to establish one and for that system to be documented on a publicly available motor vehicle use map that will be updated annually. Designations to motorized travel systems may include the limited use of motor vehicles within a specified distance (corridor) of certain designated National Forest System roads solely for dispersed camping or big game retrieval (36 CFR 212.51(b)). Once a motor vehicle use map is published, all motor-vehicle travel that is inconsistent with its designations is prohibited (36 CFR 261.13).

With the exception of wilderness areas, the forest plans for the 1990 Wallowa-Whitman and Malheur National Forests include little management direction to distinguish motor vehicle use allocations from nonmotorized use allocations; however, the forest plan for the Umatilla National Forest included detailed management direction related to motor vehicle use. Subsequent to the Umatilla National Forest 1990 land management plan decision, each District on the Umatilla National Forest made Access and Travel Management Decisions (USDA Forest Service 1990, 1992, 1993a and 1993b), leading to the production of a forestwide motor vehicle use map in compliance with 36 CFR 212.51, Subpart B and 36 CFR 216.13 of the Travel Management Rule.

Allotment Management Plans

The forest plan provides guidance for the rangeland resource and livestock grazing program. Project level NEPA decisions determine specific standards and guidelines, desired conditions, livestock numbers and pasture rotations for a specific allotment. That decision is captured in the Allotment Management Plan (AMP), which is incorporated into the Term Grazing Permit as part of the management direction for the allotment. Annual Operating Instructions (AOIs) are issued to identify changes to the allotment management including pasture rotation, season or livestock numbers, range betterment projects, etc. for a given year. Current AMPs are tiered to the 1990 forest plan. Once the revised forest plan decisions are implemented, the forests will incorporate the new management direction as a Modification to the Term Grazing Permits, as well as in the AOIs until new NEPA can be conducted.

Landscape Scale

Several watershed assessments at the subbasin or watershed scale have been completed since the 1990 forest plans were completed. Subbasin plans were developed collaboratively by state and Federal fish and wildlife agencies, American Indian tribes, local planning groups, and fish recovery boards. The planning effort was guided by the Northwest Power and Conservation Council and funded by the Bonneville Power Administration. Subbasin plans identify priority restoration and protection strategies for habitat and fish and wildlife populations in the United States portion of the Columbia River system. The plans will guide the future implementation of the council's Columbia River Basin Fish and Wildlife Program, which directs more than $140 million per year of Bonneville Power Administration electricity revenues to protect, mitigate, and enhance fish and wildlife affected by hydropower dams. Subbasin plans will provide this guidance by providing the context for proposed project review for funding through the council's program. Subbasin plans were finalized in 2005 for all subbasins within the project area except for Silver Creek and Silvies River within the Malheur National Forest. The completed subbasin plans are available at the Northwest Power and Conservation Council website.[1]

Watershed assessments at the 5th-field hydrologic unit code (HUC) watershed scale have also been completed since 1990. Not all watersheds have been assessed. Umatilla National Forest watersheds with completed reports are available on the Umatilla National Forest website[2] under "Land and Resources Management Planning." Watershed assessments for the Wallowa-Whitman and Malheur National Forests are available in the project record.

[1] http://www.nwcouncil.org/fw/subbasinplanning/home/
[2] http://www.fs.usda.gov/detail/umatilla/landmanagement/planning/?cid=fsbdev7_016111

Chapter 2. Alternatives, Including the Modified Proposed Action

This chapter describes and compares the six management alternatives for revising the 1990 forest plans for the national forests of the Blue Mountains. The alternatives were developed based on public involvement both during and prior to the scoping period for the proposed action and based on the purpose and need and issues described in chapters 1 and 4. The alternatives present a range of analysis options, as required by National Environmental Policy Act (NEPA) regulations (40 CFR 1502.14).

NEPA requires that an environmental impact statement include analysis of the no-action alternative (40 CFR 1502.14(d)). No action means that there would be no change in current management (FSH 1909.15(14.2)). Alternative A is the no-action alternative. This alternative would keep the 1990 forest plans as amended in effect. The action alternatives (alternatives B, C, D, E, and F) modify components of the 1990 forest plans to respond to new scientific information, management challenges, changed conditions, and the significant issues developed from public comments.

The alternatives provide a framework for analyzing different ways of meeting the purpose and need of the forest plans and for addressing the issues described in chapter 1. These alternatives show a range of options for guiding land and resource management activities on the national forests of the Blue Mountains during the life of the plan. While this draft environmental impact statement identifies a preferred alternative, the key purpose of this document is to describe in detail the environmental consequences of implementing any one of the alternatives.

Following publication of this draft environmental impact statement, there will be a 90-day period for public comment. Adjustments based upon public comment may be made to one or more of the alternatives. A subsequent evaluation of the modified alternatives will occur as part of the preparation of the final environmental impact statement and the final revised forest plans. The record of decision will indicate the selection of one of these final alternatives as the basis for the final set of forest plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests.

Appendix A is a detailed description and comparison of the alternatives considered in detail.

Developing the Alternatives

The alternatives include different options to address significant issues and to respond to the purpose and need discussed in chapter 1. The public; other Federal, state, and local agencies; and Forest Service employees contributed to the identification of the significant issues that are addressed by the alternatives compared in this draft environmental impact statement. Using an interdisciplinary approach, the Forest Service used the significant issues as the primary basis for developing the action alternatives. While all alternatives provide a range of multiple uses and goods and services, each responds to the significant issues in different ways.

Public participation that is ongoing, including collaborative workshops, field trips, meetings, and comments received during the scoping period, helped focus the issues and the scope for alternative development. The Blue Mountains forest plan revision team developed the alternatives in response to significant issues and the purpose and need for change, and these were approved by

the regional forester. The alternatives considered fall within the range of the minimum and maximum resource potentials established in the benchmark analysis required by regulation (1982 planning rule provisions 36 CFR 219.12(e)(1)).

The "Decisions to be Made" section of chapter 1 outlines the six decisions made in a forest plan. These six items are the components of the forest plans. All alternatives include these components. The differences between the alternatives are based on how they respond to the issues described in chapter 1 relative to the plan components.

Description and Comparison of the Alternatives

The following sections describe and compare the alternatives. For each alternative, the description begins with the alternative theme and is followed by the description of how the alternative responds to the issues. The alternatives are also described in the context of other resource areas not already addressed by the issues. This section ends with a comparison of the alternatives.

Appendix A provides a detailed description of the alternatives, including the No-action alternative. Appendix A will form the basis of the forest plan. The draft forest plan is based on the preferred alternative, to give the public an idea of what the plan will look like after the decision. Appendix A provides the full details for the range of alternatives, which forms the basis for the effects analysis in chapter 3. The alternatives are comprised of desired conditions, standards, guidelines, management areas, objectives, suitability and monitoring. The appendix and glossary define these plan component terms and provide more details on what these components are comprised of and what they mean in forest planning.

At the end of this chapter, key issue descriptions are presented for the three national forests as a whole to facilitate comparison of the alternatives (tables 3, 4, and 5).

Elements Common to the Action Alternatives

Plan Components

As previously mentioned, forest plans generally include the following components: goals and desired conditions, management areas, objectives, suitable uses and activities, standards and guidelines, and monitoring.

Some components differ very little between the action alternatives. The goals and desired conditions are generally the same for the action alternatives, with limited exceptions, which are noted in appendix A. These desired conditions are the result of public involvement and reflect the best available scientific information, including the Interior Columbia Basin Ecosystem Management Project (USDA Forest Service 2000), the Pacific Northwest Region Aquatic and Riparian Conservation Strategy, and more.

The monitoring is an adaptive management tool that will be used to determine if the forest plan is being implemented as intended and if projects implemented using its management direction are moving towards or achieving the goals and desired conditions as expected. Monitoring results will be used to determine if there is a need to change plan components. Many elements of the monitoring plan are the same for all alternatives, but some differences are outlined in appendix A.

Management Focus

A strategy for the proposed action was developed to guide future development of projects and activities within the national forests. This strategy is included in the other action alternatives. The identification of management focal points highlights those areas where immediate improvements to the resilience of the Blue Mountains ecosystem could be made or areas that are most sensitive from a social perspective. Considering these factors, the drivers for active restoration priorities are:

- Priority watersheds
- Wildland urban interface
- Dry vegetation groups

Areas where multiple drivers overlap are a higher priority than those with only a single driver. Depending on cost sharing or other factors, lower priority work may still occur before higher priority work. This prioritization also recognizes the need for maintenance activities to prevent areas from becoming departed and then needing more expensive restoration treatments.

Assumptions

Various assumptions were made in the development of the action alternatives that warrant highlighting here.

Timber and Wildland Fire

- The use of wildland fire as a tool may occur on all acres in all alternatives, with some exceptions described in alternative D, so long as those fires are moving the landscape towards or helping maintain the desired condition.
- The majority of forest vegetation restoration treatments would be scheduled in dry forest groups.
- No even-aged management regeneration harvests would be scheduled within current old forest stands, and only minimal harvest of trees 21 inches d.b.h. or larger or older than 120/150 years would occur.
- All areas that meet the criteria for recommended wilderness areas are identified as unsuitable for timber production. Minimal harvest would occur within these areas, and no new roads would be built.
- No harvest would be scheduled within areas determined to be unsuitable for timber production due to concerns about sensitive soils or difficulty regenerating sites within five years.
- Active timber harvest restoration activities would occur in areas with established road systems (primarily within MA 4A General Forest).
- All fuels generated by management activities would be reduced to meet the desired conditions for down wood.
- Prescribed fire outside of timber harvest units may or may not utilize thinning or piling as a pretreatment depending on anticipated fire effects in relation to the desired conditions.
- The amount of prescribed fire outside of harvest units is constant between alternatives (except alternative D), with the assumption that current levels of prescribed fire are within the current budgetary and organizational capacity of the Forest Service.

- All vegetation treatments (wildland fire and timber harvest) are assumed to have the intent of improving resilience by moving all potential vegetation groups of the potential vegetation groups toward the desired conditions.

Alternative A: No-action Alternative

The no-action alternative, alternative A, represents a continuation of the 1990 forest plans and their amendments (the current condition). A portion of the Ochoco National Forest is administered by the Malheur National Forest's Emigrant Creek Ranger District using the 1989 forest plan for the Ochoco National Forest and would continue to be administered in that manner. The forest plans placed an emphasis on the production of wood products using even-aged management. These plans include assumptions that ecological conditions were healthy and that disturbances, such as wildland fire and insects and disease, would not substantially affect planned actions, desired outcomes, or outputs. The forest plans provide a mix of natural resource-based goods and services, such as timber and wood products, livestock forage, big game, and minerals in an environmentally sound manner. This alternative reflects the current level of goods and services provided by the unit and the most likely amount of goods and services expected to be provided in the future if current management direction continues (36 CFR 219.12(f)(7), 1982). At the same time, other uses and values, such as scenery, recreational opportunities, viewable wildlife, and clean air and water are provided. The PACFISH, INFISH, and Eastside Screens amendments to the forest plans were intended to provide interim direction but have become long-term management direction.

Issues to be Resolved

Issue 1: Access

The alternatives address access issues by addressing how the management areas are configured; suitability for summer and winter motor vehicle use and trail construction; and the desired conditions, standards and guidelines. The management areas would remain unchanged in this alternative. There would be no additions to the backcountry areas, no additional wildlife corridors or recommended wilderness areas. Suitable uses for each management area would be those described in the previous 1990 forest plans.

The old forest plans had standards for road density that varied by forest and management areas within the forests. Within the Malheur National Forest, the forestwide open road density standard varies by management area from 1.5 to 3.2 miles per square mile, and off-route motor vehicle travel is authorized unless otherwise restricted.

Within the Umatilla National Forest, the open road density desired condition is 2.0 miles per square mile, and motor vehicle use is limited to designated routes.

Within the Wallowa-Whitman National Forest, the open road density guideline is 2.5 miles per square mile for general forest and 1.5 miles per square mile for summer and winter elk range management area, and off-route motor vehicle travel is authorized unless otherwise restricted.

Issue 2: Economic and Social Well-being

The 1990 forest plans projected robust economic returns to the local communities from management activities, but the returns were realized only during the first few years of implementation because of amendments that addressed habitat needs for listed fish species and other old forest associated ecosystems. These amendments did not adjust the objectives for timber

harvest and the allowable sale quantity. The analysis for this alternative updates the allowable sale quantity and objectives for all three national forests using the amended direction and carries the updated figures through the comparison of alternatives and the effects analysis.

Jobs and income are associated with resource flows and uses. The predicted annual timber harvest for the three national forests for alternative A is 81 MMBF. This would support about 577 jobs associated with timber harvest and primary wood products manufacturing and generate about $32.2 million in wages. This would be the second smallest number of jobs projected for the alternatives, and only alternative C would have fewer jobs. Based upon the current number of grazing permits, 242,800 cattle and sheep animal unit months (AUMs) are projected. This would support about 800 jobs and generate about $10.5 million in wages including estimates for unpaid or family labor contributions. Recreation within the three national forests is estimated to be 1.1 million visits annually. Expenditures by the visitors including local residents support about 817 jobs with $16.8 million in wages.

Annual Forest Service budget expenditures including those for ecosystem restoration are projected to be $61.4 million. These dollars would support about 1,221 jobs and $59.2 million in wages. The portion identified as ecosystem restoration expenditures is about $12.7 million, which would support about 224 jobs and generate $7.6 million in wages.

Issue 3: Livestock Grazing and Grazing Land Vegetation

Grazing permit authorizations have diminished since 1990 due to the Federal listing of fish species per the Endangered Species Act and the PACFISH and INFISH amendments to the 1990 forest plans. These changes resulted in stricter management direction for livestock grazing in riparian areas. Within the three national forests, 187,000 acres would be generally suitable for sheep grazing, and 1,889,000 acres would be generally suitable for cattle grazing. These totals are less than what would be generally suitable for alternative D but greater than what would be generally suitable for alternative C. Progress toward achieving desired conditions for rangeland vegetation and livestock grazing would be slow to moderate. The potential for disease transmission from domestic sheep to bighorn sheep would be managed in cooperation with state wildlife agencies, but without revision, the forest plans would lack specific management direction (standards and guidelines) for those cooperative decisions.

Issue 4: Old Forest

Designated old forest management areas are not suitable for timber production per management direction in the 1990 forest plans. The single exception is timber harvest in managed old forest stands within the Umatilla National Forest, but only for the purpose of enhancing wildlife habitat. The 1990 forest plans include standards for snag retention and green tree replacement that provide management direction for retention of some old forest characteristics outside of designated old forest stands. The Eastside Screens forest plan amendment added additional requirements for doing so. As a result, stands with late and old forest structure are managed to retain and develop structure and patch sizes within the historic range of variability, and harvest of trees 21 inches d.b.h. or larger is severely limited.

Alternative A and alternative C are the only alternatives that include designated old forest management areas. Under alternative A, the percentage of old forest structure in all potential vegetation groups within all three national forests would exceed the other alternatives by approximately 1 to 3 percent at year 50. However, the percent of the dry upland forest potential vegetation group in the old forest single story stage within the Malheur and Wallowa-Whitman

National Forests would be less than projected for alternatives D and E, which propose more aggressive forest management strategies.

Issue 5: Recommended Additions to the National Wilderness Preservation System

For alternative A, no areas would be recommended for recommended wilderness. If alternative A is implemented, the allocations of the areas that would be recommended for the action alternatives would remain as they are (existing condition). These allocations vary by national forest.

Issue 6: Ecological Resilience

Improvements to ecological resiliency are mixed, and alternative A has a moderately active approach to managing forest conditions where conflict with other resources is unlikely. The annual forested vegetation active restoration activities, miles of road treatments, and miles of restored riparian areas projected for alternative A would occur at levels similar to those projected for alternatives B and F.

Other Resources

Physical Environment

This alternative's proposal for managing riparian conditions is the use of riparian habitat conservation areas. Standards and guidelines for activities within these streams buffers focus on limiting the amount of detrimental change that might occur within riparian habitat conservation areas. Default riparian habitat conservation area widths are 300 feet on each side of fish-bearing streams, 150 feet on each side of perennial non-fish-bearing streams, and 100 feet on each side of intermittent streams.

Biological Environment

The 1990 forest plans include basic aquatic standards for streams. The plans were amended in 1994 (PACFISH and INFISH) to include direction for the restoration and management of aquatic and riparian areas for native fish species habitat. These amendments established riparian habitat conservation areas and riparian management objectives, which substantially protect threatened or endangered fish species and their habitats by maintaining quality habitat where it exists and reducing risks to habitat and species during the short term. As this short-term strategy became longer-term management direction, passive restoration continued through natural processes. Continuation of this strategy would provide immediate protection to listed fish habitat but would limit long-term management of vegetation within riparian habitat conservation areas. Progress toward achieving desired conditions for riparian vegetation and aquatic habitats would be slow to moderate through passive protections and natural processes. Investments and progress in active restoration for riparian and aquatic habitat improvement, including culvert replacements to improve connectivity of aquatic habitats, would continue at current funding levels.

The alternative A management strategy for big game would continue to be based on habitat effectiveness index and open road density guidelines. Big game security would be provided by travel management plan considerations when designating routes and areas open to motor vehicle travel. Consideration of security areas would be addressed by site-specific project analyses rather than by forest plan desired conditions, objectives, and standards and guidelines.

Social Environment

Alternative A would keep in place current recommendations for rivers that are eligible or suitable for inclusion in the National Wild and Scenic River System according to analyses completed in response to the 1990 forest plan appeals and their subsequent resolutions.

Alternative B: The Modified Proposed Action

This alternative is designed to focus on restoring landscapes, their functions, and their processes, and to create resilient landscapes that are adaptable to climate change. Alternative B differs from alternative A by including desired conditions that would emphasize an integrated strategy for managing National Forest System lands. Management allocations would become more consistent between the three national forests. Alternative B would emphasize a combination of active management and natural processes for restoring landscapes.

Substantial public input contributed to the development of the proposed action. Based on a series of public meetings and coordination with various interest groups and tribal, local, state, and Federal governments between 2003 and 2010, several needs for changing the 1990 forest plans were identified. The proposed action was developed to address those needs for change. The proposed action was then distributed for public review in March 2010. Based on public response to the proposed action, the following modifications were incorporated into alternative B:

- Plan components include consideration of possible climate change scenarios where appropriate. Desired conditions for plant species composition and stand density better reflect how this management direction will be used in project planning.
- Acre figures reflect finalized management area boundaries.
- The general suitability table includes fewer activities, but renewable/wind energy development was added.
- The objectives better describe management activities and program outcomes necessary to maintain or achieve desired conditions. The objectives are displayed separately for each national forest.
- Additions, deletions, and modifications to standards and guidelines account for new information and reduce redundancy with existing direction. Direction for domestic sheep grazing addresses bighorn sheep viability concerns regarding disease transmission. The standards and guidelines are displayed by national forest.
- The monitoring section includes more than just those items legally required and management indicator species have been identified.

Issues

Issue 1: Access

The alternatives address access issues by addressing how the management areas are configured; suitability for summer and winter motor vehicle use and trail construction; and the desired conditions, standards and guidelines. Motor vehicle use during summer and winter, as well as trail construction varies by alternative depending on the management area configuration of the alternative. This alternative designates recommended wilderness area (MA 1B) and it would be suited for over-snow motor vehicle use (table A-40, appendix A). This alternative would also designate both nonmotorized (MA 3A) and motorized (MA 3B) backcountry management areas (table A-40, appendix A). Both summer and winter motor vehicle use would be considered

unsuitable in nonmotorized areas (MA 3B). This alternative would not designate any wildlife corridor (MA 3C).

Open motor vehicle route density would change from a standard and/or guideline in alternative A to a desired condition depending on the management area and winter elk habitat. The desired condition for open motor vehicle route density in motorized backcountry management areas would have a desired condition of 1.5 miles per square mile. General Forest (MA 4A) management would have an open route density of 2.4 miles per square mile. Winter elk habitat would have a desired condition of 1.5 miles per square mile. Road maintenance for alternative B would be similar to alternative A.

Issue 2: Economic and Social Well-being

The predicted annual timber harvest for the three national forests for alternative B is approximately 87 MMBF. This harvest level would support about 650 jobs associated with timber harvest and primary wood products manufacturing and generate about $36.2 million in wages, slightly more than projected for alternative A. Alternative B provides slightly less grazing capacity than alternative A with an expected 239,600 cattle and sheep AUMs. This level of AUMs would support about 770 jobs that would generate about $10.2 million in wages including estimates for unpaid or family labor contributions. Recreation within the three national forests is estimated to be at 1.1 million visits annually. Expenditures by the visitors support about 817 jobs with $16.8 million in wages.

Annual Forest Service budget expenditures including those for ecosystem restoration are projected to be $61.4 million. These dollars would support about 1,221 jobs and $59.2 million in wages. The portion identified as ecosystem restoration expenditures is about $12.7 million, which would support about 224 jobs and generate $7.6 million in wages.

Issue 3: Livestock Grazing and Grazing Land Vegetation

Grazing permit authorizations for cattle would remain the same as alternative A, and acres suitable for grazing would also be similar. Permit authorizations for grazing sheep would be slightly reduced to reduce the risk of disease transmission from domestic sheep to bighorn sheep.

Issue 4: Old Forest

This alternative would not include the designation of old forest management areas. The management of old forest would be guided by the desired conditions, such as forested structural stages, stand density, and species composition. Vegetation treatments, both timber harvest and the use of wildland fire, are designed to improve resilience to disturbance while making progress toward a greater abundance of old forest stands. This alternative would include a guideline that would emphasize retaining trees 21 inches d.b.h. and larger, with some exceptions.

Under alternative B, the percentage of old forest structure within all potential vegetation groups in the national forests would be comparable to the other alternatives. However, the percentage of the dry upland forest in the old forest single story stage would be less than projected for alternatives D and E, which propose more aggressive forest management strategies.

Issue 5: Recommended Additions to the National Wilderness Preservation System

Alternative B proposes to recommend 13,400 acres for preliminary administratively recommended additions to the National Wilderness Preservation System. Of the action

alternatives, alternative D is the only one with fewer acres (none) proposed. These areas would be closed to summer motor vehicle travel but would remain open to over-the-snow motor vehicles.

Issue 6: Ecological Resilience

For alternative B, the levels of annual forested vegetation active restoration activities proposed to restore ecological resilience would be similar to alternative A. The combination of annual forested vegetation active restoration activities, road treatments, and grazing practices would result in improvements in watershed condition in 4 to 23 subwatersheds.

Other Resources

Physical Environment

This alternative proposes to manage riparian conditions through riparian management areas, identified as MA 4B, where they occur within general forest (MA 4A). Desired conditions, standards, and guidelines would provide management direction for these areas. Streamside areas that occur outside of MA 4A would be subject to the same desired conditions and standards and guidelines as MA 4B. The riparian management area width would be either 300 feet (slope distance) on each side of fish-bearing streams or the outer edge of the 100-year floodplain, whichever is greater. For perennial non-fish-bearing streams, the width would be either 150 feet (slope distance) on each side of the stream or the outer edge of the 100-year floodplain, whichever is greater. For intermittent and ephemeral streams, the width would be 100 feet (slope distance) on each side. These riparian management area criteria are the same as those used for riparian habitat conservation areas in key and priority watersheds for PACFISH and INFISH but would apply throughout the planning area.

Biological Environment

Habitats for fish species with management concerns (at-risk species) would be managed consistent with the Pacific Northwest Region Aquatic Restoration and Conservation Strategy.

Social Environment

All streams considered by the Forest Service to be eligible for inclusion in the National Wild and Scenic River System would be allocated to wild and scenic river management areas (MA 2A). These river corridors would be managed to avoid compromising potential outstandingly remarkable values.

Alternative C

Alternative C varies from alternative B by emphasizing the role of natural processes in forest restoration (also referred to as passive restoration). When compared to the other alternatives, less timber would be harvested, more area would be allocated for nonmotorized recreation, and more area would be allocated to recommended wilderness areas. Similar to alternative A, old forest would be mapped and allocated to a management area. The harvest of large trees (21 inches d.b.h. or larger) would be prohibited with no exceptions. Managed wildland fire for resource benefit would be highest in this alternative to achieve the desired condition. Wildlife corridor management areas would be mapped and allocated to management area. This alternative would make substantial reductions to the permitted number of domestic livestock. The default width of riparian management areas would be greater than what is proposed for the other alternatives.

Issues

Issue 1: Access

The alternatives address access issues by addressing how the management areas are configured; suitability for summer and winter motor vehicle use and trail construction; and the desired conditions, standards and guidelines. Nonmotorized uses would be emphasized in this alternative. Wildlife Corridor (MA 3C) is proposed, as are backcountry nonmotorized (MA 3A) and recommended wilderness areas (MA 1B). No National Forest System lands would be designated as motorized backcountry (MA 3B).

This alternative designates the most recommended wilderness area (MA 1B), which would not be suited for over snow motor vehicle use (Tables A-45, appendix A).

The desired condition for open motor vehicle route density within watersheds in MA 3C is 1 mile per square mile or less. In addition, all cross-country over-the-snow vehicle travel is prohibited, with over-the-snow vehicle travel permitted only on routes designated open to summer motor vehicle travel in MA 3C. Alternative C would provide the least amount of area considered generally suitable for motor vehicle use in summer and in winter.

The desired condition for open motor vehicle route density within watersheds in General Forest (MA 4A) is 2.4 miles per square mile or less. Within subwatersheds, an exception is made for winter elk habitat, where the open motor vehicle route density is 1.5 miles per square mile or less.

Road maintenance projections are also the lowest, primarily because fewer roads would be open for motor vehicle use and therefore less maintenance would be needed.

Issue 2: Economic and Social Well-being

The predicted annual timber harvest for the three national forests for alternative C is approximately 47 MMBF, the smallest projection among all of the alternatives. This would support about 288 jobs associated with timber harvest and primary wood products manufacturing and generate about $16.0 million in wages. Domestic livestock grazing would be reduced to 95,900 AUMs, which would support about 308 jobs and generate about $4.1 million in wages including estimates for unpaid or family labor contributions. Recreation within the three national forests is estimated at 1.1 million visits annually. Expenditures by the visitors support about 817 jobs with $16.8 million in wages.

Annual Forest Service budget expenditures including those for ecosystem restoration are projected to be $55.7 million. These dollars would support about 1,130 jobs and $55.3 million in wages. The portion identified as ecosystem restoration expenditures is about $8.1 million, which would support about 142 jobs and generate $4.9 million in wages.

Issue 3: Livestock Grazing and Grazing Land Vegetation

The area that would be generally suitable for cattle grazing would be reduced to approximately 785,000 acres, the smallest projection among alternatives. This decrease would result from the classification of riparian areas and subwatersheds with habitat for listed fish species as generally unsuitable for cattle grazing.

The area that would be generally suitable for sheep grazing would be reduced to approximately 90,000 acres, also the lowest projection among alternatives. This decrease would result from the

classification of subwatersheds within the maximum foray distance for bighorn sheep rams as generally unsuitable for sheep grazing.

Issue 4: Old Forest

Old forest (390,900 acres) would be allocated to MA 4C Old Forest. Only trees 8 inches d.b.h. or less would be authorized for timber harvest in this management area. This alternative would include a standard that would strictly prohibit the harvesting of trees 21 inches d.b.h. and larger, both within and outside of old forest.

This alternative would include a standard that would strictly prohibit the harvesting of trees 21 inches d.b.h. and larger, both within and outside of old forest.

Under alternative C, the percentage of old forest structure within all potential vegetation groups in the national forests would be comparable to the other alternatives. However, the percentage of the dry upland forest in the old forest single story stage would be lower than projected for all other alternatives due to less aggressive forest management strategies.

Issue 5: Recommended Additions to the National Wilderness Preservation System

Approximately 505,000 acres would be recommended wilderness or allocation to MA 1B, the largest projection of the alternatives, comprised of the potential wilderness areas. This area would be closed to both summer and winter motor vehicle use, but mechanized travel would be permitted (e.g., bicycles and hunting carts). Mechanized uses would be prohibited if these areas become designated wilderness areas.

Issue 6: Ecological Resilience

Alternative C is designed to emphasize the role of natural processes in the restoration of ecological resilience. Forested vegetation mechanical restoration treatments and forage use intensity both would be less than all the other alternatives. With the exception of alternative D, roads treatments would be greater than the other alternatives. The greatest amount of subwatersheds would be improved, but the dry forest fire regime condition class departure score would improve the least.

Other Resources

Physical Environment

Similar to alternative B, the riparian management areas in general forest would be allocated to MA 4B; however, the riparian management areas would be 300 feet (slope distance) on each side of any stream, regardless of classification. Alternative C would greatly restrict livestock grazing within riparian areas. Many of the riparian management area desired conditions are the same as alternative B, but there are some additional standards and guidelines and some of the guidelines go to standards.

Biological Environment

Habitats for fish species with management concerns (at-risk species) would be managed consistent with the Pacific Northwest Region Aquatic Restoration and Conservation Strategy.

Approximately 502,200 acres would be allocated to Wildlife Corridor (MA 3C) (this management area allocation is unique to alternatives C, E, and F). The desired condition for open motor

vehicle route density within watersheds in MA 3C is 1 mile per square mile or less. As previously mentioned in Access, all cross-country over-the-snow vehicle travel is prohibited, with over-the-snow vehicle travel permitted only on routes designated open to summer motor vehicle travel in MA 3C providing additional security to wildlife from motor vehicle use.

Desired conditions describe the desired forest densities and limits would be placed on canopy cover reduction.

Social Environment

As with alternative B, all streams considered eligible for inclusion in the National Wild and Scenic River System by the Forest Service would be allocated to MA 2A. These river corridors would be managed to avoid compromising potential outstandingly remarkable values.

Alternative D

This alternative would include more timber harvest than all other alternatives and would emphasize active management using mechanical treatments to restore the forested landscape. This alternative also responds to requests for more public motor vehicle access. No areas would be allocated to recommended wilderness area or allocation to MA 1B. This alternative does not include a standard or guideline prohibiting the harvest of trees 21 inches d.b.h. or larger, but relies exclusively on desired conditions. This alternative proposes the smallest riparian management area.

Issues

Issue 1: Access

The alternatives address access issues by addressing how the management areas are configured; suitability for summer and winter motor vehicle use and trail construction; and the desired conditions, standards and guidelines. This alternative does not designate any Wildlife Corridor (MA 3C), backcountry nonmotorized (MA 3A) or recommended wilderness areas (MA 1B). This alternative designates backcountry motorized (MA 3B), which are suitable for both summer and winter motor vehicle use.

The desired condition for open motor vehicle route density within watersheds in General Forest (MA 4A) is 3 miles per square mile or less. Within subwatersheds, an exception is made for winter elk habitat, where the open motor vehicle route density is 1.5 miles per square mile or less.

This alternative emphasizes retaining the areas that currently are generally suitable for motor vehicle use, resulting in more area suitable for summer and winter motor vehicle use than proposed by the other alternatives.

Road maintenance projections are also the highest, primarily because more roads would be open for motor vehicle use and would be maintained.

Issue 2: Economic and Social Well-being

The predicted annual timber harvest for the three national forests for alternative D is approximately 243 MMBF. This would support about 2,040 jobs associated with timber harvest and primary wood products manufacturing and generate about $113.7 million in wages, the largest projection for the alternatives. The estimated 244,600 cattle and sheep AUMs are slightly more than alternative A. Domestic livestock grazing would support about 833 jobs and generate

about $11.1 million in wages including estimates for unpaid or family labor contributions. Recreation within the three national forests is estimated at 1.1 million visits annually. Expenditures by the visitors support about 817 jobs with $16.8 million in wages.

Annual Forest Service budget expenditures including those for ecosystem restoration are projected to be $74.5 million. These dollars would support about 1,444 jobs and $68.7 million in wages. The portion identified as ecosystem restoration expenditures is about $24.0 million, which would support about 424 jobs and generate $14.3 million in wages.

Issue 3: Livestock Grazing and Grazing Land Vegetation

Grazing permit authorizations for cattle would be slightly higher than the other action alternatives. Both active and inactive allotments are included in this alternative, unlike alternative B, E and F, which only include active allotments. Permit authorizations for grazing sheep would be slightly reduced to reduce the risk of disease transmission from domestic sheep to bighorn sheep. Alternative D would use desired conditions to address livestock grazing and rangeland vegetation rather than the standards and guidelines proposed for all other alternatives.

Issue 4: Old Forest

This alternative would not include the designation of old forest management areas, similar to alternatives B, E, and F. The management of old forest would be exclusively guided by the desired conditions, such as forested structural stages, stand density, and species composition without additional old tree standards or guidelines. Vegetation treatments are designed to improve resilience to disturbance while making progress toward a greater abundance of old forest stands this alternative does not include a designated old forest management area.

Under alternative D, the percent of the landscape in old forest structural stages in all potential vegetation groups would vary from the other alternatives by approximately one to three percent at year 50. Within the dry upland forest potential vegetation groups, the percent in the old forest single story stage would be highest under alternatives D and E. This would be due to increased timber harvest resulting in more open stand densities and increased growth of the residual trees, creating more larger-diameter trees. Vegetation treatments would emphasize mechanical treatments rather than wildland fire use (planned or unplanned ignitions).

Issue 5: Recommended Additions to the National Wilderness Preservation System

Alternative D is the only action alternative that would not recommend any area for preliminary administratively recommended wilderness or allocations to MA 1B.

Issue 6: Ecological Resilience

Alternative D is designed to have the most aggressive approach to restoring the ecological resilience of forested vegetation and thus would have the most forested vegetation mechanical restoration treatments. As a result of road maintenance associated with timber sales, road treatments (miles) would be the greatest of the alternatives. Forage use intensity would be slightly greater than the projection for alternative B. The dry forest fire regime condition class departure score would improve the most, but, due to forage use intensity, alternative D would have the least number of improved subwatersheds. However, alternative D would not include prescribed burning (planned ignitions) outside of harvest units and would include very limited amounts of prescribed burning (planned ignitions) within harvest units. Under alternative D, the majority of fuels treatments within harvest units would be accomplished by removal or crushing instead of

burning. There would be no objective for managed wildland fire for resource benefits in this alternative.

Other Resources

Physical Environment

The approach to management of riparian conditions would be similar to alternative B in that riparian management areas (MA 4B) would be designated where they occur within general forest (MA 4A). Desired conditions and standards and guidelines for riparian management areas are also the same. Alternative D differs from alternative B by proposing to narrow riparian management areas. The widths would be similar to the State of Oregon Forest Practices Act as described in the November 15, 2007 Oregon Administrative Rules (OAR 629-635-0000). For fish-bearing streams, the riparian management area would be 100 feet (slope distance) on either side of the stream or the outer edge of the 100-year floodplain, whichever is greatest. For perennial non-fish-bearing streams, the width would be 70 feet (slope distance) or the outer edge of the 100-year floodplain. For intermittent and ephemeral streams, the width would be 50 feet (slope distance) on each side, whichever is greatest.

Biological Environment

Habitats for fish species with management concerns (at-risk species) would be managed consistent with the Pacific Northwest Region Aquatic Restoration and Conservation Strategy, with the exception of establishing riparian management area widths that are narrower than the Strategy's expectations for functional riparian management area widths.

Social Environment

All streams within the Malheur and Umatilla National Forests considered by the Forest Service to be eligible for inclusion in the National Wild and Scenic River System would be allocated to wild and scenic river management areas (MA 2A). These river corridors would be managed to avoid compromising potential outstandingly remarkable values.

Past suitability studies for 11 rivers within the Wallowa-Whitman National Forest concluded that three rivers are suitable for inclusion in the system. These conclusions would be accepted, and, as a result, fewer river corridors than for alternative B would be allocated to wild and scenic river management areas (MA 2A), where management would avoid compromising potential outstandingly remarkable values.

Alternative E

Alternative E would use vegetation management, aquatic and wildlife habitat treatments to emphasize active restoration. The alternative responds to public concerns and questions (as captured in issue 6) about the environmental effects of accelerating efforts to restore ecological resilience beyond recent levels. While similar to alternative B in many regards, alternative E would increase restoration projects occurring within the national forests, resulting in almost twice as much area being restored through vegetation management activities.

This alternative focuses on the desired condition to reduce hydrologic connectivity as opposed to using road density, so that roads contributing the most sediment to the aquatic and riparian system will be addressed, focusing on threatened and endangered fish species habitat. Both riparian and aquatic habitat improvement activities and road maintenance proposals for investments in aquatic

restoration within key and priority watersheds are significantly greater than alternative B proposes.

Objectives for rangeland vegetation restoration and management of wildfire to achieve desired conditions would be greater than those for alternative B.

Alternative E would include more recommended wilderness areas (MA 1B) than alternative B but significantly less than alternative C.

This alternative would eliminate the old tree guideline based on diameter and replace it with a guideline that would emphasize retaining trees with certain old tree characteristics in order to protect old trees.

Issues

Issue 1: Access

The alternatives address access issues by addressing how the management areas are configured; suitability for summer and winter motor vehicle use and trail construction; and the desired conditions, standards and guidelines. The approach to managing access would be similar to alternative B, with a few exceptions. This alternative identifies recommended wilderness areas (MA 1B), which would allow for the use of over-the-snow motor vehicle use in winter (table A-47, appendix A). It also, designates a small amount of wildlife corridor (MA 3C), linking high quality, unroaded wildlife habitats which would allow the suitable use of motor vehicle use in summer and winter on designated routes. This alternative would also designate both nonmotorized (MA 3A) and motorized (MA 3B) backcountry management areas. Both summer and winter motor vehicle use would be considered unsuitable in nonmotorized areas (MA 3B).

Open motor vehicle route density would change from a standard and/or guideline in alternative A to a desired condition depending on the management area and winter elk habitat. The desired condition for open motor vehicle route density in motorized backcountry management areas (MA 3B) would be to minimize the number of miles of designated routes. The open motor vehicle route density in MA 3C would be no greater than 1 mile per square mile. Winter elk habitat would have a desired condition of 1.5 miles per square mile. The desired condition for this alternative is to reduce the road related sedimentation by reducing road density and reducing the hydrologic connectivity of the road system. Road maintenance for alternative E would be similar to alternative A.

This alternative takes a different approach by moving away from road densities in general forest (MA 4A) and instead focusing on the roads that are causing the biggest problems on the landscape to fish and aquatic ecosystems. In this alternative, the desired condition would focus on hydrologically disconnecting the roadbed from the stream system. This would involve replacing undersized culverts, out-sloping roads, hardening surfaces to reduce erosion, occasionally relocating or decommissioning roads to address the roads with a focus on watersheds with threatened and/or endangered aquatic fish species.

Issue 2: Economic and Social Well-being

The predicted annual timber harvest for the three national forests for alternative E is approximately 162 MMBF, more than projected for alternative A but less than projected for alternative D. This level of harvest would support about 1,330 jobs associated with timber harvest and primary wood products manufacturing and generate about $74.3 million in wages. The

projected 239,800 cattle and sheep AUMs are similar to projections for alternative B, and would support about 780 jobs and generate about $10.3 million in wages including estimates for unpaid or family labor contributions. Recreation within the three national forests is estimated at 1.1 million visits annually. Expenditures by the visitors support about 817 jobs with $16.8 million in wages.

Annual Forest Service budget expenditures including those for ecosystem restoration are projected to be $65.8 million. These dollars would support about 1,290 jobs and $62.1 million in wages. The portion identified as ecosystem restoration expenditures is about $16.2 million, which would support about 285 jobs and generate $9.7 million in wages.

Issue 3: Livestock Grazing and Grazing Land Vegetation

Proposals made for alternative B would be retained with the following exceptions. An objective designed to improve a portion of rangeland in phase C or D to phase A or B would be included. Utilization guidelines would place additional limitations on livestock grazing in subwatersheds with occupied bull trout spawning and rearing reaches and habitat for listed anadromous fish species. The management approach proposed to reduce the risk of disease transmission from domestic sheep to bighorn sheep for alternative D would also be proposed in alternative E.

Issue 4: Old Forest

Vegetation treatments, both timber harvest and the use of wildland fire, are designed to improve resilience to disturbance while making progress toward a greater abundance of old forest stands. This alternative would not include the designation of old forest management areas, similar to alternatives B, D and F. The management of old forest would be guided by the desired conditions, such as forested structural stages, stand density, and species composition with additional old tree guidelines. This alternative would include a guideline that emphasizes retaining trees with certain old tree characteristics, both within and outside of old forest stands. For most tree species, certain tree characteristics can be used as a fairly reliable indicator of older age (generally greater than 150 years old, but varies by species and site).

Under alternative E, the percent of the landscape in old forest structural stages in all potential vegetation groups would vary from the other alternatives by approximately one to three percent at year 50. Within the dry upland forest potential vegetation groups, the percent in the old forest single-story stage would be highest under alternatives D and E. This would be due to increased timber harvest resulting in more open stand densities and increased growth of the residual trees, creating more larger-diameter trees. Vegetation treatments would emphasize mechanical treatments and wildland fire use (planned and unplanned ignitions).

Issue 5: Recommended Additions to the National Wilderness Preservation System

At approximately 90,800 acres, the area that would be allocated to MA 1B (preliminary administratively recommended wilderness areas) is greater than the area that would be allocated for alternative B but significantly less than alternative C.

Issue 6: Ecological Resilience

For alternative E, forested vegetation mechanical restoration treatments would be second to alternative D. Road treatments (miles), improved riparian areas (miles), and forage use intensity would all be higher than alternative B. The number of subwatersheds that would be improved is slightly more than the alternative B projection but less than alternative C. The improvement in the

dry forest fire regime condition class departure score would be similar to alternative D but more than projected for the other alternatives. Because alternative E would add the reintroduction of fire to the ecosystem in addition to the decreased fire regime condition class departure score, this alternative would be expected to result in increased ecological resiliency in the dry upland forest potential vegetation groups because fuel composition, fire frequency, severity, pattern, and other associated disturbances would more closely resemble the historic range of variability.

Other Resources

Physical Environment

This alternative's proposal for managing riparian conditions is the use of riparian management areas with the same desired conditions, standards and guidelines, and riparian management area widths proposed for alternative B.

Biological Environment

Habitats for fish species with management concerns (at-risk species) would be managed consistent with the Pacific Northwest Region Aquatic Restoration and Conservation Strategy. Protection for fisheries would be stronger than alternative B with the additions of stricter livestock grazing utilization guidelines for watersheds with occupied bull trout spawning and rearing reaches and habitat for listed anadromous fish species. Fisheries would also benefit from road maintenance projections that are greater than the projections for alternative B. In addition, approximately 28,100 acres would be allocated to MA 3C Wildlife Corridor, and these corridors would connect large blocks of undeveloped habitat within the Umatilla and Wallowa-Whitman National Forests. Over-the-snow motor vehicle use would be allowed only on designated routes in MA 3C. No acres would be allocated to MA 3C within the Malheur National Forest.

Social Environment

Alternative E makes the same proposals for management of wild and scenic rivers as alternative D.

Alternative F

The management emphasis is essentially the same as stated for alternative E. Management activities for active restoration, while greater than proposals made for alternative B, would be less than the proposals for alternative E. The investment in vegetation treatments would be the same as proposed for alternative B. Alternative F proposes the same desired conditions and management areas as alternative B and E.

Both riparian and aquatic habitat improvement activities and road maintenance proposals for investments in aquatic restoration within key and priority watersheds are significantly greater than the alternative B proposals.

Objectives for rangeland vegetation restoration and management of wildfire to achieve desired conditions would be greater than those for alternative B.

Alternative F would include the same number of acres of recommended wilderness areas (MA 1B) as alternative E, more than alternative B but significantly less than alternative C.

This alternative would eliminate the old tree guideline based on diameter and replace it with an age-based guideline to guide the protection of old trees.

Issues

Issue 1: Access

The same proposals made for alternative E are made for alternative F.

Issue 2: Economic and Social Well-being

The predicted annual timber harvest for the three national forests for alternative F is approximately 107 MMBF. This would support about 838 jobs associated with timber harvest and primary wood products manufacturing and generate about $46.3million in wages, more than projected for alternative B but less than projected for alternative E. The projected 239,800 cattle and sheep AUMs would support about 774 jobs that would generate about $10.3 million in wages including estimates for unpaid or family labor contributions. Recreation within the three national forests is estimated at 1.1 million visits annually. Expenditures by the visitors support about 817 jobs with $16.8 million in wages.

Annual Forest Service budget expenditures including those for ecosystem restoration are projected to be $60.2 million. These dollars would support about 1,201 jobs and $58.3 million in wages. The portion identified as ecosystem restoration expenditures is about $11.7 million, which would support about 206 jobs and generate $7.0 million in wages.

Issue 3: Livestock Grazing and Grazing Land Vegetation

The same proposals made for alternative E are made for alternative F.

Issue 4: Old Forest

This alternative would not include the designation of old forest management areas. As with all of the action alternatives, the management of old forest would be guided by the desired conditions, such as forested structural stages, stand density, and species composition with the addition of a guideline stating that management of individual, large diameter and/or old trees would emphasize retaining trees greater than 150 years old. Vegetation treatments, both timber harvest and the use of wildland fire, are designed to improve resilience to disturbance while making progress toward a greater abundance of old forest stands.

Under alternative F, the percent of the landscape in old forest structural stages in all potential vegetation groups would vary from the other alternatives by approximately one to three percent at year 50. Within the dry upland forest potential vegetation group, the percent in the old forest single story stage would be lower, compared to alternatives D and E. This would be due to lower levels of timber harvest resulting in less open stand densities and decreased growth of the residual trees.

Issue 5: Recommended Additions to the National Wilderness Preservation System

The same proposals made for alternative E are made for alternative F.

Issue 6: Ecological Resilience

Forested vegetation mechanical restoration treatments would be more than projected for alternative B but less than for alternative E. Road treatments (miles) would be slightly less than projected for alternative E. The improvement in the dry forest fire regime condition class departure score would be greater than alternatives A, B, and C but less than alternatives D and E.

Other Resources

Physical Environment

This alternative's approach to management of riparian conditions is to implement riparian management areas, using the same desired conditions, standards, and guidelines and defining the same streams widths as alternatives B and E.

Biological Environment

The management approach to habitats for fish species with management concerns (at-risk species) and allocating areas to wildlife corridors is the same as proposed for alternative E. The maximum utilization within riparian management areas would provide greater protection to anadromous fish by imposing slightly more restrictive grazing standards in riparian areas.

Social Environment

Alternative F makes the same proposals for management of wild and scenic rivers as alternatives D and E.

Description of Alternatives Considered but Eliminated from Detailed Study

During the scoping period, the Blue Mountains forest plan revision team received a large number of comments on the proposed action. Many of those comments included specific requests for changes in management area allocations, goals and objectives, standards and guidelines, and monitoring requirements. Given the large area under consideration and the number of decisions being made, there are a large number of possibilities for combining different alternative components. Various components from these comments were incorporated into the alternatives studied in detail, but some requests were not carried forward because they closely resemble alternatives considered in detail, did not meet the purpose and need for forest plan revision, or were not appropriate for a forest plan decision.

Alternative G – Minimum Management Alternative

Some people desire an alternative that eliminates human uses and human induced impacts to the Blue Mountains national forests. In this alternative, there would be no vegetation management, no wildlife habitat improvements, no grazing permits, limited recreation use, and limited access to the national forests. This alternative was considered but not studied in detail because this level of management is already described in the Minimum Management Level Benchmark (available in the project record). This alternative does not address all the identified issues and it would eliminate most of the multiple uses and benefits for which the national forests were created. With demonstrated demands for public access, recreation experiences, and forest products, elimination of these activities would conflict with current agency policy. Alternative C, which would substantially reduce the amount of human uses and activities, addresses these comments.

Alternative H – Elimination of Inventoried Roadless Areas

Some people desire an alternative that would release the areas in the inventoried roadless areas into general forest and make them suitable for timber production and road building. Inventoried roadless areas were evaluated and considered for recommendation as potential wilderness areas in accordance with 36 CFR 219.17. The results of the evaluation were considered during the

analysis of the alternatives studied in detail and are disclosed in chapter 3 and appendix F. Inventoried roadless areas within all three national forests are allocated to management areas where their undeveloped character will be retained by restricting road construction and timber harvest. Additionally, in 2012, the Supreme Court retained the 2001 Roadless Area Conservation Rule which prohibits road construction, road reconstruction, and timber harvesting in inventoried roadless areas on National Forest System lands, with some exceptions (36 CFR 294, Subpart B). This ruling means that areas designated as inventoried roadless areas would retain certain protections regardless of what management area they fall under. For a full disclosure of the inventoried roadless areas and the management areas they fall under see the Recommended Wilderness Area Section in chapter 3.

Alternative I – No Commercial Timber Harvest

A number of individuals and organizations asked for consideration of an alternative that would include no commercial timber harvest. Some of these comments suggested that vegetation treatments to meet habitat objectives would be acceptable to them, but commercial timber sales would not be. The National Forest Management Act of 1976 allows for the commercial harvest of timber from National Forest System lands for the purpose of achieving the policies set forth in the Multiple-Use Sustained-Yield Act of 1960. The no-harvest proposal is addressed to some degree in all of the alternatives considered in detail, and alternative C addresses this concern more than the other alternatives by projecting a relatively low amount of commercial timber harvest. These alternatives include management area allocations where there would be no commercial timber harvest. These allocations include wilderness areas, proposals to recommend the designation of wilderness areas, and many of the special areas.

Alternative J – No Grazing Alternative

Among the comments were requests for analysis of an alternative that prohibits grazing. While the National Forest Management Act requires the Forest Service to address rangeland capability and suitability, stocking decisions for specific grazing allotments are made through site-specific NEPA analyses. Grazing is authorized by term grazing permits. The forest plans define the desired outcomes and prescriptive measures (i.e., standards and guidelines that may influence grazing practices allowed by term grazing permits), but do not make decisions for livestock grazing use or capacity levels. The restrictions on grazing proposed for alternative C, while not stating that grazing would be prohibited, would severely limit the amount of domestic livestock grazing within the Blue Mountains national forests.

Alternative K – Unconstrained Budget Alternative

An alternative that assumes an unconstrained future budget was suggested. An unconstrained budget is inherently unrealistic and unreasonable. In addition, a forest plan does not influence or control the budget for a national forest. This alternative was eliminated from further study. Alternatives D, E, and F include budget assumptions that would exceed the current budget.

Alternative L – No Wildfire Use Alternative

Comments received suggested the Forest Service should consider an alternative that eliminates wildland fire use. The Forest Service national policy is to manage naturally ignited wildland fires to meet land management direction specified in the forest plan. Use of wildland fire allows the Forest Service to explicitly acknowledge when and where a naturally ignited wildland fire could create, enhance, or maintain desired conditions. As always, the overriding consideration in any

response to a wildland fire remains firefighter and public safety. Many scientific studies have concluded that restoration of wildland fire as an ecological process is essential to land health. Therefore, this alternative was not analyzed in detail. There would be no objective for managed wildland fire for resource benefits in alternative D.

Alternative M – Site-specific Travel Management Alternative

Some public comments requested that individual routes (roads and trails) or all unclassified routes be evaluated and decisions be made concerning their designation and use through the revision process. A review of routes requires more site-specific analysis and more alternatives than would be practical during forest plan revision. A forest plan is strategic, making decisions concerning desired conditions, goals and objectives, standards and guidelines, and suitable uses. Access has been identified as a significant issue and will be analyzed and discussed in this DEIS, but analysis to open or close specific routes or areas to motor vehicle access is site-specific and is not within the scope of the forest plan revision.

Alternative N – Other Management Indicator Species Alternative

The public requested that many species be considered as management indicator species. The purpose of management indicator species is to show effects of management actions. The designation does not infer a special degree of protection. Species selected as management indicator species can be monitored and a connection between habitat and management activities can be made. This connection cannot be made with most of the species suggested by the public and even most of those identified in the 1990 forest plans. The analysis of the current management indicator species is included in the analysis and description of alternative A (no action). The complete list of species considered and the rationale for those selected and not selected is available in the project record. The Aquatic and Terrestrial Wildlife Species Diversity and Viability Sections discuss the management indicator and focal species identified for this planning effort and the predicted effects from each alternative.

Alternative O – No Herbicide Use Alternative

Some public comments asked that an alternative that eliminates the use of herbicides to contain, control, or eradicate invasive species be analyzed. Herbicides, along with prevention and manual control methods, are part of the range of tools available to contain, control or eradicate invasive species. Site-specific analyses, including risk assessments of any herbicides proposed for use, will determine the best method or combination of methods that should be used to safely and effectively manage invasive species in the Blue Mountains national forests. All alternatives incorporate the decisions for management of invasive species outlined in the Forest Service Pacific Northwest Region Preventing and Managing Invasive Plants Final Environmental Impact Statement and Record of Decision (USDA Forest Service 2005).

Alternative P – Wilderness Area Emphasis Alternative

Some individuals and groups requested an alternative that allocates all unroaded areas on the Blue Mountains national forests greater than 1,000 acres to recommended wilderness areas. Many of these areas did not meet the Forest Service Handbook (FSH 1909.12 chapter 70) criteria for inclusion in the inventory of areas with wilderness area potential. Alternative C, would allocate more than 500,000 acres to recommended wilderness areas, responds to the request to emphasize wilderness areas.

Alternative Q – Conformance with the Resource Planning Act Alternative

NFMA regulations require development of at least one alternative that incorporates the Resource Planning Act (RPA) Program's tentative objectives for each national forest as displayed in Regional Guides (36 CFR 219.12(f)(6). The last RPA program was developed in 1995. Regional guides were eliminated in the 2000 Planning Rule (36 CFR 219.35) The Forest Service Strategic Plan for 2007-12, in lieu of an RPA program, was completed in accordance with the Government Performance Results Act (GPRA) and the Interior and Related Agencies Appropriations Act. The strategic plan does not recommend outputs to incorporate in specific forest plans, but all alternatives analyzed in detail incorporate the broad strategic objectives.

Comparison of Alternatives

This section compares how the alternatives are different for each national forest with respect to the issues to be resolved and their key indicators and management areas.

Issues to be Resolved

Tables 1, 2, and 3 display the comparison of how the alternatives respond to the issues to be resolved and the key indicators identified in chapter 1 for each national forest based on the objectives identified for each alternative. The figures displayed for alternative A represent the existing condition. See appendix A for a detailed description of the alternatives, including the objectives.

Table 1. Key indicators for each alternative for the Malheur National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 1: Access (Malheur NF)						
Miles of road maintained annually	1,152	1,136	235	1,604	1,313	1,313
Percent change in area available for route designation for summer motor vehicle use	0%	7%	minus-38%	11%	8%	8%
Percent change in area available for winter over-the-snow vehicle use	0%	negligible	minus-28%	2%	minus-1%	minus-1%
Issue 2: Economic and social well-being (Malheur NF)						
Timber harvest jobs	133	142	67	418	263	170
Timber harvest income	$7.214M	$7,674M	$3,625M	$22,660M	$14,224M	$9,238M
Livestock grazing jobs	389	398	187	439	395	389
Livestock grazing income	$5,195M	$5,316M	$2,550M	$5,881M	$5,276M	$5,195M
Recreation jobs	233	233	233	233	233	233
Recreation income	$4,589M	$4,589M	$4,589M	$4,589M	$4,589M	$4,589M
Ecosystem restoration jobs	68	68	41	125	85	62
Ecosystem restoration income	$2,066M	$2,066M	$1,252M	$3,790M	$2,575M	$1,867M
Predicted harvest levels/TSPQ (MMBF/year)	30	31	16	87	56	37
Allowable sale quantity (MMBF/year)	55	55	34	88	55	55
Issue 3: Livestock grazing and grazing land vegetation (Malheur NF)						
Acres suitable for permitted cattle grazing	1,197,000	1,225,000	620,000	1,216,000	1,197,000	1,197,000
Acres suitable for permitted sheep grazing	102,000	101,000	55,000	101,000	101,000	101,000
Permitted animal unit months (cattle)	117,000	120,000	61,000	119,000	117,000	117,000
Permitted animal unit months (sheep)	6,500	6,500	1,200	6,500	6,500	6,500
Rate of progress towards achieving rangeland vegetation desired condition	slow to moderate	slow to moderate	fastest	slow	moderate to fastest	moderate to fastest

Table 1. Key indicators for each alternative for the Malheur National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 4: Old Forest (Malheur NF)						
Acres of old forest within management area allocations with limited management activity	78,000	81,000	350,000	73,000	85,000	85,000
Acres of vegetation treatments per year in old forest	500	800	0	4,800	1,600	1,000
Percent old forest at year 50 (all potential vegetation groups)	33	31	31	30	30	30
Percent dry upland forest old forest single story at year 50	13	11	10	16	16	12
Issue 5: Preliminary Administratively Recommended Additions to the National Wilderness Preservation System (Malheur NF)						
Acres of MA 1B	0	1,200	83,800	0	30,400	30,400
Issue 6: Ecological Resilience (Malheur NF)						
Annual forested vegetation active restoration activities (acres)	18,100	18,700	14,300	25,100	24,800	20,100
Miles of road treatments	260	260	600	650	290	310
Percent forage use intensity	15.9	15.9	3.8	17.0	15.9	15.9
Miles of riparian area improvement	300	300	600	300	450	400
Number of subwatersheds in improved condition	16	16	42	18	21	21
Improvement in the dry upland forest potential vegetation groups fire regime condition class departure score at year 50 (percent)	24	27	23	47	42	31

Table 2. Key indicators for each alternative for the Umatilla National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 1: Access (Umatilla NF)						
Miles of road maintained annually	427	427	209	910	540	540
Percent change in area available for route designation for summer motor vehicle use	0%	7%	minus-45%	9%	minus-5%	minus-5%
Percent change in area available for winter over-the-snow vehicle use	0%	negligible	minus-30%	2%	minus-4%	minus-4%
Issue 2: Economic and social well-being (Umatilla NF)						
Timber harvest jobs	243	263	117	777	561	339
Timber harvest income	$13,882M	$15,006M	$6,707M	$44,365M	$32,058M	$19,388M
Livestock grazing jobs	153	130	19	127	127	127
Livestock grazing income	$1,874M	$1,674M	$219M	$1,631M	$1,631M	$1,631M
Recreation jobs	187	187	187	187	187	187
Recreation income	$4,527M	$4,527M	$4,527M	$4,527M	$4,527M	$4,527M
Ecosystem restoration jobs	75	75	56	143	102	75
Ecosystem restoration income	$2,907M	$2,907M	$2,163M	$5,511M	$3,946M	$2,889M
Predicted harvest levels/TSPQ (MMBF/year)	27	29	16	76	56	36
Allowable sale quantity (ASQ)) (MMBF/year)	51	51	31	73	51	51
Issue 3: Livestock grazing and grazing land vegetation (Umatilla NF)						
Acres suitable for permitted cattle grazing	284,000	298,000	30,000	284,000	284,000	284,000
Acres suitable for permitted sheep grazing	60,000	28,000	13,000	42,000	42,000	42,000
Permitted animal unit months (cattle)	30,000	31,000	3,000	30,000	30,000	30,000
Permitted animal unit months (sheep)	7,800	4,600	1,200	5,800	5,800	5,800
Rate of progress towards achieving rangeland vegetation desired condition	slow to moderate	slow to moderate	fastest	slow	moderate to fastest	moderate to fastest

Table 2. Key indicators for each alternative for the Umatilla National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 4: Old Forest (Umatilla NF)						
Acres of old forest within management area allocations with limited management activity	142,000	188,000	322,000	176,000	191,000	191,000
Acres of vegetation treatments per year in old forest	300	500	0	2,900	1,000	500
Percent old forest at year 50 (all potential vegetation groups)	29	28	28	26	27	27
Percent dry upland forest old forest single story at year 50	15	12	11	14	15	13
Issue 5: Preliminary Administratively Recommended Additions to the National Wilderness Preservation System (Umatilla NF)						
Acres of MA 1B	0	1,400	248,500	0	40,100	40,100
Issue 6: Ecological Resilience (Umatilla NF)						
Annual forested vegetation active restoration activities (acres)	16,950	17,400	14,000	20,100	23,400	18,700
Miles of road treatments	260	260	450	800	300	270
Forage use intensity	11.4%	10.6%	0.8%	13.8%	10.6%	10.6%
Miles of riparian area improvement	150	150	300	150	225	210
Number of subwatersheds in improved condition	23	23	25	25	23	23
Improvement in the dry upland forest potential vegetation groups fire regime condition class departure score at year 50 (percent)	20	23	17	35	35	28

Table 3. Key indicators for each alternative for the Wallowa-Whitman National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 1: Access (Wallowa-Whitman NF)						
Miles of road maintained annually	444	444	204	700	359	359
Percent change in area available for route designation for summer motor vehicle use	0%	minus-1%	minus-53%	minus-1%	minus-10%	minus-10%
Percent change in area available for winter over-the-snow vehicle use	0%	negligible	minus-38%	minus-2%	minus-8%	minus-8%
Issue 2: Economic and social well-being (Wallowa-Whitman NF)						
Timber harvest jobs	201	245	104	845	506	329
Timber harvest income	$11,112M	$13,526M	$5,723M	$46,722M	$28,000M	$17,716M
Livestock grazing jobs	258	242	102	267	258	258
Livestock grazing income	$3,435M	$3,241M	$1,304M	$3,556M	$3,435M	$3,435M
Recreation jobs	397	397	397	397	397	397
Recreation income	$7,678M	$7,678M	$7,678M	$7,678M	$7,678M	$7,678M
Ecosystem restoration jobs	81	81	45	156	98	69
Ecosystem restoration income	$2,582M	$2,582M	$1,449M	$5,001M	$3,143M	$2,215M
Predicted harvest levels/TSPQ (MMBF/year)	24	27	15	80	50	34
Allowable sale quantity (ASQ)) (MMBF/year)	46	46	22	75	46	46
Issue 3: Livestock grazing and grazing land vegetation (Wallowa-Whitman NF)						
Acres suitable for permitted cattle grazing	408,000	393,000	135,000	422,000	408,000	408,000
Acres suitable for permitted sheep grazing	25,000	22,000	22,000	25,000	25,000	25,000
Permitted animal unit months (cattle)	77,000	74,000	26,000	80,000	77,000	77,000
Permitted animal unit months (sheep)	4,500	3,500	3,500	4,500	3,500	3,500
Rate of progress towards achieving rangeland vegetation desired condition	slow to moderate	slow to moderate	fastest	slow	moderate to fastest	moderate to fastest

Table 3. Key indicators for each alternative for the Wallowa-Whitman National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Issue 4: Old Forest (Wallowa-Whitman NF)						
Acres of old forest within management area allocations with limited management activity	144,000	152,000	290,000	143,000	153,000	153,000
Acres of vegetation treatments per year in old forest	200	300	0	2,900	700	500
Percent old forest at year 50 (all potential vegetation groups)	22	21	21	20	21	21
Percent dry upland forest old forest single story at year 50	9	8	7	11	11	9
Issue 5: Preliminary Administratively Recommended Additions to the National Wilderness Preservation System (Wallowa-Whitman NF)						
Acres of MA 1B	0	10,800	172,700	0	20,300	20,300
Issue 6: Ecological Resilience (Wallowa-Whitman NF)						
Annual forested vegetation active restoration activities (acres)	17,650	18,150	14,450	22,650	23,450	19,850
Miles of road treatments	260	260	400	800	300	270
Forage use intensity	12%	12%	3%	17%	12%	12%
Miles of riparian area improvement	250	250	500	250	375	350
Number of subwatersheds in improved condition	4	4	14	2	5	4
Improvement in the dry upland forest potential vegetation groups fire regime condition class departure score at year 50 (percent)	5	7	4	16	16	11

Management Areas

The following tables display the management area designations and allocations for each of the alternatives. The 1990 forest plans created a variety of management areas that are not consistent across the three national forests. A new management area identification scheme is used in this document. In order to compare alternatives, the existing management areas for each national forest were reclassified into this new scheme. Therefore, alternative A is described using the same management area designations as alternatives B through F.

All management areas acres are displayed in full. Overlap occurs between most management areas but is not accounted for in these tables. The overlapping management areas result in the total acreage of all management areas being greater than the official national forest acreages. For example, several research natural areas (MA 2B) and wild and scenic rivers (MA 2A) overlap into congressionally designated wilderness areas (MA 1A).

For alternatives B, C, D, E, and F, the wilderness area acres have been recalculated for comparison purposes using the most current GIS technology. No additions or subtractions to any wilderness areas were made since the 1990 forest plans were approved and signed. Acres of private land inclusions are not included in any wilderness area acre calculations, except where noted.

The figures in the tables are rounded to the nearest 100 (acres) or to the nearest whole mile except for alternative A.

The management area acres table for the Malheur National Forest (table 4) includes acres from the portion of the Ochoco National Forest managed by the Malheur National Forest.

The management areas acre table for the Wallowa-Whitman National Forest does not include the Hells Canyon National Recreation Area (HCNRA). Scenic byways and national designated trails within the HCNRA are also excluded.

The 1990 forest plans do not have management areas designated for recommended wilderness areas, eligible wild and scenic rivers, scenic byways and All-American Roads, or nationally designated trails. Individual national forests may recognize roads, trails and areas, but they were not designated as management areas in the 1990 forest plans (alternative A).

Refer to the map packet for maps of the management areas for each national forest for each alternative.

Table 4. Management area designation, name, and acreage (miles for 2F and 2G) for each alternative for the Malheur National Forest

Management Area Designation and Name	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
1A Congressionally Designated Wilderness Areas*	82,557	82,600	82,600	82,600	82,600
1B Preliminary Administratively Recommended Wilderness Areas	NA	1,200	83,800	NA	30,400
2A Designated and Eligible Wild and Scenic Rivers (does not include eligible wild and scenic rivers for alternative A)	10,807	12,100	12,100	12,100	12,100
2B Research Natural Areas	3,426,114	11,100	11,100	11,100	11,100
2C Botanical Areas	30	100	100	100	100
2D Geological Areas	40	200	200	200	200
2E Historical Areas	NA	34,000	34,000	34,000	34,000
2F Scenic Byways and All-American Roads	NA	13 miles	13 miles	13 miles	13 miles
2G Nationally Designated Trails	NA	9 miles	9 miles	9 miles	9 miles
2H Scenic Areas	14,399	14,400	14,400	14,400	14,400
2J Municipal Watersheds	519	500	500	500	500
3A Backcountry(nonmotorized use)	47,535	59,300	270,400	NA	53,600
3B Backcountry (limited motor vehicle use)	14,652	129,100	NA	165,800	119,100
3C Wildlife Corridor	NA	NA	167,700	NA	NA
4A General Forest	851,877	1,252,000	702,500	1,359,800	1,245,600
4B Riparian Management Areas**	88,593	149,900	172,400	66,000	148,800
4C Old Forest	84,232	NA	205,100	NA	NA
4D Big Game Winter/Summer Range	293,453	NA	NA	NA	NA
4E General Wildlife/Fish	50,741	NA	NA	NA	NA
4F Visuals	217,328	NA	NA	NA	NA
5 Developed Sites and Administrative Areas	647	2,200	2,200	2,200	2,200

* The designated wilderness area acres displayed for alternative A are taken from the 1990 forest plans and have not been recalculated using current technology. Private inclusions are included in the total for congressionally designated wilderness areas for alternative A.

** MA 4A does not include riparian management area acres. MA 4B includes only the riparian area acres that would have been allocated to MA 4A General Forest (these acres are not included in the MA 4A total).

Table 5. Management area designation, name, and acreage (miles for 2F and 2G) for each alternative for the Umatilla National Forest

Management Area Designation and Name	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
1A Congressionally Designated Wilderness Areas*	304,173	304,200	304,200	304,200	304,200
1B Preliminary Administratively Recommended Wilderness Areas	NA	1,400	248,500	NA	40,100
2A Designated and Eligible Wild and Scenic Rivers (does not include eligible wild and scenic rivers for alternative A)	6,926	44,600	44,600	44,600	44,600
2B Research Natural Areas	11,224	11,000	11,000	11,000	11,000
2C Botanical Areas	817	2,400	2,400	2,400	2,400
2D Geological Areas	416	400	400	400	400
2E Historical Areas	1,178	1,200	1,200	1,200	1,200
2F Scenic Byways and All-American Roads	NA	51 miles	51 miles	51 miles	51 miles
2G Nationally Designated Trails	NA	30 miles	30 miles	30 miles	30 miles
2H Scenic Areas	31,109	31,100	31,100	31,100	31,100
2J Municipal Watersheds	12,581	20,200	20,200	20,200	20,200
3A Backcountry (nonmotorized use)	29,760	19,300	105,800	NA	70,100
3B Backcountry (limited motor vehicle use)	11,909	240,900	NA	218,700	160,600
3C Wildlife Corridor	NA	NA	91,900	NA	21,600
4A General Forest	296,180	640,300	329,000	742,300	625,200
4B Riparian Management Areas**	69,776	118,700	178,100	58,100	116,100
4C Old Forest	44,277	NA	94,800	NA	NA
4D Big Game Winter/Summer Range	130,215	NA	NA	NA	NA
4E General Wildlife/Fish	430,166	NA	NA	NA	NA
4F Visuals	65,775	NA	NA	NA	NA
5 Developed Sites and Administrative Areas	4,922	3,700	3,700	3,700	3,700

* The designated wilderness area acres displayed for alternative A are taken from the 1990 forest plans and have not been recalculated using current technology. Private inclusions are included in the total for congressionally designated wilderness areas for alternative A.

** MA 4A does not include riparian management area acres. MA 4B includes only the riparian area acres that would have been allocated to MA 4A General Forest (these acres are not included in the MA 4A total).

Table 6. Management area designation, name, and acreage (miles for 2F and 2G) for each alternative for the Wallowa-Whitman National Forest

Management Area Designation and Name	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
1A Congressionally Designated Wilderness Areas*	373,676	372,900	372,900	372,900	372,900
1B Preliminary Administratively Recommended Wilderness Areas	NA	10,800	172,700	NA	20,300
1C Wilderness Study Area	2,350	2,400	2,400	2,400	2,400
2A Designated and Eligible Wild and Scenic Rivers (does not include eligible wild and scenic rivers for alternative A)	21,936	84,400	84,400	52,900	52,900
2B Research Natural Areas	2,635,897	8,000	7,255	8,000	7,255
2E Historical Areas	0	0	0	0	0
2F Scenic Byways and All-American Roads	NA	85 miles	85 miles	85 miles	85 miles
2G Nationally Designated Trails	NA	25 miles	25 miles	25 miles	25 miles
2I Starkey Experimental Forest and Range	27,251	30,500	30,500	30,500	30,500
2J Municipal Watersheds	NA	24,500	24,500	24,500	24,500
3A Backcountry(nonmotorized use)	NA	NA	210,100	NA	104,400
3B Backcountry (limited motor vehicle use)	119,938	248,800	NA	219,500	145,500
3C Wildlife Corridor	NA	NA	242,600	NA	6,500
4A General Forest	734,500	848,000	397,200	998,700	844,300
4B Riparian Management Areas**	121,683	184,600	200,800	87,100	186,300
4C Old Forest	60,285	NA	91,000	NA	NA
4D Big Game Winter/Summer Range	396,703	NA	NA	NA	NA
4E General Wildlife/Fish	60,326	NA	NA	NA	NA
4F Visuals	4,287	NA	NA	NA	NA
5 Developed Sites and Administrative Areas	7,111	7,700	7,700	7,700	7,700

* The designated wilderness area acres displayed for alternative A are taken from the 1990 forest plans and have not been recalculated using current technology. Private inclusions are included in the total for congressionally designated wilderness areas for alternative A.

** MA 4A does not include riparian management area acres. MA 4B includes only the riparian area acres that would have been allocated to MA 4A General Forest (these acres are not included in the MA 4A total).

Chapter 3. Affected Environment and Environmental Consequences

Introduction

Chapter 3 describes the affected environment and environmental consequences from implementing the alternatives described in chapter 2and appendix A in relation to the significant and other issues described in chapter 1. This chapter provides the reader with the affected environment and environmental consequences of the modified proposed action, no action and four other "action" alternatives for each resource. The affected environment is discussed by resource, rather than in its own chapter, in order to facilitate the readers understanding of the context of the environmental consequences that follow. Each resource has a brief introduction. As required by the 40 CFR 1502.14, the resource specialist provides an explanation of the analysis methodology that was used in drawing their effects analysis in appendix B. The Environmental Consequences section is grouped by each alternative or by the action alternatives versus the No-action Alternative. This chapter touches on a variety of resources. The organization is loosely structured around the issues and then by environment type. The issues are access, economic and social well-being, livestock grazing and grazing land vegetation, old forest, recommended wilderness areas, and ecological resilience. The environment types include physical, biological and social environments. As required by 40 CFR 1502.23, the "Economic and Social Well-Being Environmental Consequences" section, provides a basis for the cost-benefit analysis of this work towards contributing to local economic stability. Watershed and soil resources are discussed under the physical environment. Appendix D provides details on the legal regulatory compliance.

The Analysis Area

The analysis area includes the National Forest System lands (NFS lands) administered by the Malheur, Umatilla, and Wallowa-Whitman National Forests, with one exception: the Hells Canyon National Recreation Area portion of the Wallowa-Whitman National Forest is not included (as discussed in chapter 1). The analysis area for the Malheur National Forest also includes an adjacent portion of the Ochoco National Forest that is administered by the Emigrant Creek Ranger District. These national forests are collectively referred to as the Blue Mountains national forests. For ease of reference and to conserve space in tables, Forest Service designators for the national forests may be used: MAL, UMA, WAW, and OCH for the Malheur, Umatilla, Wallowa-Whitman, and Ochoco National Forests respectively.

The Analysis of Environmental Consequences

NEPA requires the analysis and disclosure of direct, indirect, and cumulative effects to the affected environment. Environmental consequences are interchangeable with effects. The analysis of these anticipated effects provides a basis for comparing alternatives and a method by which the interdisciplinary team, the public, and the responsible official can assess the consequences through time and in a particular geographic area. Appendix B to this DEIS includes the methodologies used in this analysis.

Programmatic Analysis

The impacts addressed in a programmatic plan revision EIS reflect the environmental issues associated with the programmatic nature of the plan. Because these issues typically relate to environmental effects over a broad geographic and time horizon, the depth and detail of impact analysis is expected to be broad and general. The effects analysis will focus on the major impacts that might result in the long term if the plan is implemented, especially on those resources or factors that would be adversely impacted.

For estimating the effects at the programmatic forest plan level, the assumption has been made that the kinds and amounts of resource management activities described in the alternatives are reasonably foreseeable actions intended to move towards or achieve the goals and desired conditions. However, the specific location, design, and extent of such activities are generally not known at the time. As described in chapter 1, project level decisions that actually implement the forest plan are made on a site-specific basis. Therefore, the discussions here refer to the potential for the effect to occur and are in many cases only estimates. The effects analyses are useful when comparing and evaluating alternatives on a forestwide basis, but are not intended to be applied directly to site-specific locations within the national forests.

Direct effects are not analyzed in this programmatic document because the actions are not tied to a specific place or location. Land management plans typically do not have direct effects, as they generally do not authorize site-specific projects. Direct effects can only be analyzed on site-specific projects that would cause a specific action to occur in a particular time and location. Plans may prohibit some actions that might be taken or might not have otherwise been proposed; however, plans do not compel actions to be taken. Instead, plans influence what might or might not be proposed in the future, and the nature of those actions.

Indirect effects are caused by an action and occur later or are removed in distance. The effects of programmatic direction are generally indirect effects.

A **cumulative effect** is the effect of an action when added to the effects of other past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes the actions and regardless of who owns the land on which the other actions occur. The cumulative effects analysis integrates the actions and activities occurring on other national forests and lands of other ownership into a broader “landscape” analysis. The cumulative effects area includes all lands within the proclaimed boundaries of the three national forests and the portion of the Ochoco National Forest that is administered by the Malheur National Forest. It also includes the HCNRA, private, state, and other federally administered lands within and adjacent to the national forest boundaries.

The provisions of the 1982 planning rule include requirements to coordinate planning efforts with local land owners as well as related planning efforts of other Federal agencies, State and local governments, and Indian tribes (1982 rule provisions 219.6(k) and 219.7(c)). The analysis compares relevant plans and policies to the alternatives developed for National forest System lands, and then describe what the “effects” would be at that multi-land ownership level. It also describes whether and how the effects of each alternative accrue cumulatively with the effects of the plans and policies reviewed. This review is focused on the long-term outcomes of these plans as they pertain to the broader landscape. The results of this review are displayed in the environmental impact statement. The plans and policies are incorporated by reference.

This cumulative effects list does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis (appendix C). There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions during the last century (and beyond) and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because information about the environmental impacts of individual past actions is limited and one cannot reasonably identify each and every action during the last century that has contributed to current conditions. Focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By analyzing current conditions, all the residual effects of past human actions and natural events are sure to be captured, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005, regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

For these reasons, the assessment of current environmental conditions in the affected environment incorporates the combined effects of past actions. Ongoing and reasonably foreseeable future actions are addressed within the analysis in environmental consequences. Because the forest plan has an anticipated lifespan of 15 to 20 years, this analysis incorporates the effects of reasonably foreseeable future actions. When forest plan activities are considered within a context of climate change, an additional factor is added to the cumulative effects analysis.

The direct, indirect and cumulative effects analyses incorporate the data files that are available from the analysis file (referred to as the project record).

Consideration of Climate Change

Climate change is affecting the processes that define natural and human systems in the Pacific Northwest. Relative changes in temperature, precipitation, and carbon dioxide concentrations have implications for the amount and seasonality of water availability. These influences consequently effect the geographic locations that are habitable by particular plant and animal species, species abundance, the productive capacity of natural and human systems, and risks to natural and human systems from extreme events, such as floods. Changes in hydrologic processes are also important because they determine when water is available and how it must be stored for use by natural and human systems.

Understanding of regional trends in climate across the Pacific Northwest is becoming clearer with time, while finer-scale trends, such as the Blue Mountains, are less certain. Average annual temperatures in the Pacific Northwest have risen by 1.5 °F since 1900. Since 1950, temperatures have risen at twice the rate of increase that occurred before 1950 (Mote 2003a). Temperatures are expected to increase by 0.2 to 1 °F per decade throughout the 21st century, and temperatures are expected to rise for the next several decades or longer, even if emissions stopped today (Mote and Salathé 2009). Compared to 1970 to 1999, temperatures are expected to be 2.8 to 9.7 °F warmer by 2100 (Littell et al. 2009a).

Trends in historical and projected changes in precipitation in the Pacific Northwest are less clear than for temperature. For example, precipitation in the Pacific Northwest has increased by 13 to 38 percent since 1900 and has shown substantial inter-annual and decadal variability during the 20th century (Mote 2003a). Littell et al. (2009a) showed that projected increases in annual precipitation for the Pacific Northwest vary considerably between models. Average model increases in precipitation relative to the period from 1970 to 1999 were 1.3, 2.3, and 3.8 percent for the 2020s, 2040s, and 2080s, respectively. Ranges in these model estimates were minus-9 to plus-12 percent, minus-11 to plus-12 percent, and minus-10 to plus-20 percent, respectively.

While temperature data in the Blue Mountains appears to track regional trends fairly well, regional averages in precipitation for the Pacific Northwest may differ from those in the Blue Mountains due to complex local terrain and the position of the Blue Mountains relative to prevailing air masses and storm tracks. Based on average data for Blue Mountains (Oregon climate zone 8), average precipitation is lower since 1970 for every month except April, July, and August. Cool season (October through March) precipitation is lower by 14 percent; warm season precipitation (April through September) is lower by 2 percent; July and August precipitation is higher by 27 percent. Changes at individual stations within and near the Blue Mountains may vary greatly from these averages (Gecy 2010). The difference between observed changes in precipitation in the Blue Mountains and the Pacific Northwest region illustrate that climate changes are not homogeneous and that local differences in weather pattern, topography, and other factors that influence the distribution of precipitation may be important in future assessments of climate change response.

April 1 snowpack has declined in mountainous regions across the West (Mote 2003b, Mote et al. 2005), with observed changes largely being attributed to elevated temperatures in both winter and spring (Hamlet et al. 2005, Stewart et al. 2005). Similar changes are observed in the Blue Mountains where all but 2 of 34 measuring stations have recorded declines in April 1 snowpack since 1970, with an average decline of 24 percent and a range of 5 to minus-73 percent (Gecy 2010). Snowpack declines are expected to continue across the Blue Mountains as temperatures throughout the region increase. Continued warming is expected to result in more winter precipitation falling as rain rather than snow and less winter snow accumulation. Watersheds in which runoff presently results from a mixture of rain and snow are likely to become rain dominated by 2100. These changes are projected to result in reduced peak spring streamflow, increased winter streamflow, and reduced late summer flow. In low elevation areas where winter temperatures are at the threshold of freezing, winter precipitation is expected to become increasingly dominated by rain instead of snow (Mote 2003b, Hamlet et al. 2005, and Mote et al. 2005), and winter streamflow will become higher and more variable (Elsner et al. 2010). Overall, earlier snowmelt and longer warm periods is expected to lead to a shift of peak river runoff to early spring or winter (Barnett et al. 2005). Streamflow projections suggest that there will be higher annual streamflow with lower summer flows and higher and more variable winter flows (Hamlet and Elsner 2010). In the Blue Mountains, all 16 measuring stations with streamflow records beginning prior to 1940 show an increase in March runoff, and most show decreased June runoff. Reduced summer streamflow has not yet been observed.

The projected increase in air temperatures and the resulting effect on snow pack and timing and magnitude of rainfall is predicted to have considerable impact on natural resources and their management in the region and in the Blue Mountains (for more detail, refer to specific resource sections in this chapter.) Further, higher temperatures result in more energy input to the biophysical environment and an increased ability of the atmosphere to hold moisture; hence,

some weather events and extremes will become more frequent, more widespread, or more intense during the 21st century (Parry et al. 2007).

Climate Change Effects on the Terrestrial Environment

Significant impacts to terrestrial ecosystem structure and function are expected as a consequence of climate change. Climate-vegetation interactions are expected to produce a number of terrestrial ecosystem disturbance effects, including increased fire frequency and severity and increased susceptibility to insects and disease and invasive species. Within the region, increased summer temperature and decreased summer precipitation are projected to result in a doubling of the area burned by fire by the 2040s and a tripling by the 2080s. The probability of very large fires (more than two million acres) in a given year is projected to increase from 5 percent (observed) to 33 percent by the 2080s. Primarily east of the Cascades, mountain pine beetles will likely reach higher elevations and pine trees experiencing stress from changing climatic conditions will likely be more vulnerable to infestations by beetles (Littell et al. 2009b).

Changes in the length of the growing season, the timing of bud break (phenology), and the availability of soil moisture are expected to produce large shifts (both positive and negative) in forest growth and mortality rates, forest floor decomposition, and species composition in forest ecosystems. There is correspondence between earlier spring green up and the early onset of spring snowmelt runoff in western North America (Cayan et al. 2001). For wildlife, changes in climate and vegetation will affect habitat (i.e., cover), reproductive success, and food and water availability. These impacts in turn will alter species assemblage, migration routes, and viability of populations, particularly rare species and large mammals that may have greater sensitivity to these ecosystem and climatic changes. Anticipated changes to wildlife include:

- The susceptibility of high elevation habitats and species dependent on snowpack (e.g., wolverine)
- Impacts on wetlands and associated species, especially those sensitive to water temperature (e.g., tailed frog)
- Phenological mismatch between migratory bird movements and their habitat

Changes are expected to happen more quickly than species' abilities to adapt, thus connectivity to allow movement of species will be critical (for more detail, refer to the Terrestrial Wildlife Diversity and Viability section in this chapter).

Management strategies to increase the adaptive capacity of terrestrial ecosystems in the face of climate change include:

- Conserving species and habitats threatened directly or indirectly by climate change
- Enhancing landscape connectivity
- Reducing barriers to species movement caused by shifts in habitat distributions
- Reducing the risk of uncharacteristically severe fires and insects and disease disturbances
- Reducing the extent of nonnative invasive species and preventing future infestations

Climate Change Effects on the Aquatic Environment

Increasing air temperatures, decline in snowpack and changes in the magnitude and timing of rainfall are expected to reduce summer streamflow, increase cool season streamflow, and increase stream temperatures at least during the next century throughout the Pacific Northwest. These changes in streamflow and temperature have the potential to directly impact aquatic habitat and organisms. For example, bull trout and salmon populations may be directly impacted and could decline through these anticipated changes. Changes in the timing of streamflow and scouring of stream habitat due to increased rain on snow events are expected to affect the quality and quantity of habitat for aquatic species and the development and timing of emergence of aquatic insects (Mantua et al. 2009).

Management strategies to increase the adaptive capacity of aquatic ecosystems in the face of climate change include:

- Reducing potential increases in stream temperatures through riparian buffers
- Restoring and the maintaining effective stream shade
- Reducing the risk of water quality degradation and increasing aquatic connectivity by:
    - Decreasing road density
    - Reducing hydrological connectivity of the road system
    - Replacing culverts
    - Closing, realigning, or obliterating roads

Carbon Sequestration and Mitigation of Greenhouse Gas Emissions

Ecosystems are affected not only by climate change but also through carbon sequestration (e.g., plant growth) and greenhouse gas emissions (e.g., fire, organic matter decomposition, and soil respiration). Ecosystem functions also directly influence the global carbon cycle. The Forest Service administers roughly one-fifth of all U.S. forestland, and management of these forests can substantially affect total national forest carbon stocks (Heath et al. 2011). Consequently, the Forest Service roadmap for responding to climate change (USDA Forest Service 2010) identified assessing and managing carbon stocks as a part of the strategy.

Forest management can offset greenhouse gas emissions by increasing capacity for carbon uptake and storage in biomass, wood products, and soils. In general, while deforestation is a large global source of CO_2, forestland area the United States has declined only slightly, and the forestry sector is in fact a net greenhouse gas sink in the U.S. (USDA Forest Service2008). Forests of the Blue Mountains currently store substantial carbon stocks. Forest management activities and disturbances, such as wildland fire, can either increase or reduce carbon stocks over time, depending on their type, frequency, and severity. In general, current Forest Service management activities are unlikely to affect carbon stocks substantially in the Blue Mountains.

Carbon is also stored in wood products that are harvested from Oregon’s forests, but wood products are unlikely to provide for substantial increases in stored carbon under current manufacturing, use, and disposal practices. Management activities carried out in response to climate change, such as thinning of forests to reduce risk of stand replacing wildland fire or insects disturbances, or to reduce moisture stress on the remaining trees, may reduce carbon

stocks in the short term, but can have long-term benefits for carbon sequestration (Zhang et al. 2010). Rangeland carbon stocks are lower than forests and are less directly affected by rangeland management practices than timber harvests in forestlands (U.S. EPA 2011).

Adaptation to Climate Change

All forest plan alternatives include outcomes or allow for management actions that would improve the ability of national forest resources to adapt to a changing climate. The alternatives vary in the amount of outcomes and types of actions that are likely to occur. Forest plan components appropriate for addressing climate change include the following:

- Conserving species and habitats threatened directly or indirectly by climate change, enhancing landscape connectivity, and reducing barriers to species movement to facilitate the ability of species to move across the landscape with shifts in habitat distributions (desired conditions 1.1, 1.2, 1.7, and 1.12 and objectives 1.1 and 1.2)
- Reducing the risk of uncharacteristically severe fires and insects and disease disturbances through forest thinning (desired conditions 1.4.1, 1.4.2, 1.7, and 1.8 and objectives 1.1, 1.4.1, 1.4.2, 1.6, and 1.8)
- Reducing the risk of increased nonnative species infestations through reductions in the extent of current nonnative species and prevention of future infestations (desired condition 1.5 and objective 1.5)
- Reducing potential increases in stream temperatures through riparian buffers and stream restoration and maintenance of effective stream shade (desired condition 1.1 and objective 1.1)
- Reducing risk of water quality degradation while increasing aquatic connectivity by decreasing road density, reducing hydrological connectivity of the road system, replacing culverts, and road closure, realignment or obliteration (desired condition1.1 and objective 1.1)

The referenced forestwide desired conditions and forestwide objectives are described in more detail in appendix A.

These management approaches, once implemented, should result in landscapes that are more resistant to catastrophic wildland fires and insects and disease disturbances, are more resilient in the wake of extreme weather events, and are better able to adapt to changing conditions.

Climate change effects are discussed in detail in the individual resource sections in this chapter. Relative comparisons of the degree of climate change adaptation between alternatives are based on evaluation of one or more of the following indicators:

- Acres available for planting (even-aged harvest) and providing opportunities to adapt tree species composition to changing climates
- Acres of designated wildlife corridors, which can reduce barriers to movement
- Acres of thinning to restore disturbance regimes and/or reduce uncharacteristically severe wildland fires
- Miles of roads with improved drainage and reduced sediment delivery, thus reducing hydrologic connectivity of the road system

- Miles of riparian restoration, which restores floodplain connectivity, flow regimes, and/or increases effective stream shade
- Acres of invasive plants treated

Addressing Uncertainty through Adaptive Management

The effects of climate change on ecosystem structure and function and the effectiveness of management activities in climate adaptation are just a couple of many uncertainties in natural resource management. At this point, much of what is understood about climate change is based on models that are built on the best available scientific information and assumptions. There is relatively less direct experience observing how climate change is playing out in its effect on ecosystems, how management actions may help ecosystems adapt to a changing climate, and how model assumptions compare to reality. Varying levels of uncertainty still remain across climatic variables, across spatial and temporal scales, and across management objectives. For example, within the region, trends in warming temperatures, declining winter snow packs, and earlier spring snowmelt are relatively more clear than trends in precipitation. Further, it is challenging to interpret local variations in precipitation within the context of regional long-term trends. These types of uncertainties complicate the design of land management actions that may be needed to take to adapt to climate change. However, the understanding of regional trends in climate across the Pacific Northwest is becoming clearer with time, and will continue to do so as monitoring and research data builds. The likely effects of climate change on the distribution of plant and animal species and their biophysical environment (described in detail within specific resource sections in this chapter), as well as the potential adaptation actions that can be taken in response, will also become more clear with time. In any case, surprising trends and the need to consider how management actions now will maintain opportunities to respond to surprises in the future is relatively certain.

Fundamentally, managing to restore and maintain ecosystem resilience to change is a key forest plan revision strategy, as represented by the plan components described previously and others detailed in appendix A. However, compared to what is known about likely future conditions, desired conditions in the forest plan, including those aimed to restore or maintain ecosystem resilience, are biased by the greater body of knowledge available about historical ecological and social conditions. Hence, land managers must also be cognizant of how desired conditions may need to change as a better understanding of ecosystem and social capabilities and desires emerges in response to climate change.

Key components to addressing climate change impacts on ecosystems (both freshwater and terrestrial) include focusing on monitoring to reduce uncertainties in the understanding of climate change and ecosystem responses, the efficacy of management to facilitate adaptation and changes to desired conditions. Adaptive management is an approach for testing assumptions and reducing uncertainty over time. The Blue Mountains forest plan revision incorporates monitoring elements that facilitate evaluation of assumptions about interactions between weather, ecosystem structure and function, natural disturbances, and outcomes of management objectives (see monitoring plan, appendix A). Through local and regional monitoring and by staying abreast of the best available information, management assumptions can in turn be adjusted and be positioned to continually improve national forest management in a changing climate.

Significant Issues

Issue 1: Access

Access to the national forests, including access for recreation, administrative use, permitted activities, valid existing rights, and firefighting, was identified as a significant issue during scoping. The issue involves road and trail access for motor vehicles, road access for managing resources, the cost of maintaining the transportation system, and the desire to reduce motor vehicle route density (and therefore access) to improve fish and wildlife habitat and to protect streams. Access is best analyzed and discussed as whether an area is generally suitable or unsuitable for motor vehicle and nonmotorized uses.

An additional aspect of areas that would be generally suitable or unsuitable for motor vehicle use is the social response to these designations. Conflicts between users may be minimized by having areas that are clearly designed and designated for either motor vehicle use or nonmotorized use.

While the forest plan would not change designations of roads and trails for motor vehicle use, it would provide direction for future planning. Specifically, the forest plan would include determinations (generally suitable or unsuitable for motor vehicle use) that dictate whether or not motor vehicle routes can be constructed or reconstructed in an area. The areas that would be generally unsuitable for motor vehicle use would be dominated by nonmotorized uses.

Motor vehicle access is desired for hunting and fishing, summer and winter recreation, private land access, management activities, and wildland fire suppression. Nonmotorized areas are needed for hunting and fishing, summer and winter recreation, secluded wildlife habitat, and biological reserves. The number of acres suitable for motor vehicle use and the desired conditions for road density in those areas will influence the future transportation system and future road management opportunities. The amount and type of access to an area is an important factor affecting the health of terrestrial, aquatic, and riparian habitats.

The amount and type of access available within the national forests is a large component of recreation, wildlife, fisheries, and watershed effects and is discussed in more detail in the corresponding resource sections. The focus of this section is access to the national forests for all uses.

The amount of area within each national forest that is generally suitable for motor vehicle use (summer and winter) varies by alternative and is one measure of the differences between alternatives.

Identification of an area as generally suitable or generally unsuitable for a use guides future project and activity decision making. For instance, if an area that is suitable for motor vehicle use in the 1990 forest plans is determined to be unsuitable for that use in the revised forest plans, the new determination does not result in immediate closure of roads in that area. Rather, that suitability determination would be considered in making future project level decisions. Those site-specific decisions may include road closures in the area. An area determined to be unsuitable for motor vehicle use is expected to have no future road or motor vehicle trail construction.

In 2005, the Forest Service published the travel management rule, governing use of motor vehicles on National Forest System lands. The Code of Federal Regulations Title 36, Part 212 has two subparts that provide direction for travel management in national forests. The first portion of that rule, also known as subpart A, stipulates the administration of national forest transportation

systems and includes how road systems are to be managed. In 36 CFR 212.5 (b) the responsible official must identify the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of National Forest System lands. This requires a science-based roads analysis at the appropriate scale involving a broad spectrum of interested and affected citizens, state and Federal agencies, and tribal governments. The minimum system is the road system determined to be needed to meet resource and other management objectives adopted in the relevant land and resource management plan (36 CFR part 219) to meet applicable statutory and regulatory requirements, to reflect long-term funding expectations, and to ensure that the identified system minimizes adverse environmental impacts associated with road construction, reconstruction, decommissioning, and maintenance. The forest plan revision will help inform this subpart A requirement.

The travel management rule (36 CFR part 212, subpart B) requires each administrative unit or ranger district to designate those National Forest System roads, National Forest System trails, and acres of National Forest System lands that are open to motor vehicle use by vehicle class and, if appropriate, by time of year. The travel management rule also requires designated roads, trails, and areas to be identified on a motor vehicle use map (MVUM). After designated roads, trails, and areas have been identified on a MVUM, motor vehicle use inconsistent with those designations is prohibited by 36 CFR 261.13.

The travel management rule combines regulations governing administration of the national forest transportation system and regulations governing use of motor vehicles off National Forest System roads. The travel management rule implements Executive Order (E.O.) 11644 (February 8, 1972) “Use of Off-Road Vehicles on the Public Lands,” as amended by E.O. 11989 (May 24, 1977).

The forest plan revision process does not include determinations for whether or not specific roads and trails will be constructed, maintained, closed, or decommissioned. The primary ways that the transportation system is managed during a plan period are by goals and desired conditions, including open motor vehicle route density, and the general suitability of an area for motor vehicle use or, conversely, the general suitability of an area for nonmotorized use only. Decisions on motor vehicle access are made through individual project planning and are reflected on the individual national forest annual motor vehicle use map (MVUM). When the forest plans were approved in 1990, cross-country motor vehicle travel was prohibited within much of the Umatilla National Forest. The remaining area that was open to cross-country motor vehicle travel was closed in 2010. In contrast, the 1990 forest plans for the Malheur and Wallowa-Whitman National Forests did not prohibit cross-country travel, unless an area was closed to it by order.

It is assumed that cross-country motor vehicle travel within the Malheur and Wallowa-Whitman National Forests will be limited when their travel management plans are completed and implemented. After implementation of the travel management plans, all three national forests will be in compliance with the 2005 Travel Management Rule (36 CFR 212). The forests are waiting on national direction with regards to how to address over-the-snow motor vehicles.

Affected Environment – Access

Access to the Malheur, Umatilla, and Wallowa-Whitman National Forests is provided by a complex and integrated transportation system of roads and trails managed by the Forest Service, county, state, and private jurisdictions. National Forest System roads range from double-lane paved highways to narrow, native-surface roads. The entire road system for all three national forests includes more than 22,000 miles of roads. Roads are an important part of the infrastructure in the Blue Mountains national forests and provide access for recreation activities, timber

removal, grazing, wildfire protection, and to facilities that are operated under special use authorizations. However, roads also have the potential to adversely affect a number of resources in various ways. Please note that roads and trails are collectively referred to as routes.

The information for this analysis was acquired from agency documentation of historical maintenance funding and practices, as well as agency data on the transportation system (INFRA).

The history and development of the road systems of the Blue Mountains national forests is primarily related to extractive resource management activities, such as mining and logging, which included constructing transportation infrastructure as it progressed. Many roads were located directly adjacent to streams and rivers because mining operations were often associated with water. Lode mining necessitated the construction of roads and railroads to haul the ore. Logging operations often followed mining operations because timbers were needed to shore up tunnels or build cabins. Prior to the dependency on trucks, railroads provided the primary access into the area. Railroad logging can be traced as far back as 1901, and signs of this activity remain today, as evidenced by the numerous railroad grades throughout the area.

Additional roads were constructed to connect communities and for firefighting and administrative access to the national forests. Roads provided access for viewing scenery, reaching traditional campsites and hunting areas, grazing, and gathering forest products, such as berries and firewood.

New, permanent road construction has markedly declined, and the current transportation system includes a backlog of maintenance needs. Currently, new road construction ranges from zero to 3 miles, reconstruction ranges from 5 to 35 miles, and decommissioning ranges from zero to 12 miles, all annually, for each of the three national forests. Roads are reconstructed for a number of purposes, including improving road conditions, driver safety, and fixing resource impacts. Road decommissioning occurs when a road is no longer needed for resource management and is minimally used by the public. Road decommissioning terminates motor vehicle use and restores ecological processes interrupted or impacted by the road. Roads are also decommissioned when maintenance requirements and resource impacts outweigh access needs.

Forest plans have components that guide decisions made to manage the transportation system on the three national forests. Those plan components include desired conditions for the road system, including desired conditions for open motor vehicle route density; suitability determinations for management areas where motor vehicle use is generally suitable or unsuitable; objectives for managing the transportation system to move towards achieving the desired conditions; and standards and guidelines to prevent environmental impacts when road maintenance, construction, or reconstruction is performed. Forest plans do not make decisions regarding individual roads or trails. This section includes discussion of the current transportation system on the three national forests, how the alternatives address the different plan components that would guide future management, and what the effects to access would be from implementing those plan components.

The Blue Mountains national forests trail system has remained relatively the same for the past 20 years. Currently, additional trail miles are rarely added to the trails system. Reconstruction of trails depends on funding and ranges from zero to 40 miles a year. Trail systems are rarely decommissioned.

Combining motor vehicle use and nonmotorized use at trailheads and along travel routes results in occasional conflicts, and contributes to access issues for each user group. As stated in the Recreation section, some trail maintenance issues have been resolved through project-level activities using American Recovery and Reinvestment Act funds. However, with the continuing

shortage of allocated funds for trail maintenance, issues will continue to develop with limited funds to address them. There are relatively limited opportunities for motor vehicle use on system trails throughout the three national forests, a limitation that poses additional challenges considering this type of use is increasing both locally and regionally.

Trails used primarily for foot, pack or riding stock, and mechanized transportation have occasional conflicts between users. Trails for snowmobiles, Nordic skiers, snowshoers, and dog sleds are designated on existing National Forest System roads and contribute to the winter recreation opportunities offered within the national forests. The following table displays the distribution of opportunities across the three national forests. Recreation opportunities within the Hells Canyon National Recreation Area (Wallowa-Whitman National Forest) are not included in the following table.

Table 7. Route and trail miles by type and season of use for each national forest (existing condition/1990 forest plans based on 2009 data)

National Forest	Motor Vehicle Use Routes (miles in winter)	Nonmotorized Use Routes (miles in winter)	Motor Vehicle Use Trails (miles in summer)	Nonmotorized Use Trails (miles in summer)
MAL	771	55	37*	465
UMA	139*	31	464	1,246
WAW	896	80	138	860

* Used more current data to better reflect the existing condition.

Across the three national forests, trails are in a variety of management situations. In some locations, summer nonmotorized trails are in areas that allow only nonmotorized use (such as wilderness areas). In other places, summer nonmotorized trails are in an area that can also be managed for motor vehicle trails, in addition to roads and other uses. Winter recreation facilities and routes are frequently associated with road systems, so the nonmotorized winter routes are located in management areas that allow for motor vehicle use. Snowmobile routes are almost entirely on road systems, because the width of the route allows for grooming equipment to pass through. Snowmobilers may be using only the groomed routes because they prefer that kind of riding, or they may be using the routes to easily access areas where they like to ride cross country.

Road Maintenance Levels

Road maintenance level (ML) is defined as the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria (FSH 7709.58, Sec 12.3 - Transportation System Maintenance Handbook). The handbook serves as a primer for how the transportation system is managed and maintained. In general, road maintenance objectives are categorized into five levels designated ML1 to ML5. Each maintenance level and its associated characteristics and management strategy are described below.

Maintenance Level 1 - Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resource to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Roads receiving level 1 maintenance may be of any type, class or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being

maintained at level 1, they are closed to vehicular traffic, but may be open and suitable for nonmotorized uses.

Maintenance Level 2 - Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level.

Maintenance Level 3 - Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.

Maintenance Level 4 - Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated.

Maintenance Level 5 - Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-lane, paved facilities. Some may be aggregate surfaced and dust abated.

Roads may be currently maintained at one level and planned to be maintained at a different level at some future date. The operational maintenance level is the maintenance level currently assigned to a road considering today's needs, road condition, budget constraints, and environmental concerns.

Key Indicators for Analyzing Access

- Road maintenance funds projected to be available to maintain the transportation system
  - Projected road maintenance for each road maintenance level (miles)
- National Forest System lands that would be suitable for motor vehicle route designation and use or suitable only for nonmotorized use (acres)
  - Change in acres suitable for summer motor vehicle route designation and use
  - Change in acres suitable only for summer nonmotorized use (where motor vehicle use would be prohibited)
  - Change in area suitable for winter over-the-snow motor vehicle use

Environmental Consequences – Access

Road Maintenance (Alternative A)

Key Indicator

- Road maintenance funds projected to be available to maintain the transportation system
  - Projected road maintenance for each road maintenance level (miles)

Maintenance of the transportation system is not sustainable given the current funding of the Forest Service. Table 8 indicates that the majority of the road maintenance budget is utilized on the double-lane passenger vehicle roads, which are the most expensive and most highly traveled portions of the road system. It is important to understand that some roads require annual maintenance while other roads, due to the stability of the roadbed, are rarely maintained. The

figures are calculated using past maintenance and management costs, which fluctuated from year to year. When high clearance and closed roads receive maintenance on such an infrequent interval, deferred maintenance issues can become exacerbated. With the maintenance focus on maintenance levels (MLs) 3 through 5 roads, the deferred maintenance backlog for the remainder of the road system continues to grow. The cost of road maintenance and the budget trend make it likely that future road closures will be necessary.

Table 8. Average annual road maintenance appropriated expenditures for the Blue Mountains national forests (existing condition/1990 forest plans)

Road Maintenance Level (ML)	Miles of Roads in Blue Mountains National Forests	Average Maintenance Interval (years)	Annual Road Maintenance Cost (per mile)	Average Annual Cost ($)
Double lane passenger vehicle roads (MLs 4 and 5)	676	2	$2,615	$ 872,102
Passenger vehicle roads (ML 3)	714	3	$1,607	383,001
High clearance vehicle roads (ML 2)	12,330	10	$291	358,803
Custodial care (closed roads)	9,701	15	$9	5,815
Totals	**23,421**	**NA**	**NA**	**$1,474,454**

The average allocated road maintenance budget from 2008 to 2010 is approximately $1.3 million for the three national forests. The annual shortfall is approximately 200,000 dollars, which adds to an already substantial deferred maintenance backlog. Given the priority of maintaining passenger vehicle roads, much of the deferred maintenance will fall on maintenance level 1 and 2 roads, which represent 93 percent of the road network. Many of these roads are decades old with aging infrastructure that may require partial or targeted reconstruction in order to meet hydrologic standards. The continued maintenance of an extensive road system creates many challenges. Roads in disrepair create safety issues and conflicts with resource protection goals. Wildlife, soil and water quality, and the spread of noxious weeds are negatively affected by the degree and public use of the transportation system. Road closures have only been moderately successful, with many road closures breached. The future road system will reflect how the Forest Service funds and supports road maintenance, reconstruction, and decommissioning efforts.

Road maintenance costs are not equal across the Blue Mountain national forests. A majority of Forest Service units within the broader region (Oregon and Washington) have phased out internal (Forest Service) maintenance capabilities, opting instead to complete maintenance activities through external contracting. While the majority of forests within the region have developed and adopted this structure, the Malheur National Forest has retained internal road maintenance capabilities through Forest Service road maintenance staffing and equipment, resulting in the potential for slightly lower road maintenance costs. The projected annual maintenance objectives vary within each forest for the action alternatives, reflecting the varying road maintenance structure for each forest.

Table 9. Current maintenance levels and total miles of Forest Service roads for each national forest (existing condition/1990 forest plans based on 2009 data)

Road Maintenance Level (ML)	MAL		UMA		WAW	
	Miles	Percent	Miles	Percent	Miles	Percent
Custodial care (closed roads)	2,856	30%	2,447	53%	4,398	49%
High clearance vehicle roads (ML 2)	6,423	67%	1,574	34%	4,333	47%
Passenger vehicle roads (ML 3)	54	< 1%	398	8%	262	3%
Double lane passenger vehicle roads (MLs 4 and 5)	318	3%	232	5%	126	1%
Totals	**9,651**	**100%**	**4,651**	**100%**	**9,119**	**100%**

Area Suitable for Summer Motor Vehicle Use (Alternative A)

Key Indicator

- National Forest System lands that would be suitable for motor vehicle route designation and use or suitable only for nonmotorized use (acres)
  - Change in acres suitable for summer motor vehicle route designation and use

Access via roads and trails to and across the national forests has a long history in the Blue Mountains. Trails and migration routes date back to prehistoric times. American Indian migration routes are well documented through the stories of the Nez Perce, Umatilla, Warm Springs, and other tribes. Many of these ancient routes are the basis for roads, portions of roads, or trails that are in use today. Trails within the national forests also contributed to western migration as expeditions passed through this area in the 1800s. Notable ones include the original Oregon Trail, portions of which can be traced along its original alignment.

During the last 25 years, Forest Service project analyses have determined that many roads could be closed or decommissioned to improve resource conditions. Some benefits of these closures include reducing disturbances to wildlife, improving water quality, and reducing road maintenance costs.

In the 1990s, advancements in off-highway vehicle technology began to result in changes in use. Riders found that they could use off-highway vehicles to access rugged areas that had previously been accessible only by foot or horseback. This new type of use resulted in resource impacts, conflicts between user groups, and safety concerns.

The following table displays the amount of each national forest that is suitable for motor vehicle use in the 1990 forest plans.

Table 10. Area suitable and available for motor vehicle use for each national forest (existing condition/1990 forest plans based on 2009 data)

National Forest	Acres Suitable for Motor Vehicle Use	Percent of National Forest
MAL	1,428,050 acres	84%
UMA	934,240 acres	67%
WAW	1,315,750 acres	75%

Area Suitable Only for Summer Nonmotorized Use (Alternative A)

Key Indicator

- National Forest System lands that would be suitable for motor vehicle route designation and use or suitable only for nonmotorized use (acres)
    - Change in acres suitable only for summer nonmotorized use (where motor vehicle use would be prohibited)

Many trails on the national forests evolved from game trails, early American Indian hunting trails, and livestock herding trails, or those that were constructed by early recreation users. These trails were constructed to access remote lakes and scenic viewpoints. The majority of national forest trails are in dispersed and backcountry recreation areas.

National Forest System routes are extensively used by the public for a number of activities, so there is intense interest in having access continue in the way users have become accustomed to. The system was expensive to build and continues to have extensive annual cost for maintenance. With the expense of maintaining the system, budgets become a factor in what future road systems will look like. In addition, roads have created ecological impacts to fish and wildlife with sedimentation of streams, hydrologic interception, and disturbance to habitat, so there is constant pressure to reduce these negative effects of roads by limiting access, repairing heavy sediment sources, or removing the road all together.

Table 11. Area suitable and available for nonmotorized use where motor vehicle use would be prohibited for each national forest (existing condition/1990 forest plans)

National Forest	Acres Suitable for Nonmotorized Vehicle Use	Percent of National Forest
MAL	272,010	16%
UMA	460,150	33%
WAW	438,580	25%

Area Suitable for Winter Over-the-snow Motor Vehicle Use (Alternative A)

Key Indicator

- National Forest System lands that would be suitable for motor vehicle route designation and use or suitable only for nonmotorized use (acres)
    - Change in area suitable for winter over-the snow motor vehicle use

This indicator reflects the potential level of change in acres suitable for motor vehicle use and the availability of areas where the sights and sounds of motors are not heard during the winter.

Table 12. Area suitable for winter over-the-snow motor vehicle use for each national forest (existing condition/1990 forest plans)

National Forest	Acres Suitable for Winter Motor Vehicle Use	Percent of National Forest
MAL	1,575,500	92%
UMA	1,061,700	75%
WAW	1,369,200	78%

Road Maintenance (Alternatives B, C, D, E, and F)

Key Indicator

- Road maintenance funds projected to be available to maintain the transportation system
  - Projected road maintenance for each road maintenance level (miles)

Effects Common to Alternatives B, C, D, E, and F

Access is a function of the area suitable for motor vehicle use, the season, and miles of roads and trails that are maintained and at what level, which will vary by funding levels for the alternatives. Access is also a function of what miles of open motor vehicle routes would be available to the public for recreation and driving while still meeting the open motor vehicle route density. The desired condition for open motor vehicle route density varies by alternative and depends on the themes of the alternatives.

The desired conditions, objectives, and budget levels are discussed in detail in appendix A.

Effects from Alternative B on Road Maintenance

Based on the objectives for this alternative, table 13 displays the annual miles of road maintenance that are expected to occur during the first decade of the plan period for alternative B. Road maintenance is directly related to budget, and no change in the road maintenance budget is anticipated for this alternative. As a result, the expected maintenance levels are essentially the same as expected for alternative A.

It is also assumed that open motor vehicle route density desired conditions would be met by reclassifying maintenance level 2 roads to maintenance level 1 (custodial care) roads through individual project planning and decision making. These would become maintenance level 1 roads (custodial care), and while no road maintenance is expected for maintenance level 1 roads, standard practice indicates that areas with site-specific resource concerns would be treated as necessary.

The desired conditions, objectives, and budget levels are discussed in detail in appendix A.

Table 13. Projected annual road maintenance and total miles of National Forest System roads for alternative B for each national forest

Road Maintenance Level (ML)	MAL Total Road Miles	MAL Miles Projected Annual Maintenance	UMA Total Road Miles	UMA Miles Projected Annual Maintenance	WAW Total Road Miles	WAW Miles Projected Annual Maintenance
Custodial care (closed roads)	3,514	0	2,489	0	4,505	0
High clearance vehicle roads (ML 2)	5,765	900	1,532	110	4,225	218
Passenger vehicle roads (ML 3)	54	11	398	159	262	147
Double lane passenger vehicle roads (MLs 4 and 5)	318	225	232	158	126	79
Totals	**9,651**	**1,136**	**4,651**	**427**	**9,118**	**444**

Effects from Alternative C on Road Maintenance

Based on the objectives for this alternative, table 14 displays the annual miles of road maintenance that are expected to occur during the first decade of the plan period for alternative C. The estimated cost to accomplish the project annual maintenance is compared to current funding levels, and the comparison is represented as a percentage. Based on this comparison, it is estimated that accomplishing maintenance objectives for alternative C would require funding levels to be 80 percent lower for the Malheur National Forest, 50 percent lower for the Umatilla National Forest, and 55 percent lower for the Wallowa-Whitman National Forest. These maintenance objectives would prioritize wildlife habitat and watershed restoration work.

Table 14. Projected annual road maintenance and total miles of Forest Service roads for alternative C for each national forest

Road Maintenance Level (ML)	MAL Total Road Miles	MAL Miles Projected Annual Maintenance	UMA Total Road Miles	UMA Miles Projected Annual Maintenance	WAW Total Road Miles	WAW Miles Projected Annual Maintenance
Custodial care (closed roads)	4,131	0	2,583	0	4,894	0
High-clearance vehicle roads (ML 2)	5,148	64	1,438	100	3,836	75
Passenger vehicle roads (ML 3)	54	11	398	79	262	79
Double lane passenger vehicle roads (MLs 4 and 5)	318	160	232	30	126	50
Totals	**9,651**	**235**	**4,651**	**209**	**9,118**	**204**

It is also assumed that open motor vehicle route density desired conditions would be met by reclassifying maintenance level 2 roads to maintenance level 1 (custodial care) roads through individual project planning and decision making. While no road maintenance is expected for maintenance level 1 roads, standard practice indicates that areas with site-specific resource concerns would be treated as necessary. These reductions in open motor vehicle routes would result in distribution of maintenance over a considerably smaller transportation system.

The desired conditions, objectives, and budget levels are discussed in detail in appendix A.

Effects from Alternative D on Road Maintenance

Based on the objectives for this alternative, table 15 displays the annual miles of road maintenance that are expected to occur during the first decade of the plan period for alternative D. The estimated cost to accomplish the projected annual maintenance is compared to current funding levels and is represented as a percentage. Based on this comparison, it is estimated that accomplishing annual maintenance objectives for alternative D would require annual funding levels to be 40 percent higher for the Malheur National Forest, 115 percent higher for the Umatilla National Forest, and 60 percent higher for the Wallowa-Whitman National Forest. These maintenance objectives would allow greater public access and ensure that roads necessary to accomplish vegetation treatments are available.

It is also assumed that open motor vehicle route density desired conditions would be met by reclassifying maintenance level 2 roads to maintenance level 1 (custodial care) roads through

individual project planning and decision making. While no road maintenance is expected for maintenance level 1 roads, standard practice indicates that areas with site-specific resource concerns would be treated as necessary.

The desired conditions, objectives, and budget levels are discussed in detail in appendix A.

Table 15. Projected annual road maintenance and total miles of Forest Service roads for alternative D for each national forest

Road Maintenance Level (ML)	MAL Total Road Miles	MAL Miles Projected Annual Maintenance	UMA Total Road Miles	UMA Miles Projected Annual Maintenance	WAW Total Road Miles	WAW Miles Projected Annual Maintenance
Custodial care (closed roads)	2,862	0	2,448	0	4,406	0
High clearance vehicle roads (ML 2)	6,418	1,280	1,573	400	4,325	400
Passenger vehicle roads (ML 3)	54	44	398	300	262	200
Double lane passenger vehicle roads (MLs 4 and 5)	318	280	232	210	126	100
Totals	**9,651**	**1,604**	**4,651**	**910**	**9,118**	**700**

Effects from Alternative E on Road Maintenance

Based on the objectives for this alternative, table 16 displays the annual miles of road maintenance that are expected to occur during the first decade of the plan period for alternative E. The estimated cost to accomplish the projected annual maintenance is compared to current funding levels and is represented as a percentage. Based on this comparison, it is estimated that accomplishing annual maintenance objectives for alternative E would require annual funding levels to be 15 percent higher for the Malheur National Forest, 25 percent higher for the Umatilla National Forest, and 20 percent lower for the Wallowa-Whitman National Forest.

These maintenance objectives would provide the Forest Service with the ability to address soils, hydrologic, and wildlife habitat concerns in addition to providing public access and access for vegetation treatments and fuels reductions activities.

It is also assumed that open motor vehicle route density desired conditions would be met by reclassifying maintenance level 2 roads to maintenance level 1 (custodial care) roads through individual project planning and decision making. While no road maintenance is expected for maintenance level 1 roads, standard practice indicates that areas with site-specific resource concerns would be treated as necessary.

The desired conditions, objectives, and budget levels are discussed in detail in appendix A.

Table 16. Projected annual road maintenance and total miles of Forest Service roads for alternative E for each national forest

Road Maintenance Level (ML)	MAL Total Road Miles	MAL Miles Projected Annual Maintenance	UMA Total Road Miles	UMA Miles Projected Annual Maintenance	WAW Total Road Miles	WAW Miles Projected Annual Maintenance
Custodial care (closed roads)	3,524	0	2,585	0	4,553	0
High clearance vehicle roads (ML 2)	5,755	1,025	1,505	140	4,177	110
Passenger vehicle roads (ML 3)	54	38	398	200	262	159
Double lane passenger vehicle roads (MLs 4 and 5)	318	250	232	200	126	90
Totals	**9,651**	**1,313**	**4,651**	**540**	**9,118**	**359**

Effects from Alternative F on Road Maintenance

Based on the objectives for this alternative, table 17 displays the annual miles of road maintenance that are expected to occur during the first decade of the plan period for alternative F. The estimated cost to accomplish the projected annual maintenance is compared to current funding levels and is represented as a percentage. Based on this comparison, it is estimated that accomplishing annual maintenance objectives for alternative F would require annual funding levels to be 15 percent higher for the Malheur National Forest, 25 percent higher for the Umatilla National Forest, and 20 percent lower for the Wallowa-Whitman National Forest.

These maintenance objectives would provide the Forest Service with the ability to address soils, hydrologic, and wildlife habitat concerns.

Table 17. Projected annual road maintenance and total miles of Forest Service roads for alternative F for each national forest

Road Maintenance Level (ML)	MAL Total Road Miles	MAL Miles Projected Annual Maintenance	UMA Total Road Miles	UMA Miles Projected Annual Maintenance	WAW Total Road Miles	WAW Miles Projected Annual Maintenance
Custodial care (closed roads)	2,984	0	2,516	0	4,496	0
High clearance vehicle roads (ML 2)	6,395	1,000	1,505	125	4,233	100
Passenger vehicle roads (ML 3)	54	32	398	190	262	149
Double lane passenger vehicle roads (MLs 4 and 5)	318	250	232	200	126	90
Totals	**9,651**	**1,313**	**4,651**	**540**	**9,119**	**359**

It is also assumed that open motor vehicle route density desired conditions would be met by reclassifying maintenance level 2 roads to maintenance 1 (custodial care) roads through individual project planning and decision making. While no road maintenance is expected for

maintenance level 1 roads, standard practice indicates that areas with site-specific resource concerns would be treated as necessary.

The desired conditions, objectives, and budget levels are discussed in detail in appendix A.

Area Suitable for Summer Motor Vehicle Use and Areas Suitable Only for Summer Nonmotorized Use (Alternatives B, C, D, E, and F)

Key Indicator

- National Forest System lands that would be suitable for motor vehicle route designation and use or suitable only for nonmotorized use (acres)
  - Change in acres suitable for summer motor vehicle route designation and use
  - Change in acres suitable only for summer nonmotorized use (where motor vehicle use would be prohibited)

Effects Common to Alternatives B, C, D, E, and F

Access is also represented by trail routes that are accessed by either motor vehicle means, such as OHVs or motorcycles, or by nonmotorized means, such as horses, bikes, or foot travel. Because alternatives vary the acres that are generally suitable for motor vehicle or nonmotorized use vary with each alternative, the trail system distribution would vary within these areas. The desired conditions, objectives, and budget levels are discussed in detail in appendix A.

For some alternatives, management direction for areas that currently are unsuitable for motor vehicle use may change to suitable for motor vehicle use. Nonmotorized trails in these areas would continue to be nonmotorized unless a subsequent site-specific decision is made to change the type of use. Users of those trails can expect the same experience they currently have, at least in the short term, especially since cross-country motor vehicle travel is unsuitable in any area in any alternative. However, future project planning and decision making may allow for increased motor vehicle access in those areas, resulting in potential impacts to nonmotorized users (e.g., seeing and hearing motor vehicles).

The following table displays the acres suitable for summer and winter motor vehicle use for each national forest in each alternative.

Table 18. Acres suitable for summer and winter use of motor vehicle routes by alternative for each national forest

National Forest	Summer Acres				
	Alternative A	Alternative B	Alternative C	Alternative D	Alternatives E and F
MAL	1,428,050	1,533,000	876,000	1,591,500	1,543,500
UMA	934,200	1,004,000	507,000	1,019,100	884,600
WAW	1,315,800	1,289,000	606,000	1,305,100	1,182,500
National Forest	**Winter Acres**				
	Alternative A	**Alternative B**	**Alternative C**	**Alternative D**	**Alternatives E and F**
MAL	1,575,500	1,534,000	1,094,800	1,616,700	1,563,100
UMA	1,061,700	1,005,000	650,300	1,096,300	990,800
WAW	1,369,200	1,300,000	703,800	1,331,500	1,227,100

Effects from Alternative B on Areas Suitable for Motor Vehicle Route Designation and Use and Areas Suitable Only for Nonmotorized Use

For this alternative, management areas would be allocated differently than in the 1990 forest plans. See the description of the alternatives in chapter 2. Due to the change in management area allocations, there would be a change in the number of acres suitable for motor vehicle use, both in summer and in winter.

Table 19. Change in acres suitable for summer motor vehicle use and summer nonmotorized use* for alternative B for each national forest

National Forest	Acres Suitable for Summer Motor Vehicle Routes	Change in Acres Suitable for Motor Vehicle Summer Routes (from existing condition)	Change in Acres Suitable for Nonmotorized Summer Use* (from existing condition)
MAL	1,533,000 (90%)	7% increase	39% decrease
UMA	1,004,000 (71%)	7% increase	14% decrease
WAW	1,289,000 (73%)	2% decrease	6% decrease

* Nonmotorized use areas where motor vehicle use would be prohibited.

Within the Malheur National Forest, there would be a slight increase in acres suitable for summer motor vehicle use and a large decrease in acres suitable only for summer nonmotorized use. This is due to most of MA 4C Old Forest in the 1990 forest plan being suitable only for nonmotorized use. MA 4C generally consists of small areas intermixed with MA 4A General Forest/Timber/Range. In this alternative, those small areas would be reallocated to MA 4A. See the section on “Old Forest” for more information. The change would be large relative to the management area allocations, but the overall change in acres would be relatively small. Since cross-country travel would be prohibited and current MA 4C areas are unroaded, the effect of changing this allocation from suitable only for nonmotorized use to suitable for motor vehicle use would be minimal.

Within the Umatilla National Forest, there would be a slight increase in area suitable for motor vehicle use in the summer due to the same reallocation of MA 4C to MA 4A discussed for the Malheur National Forest. The amount of area allocated to MA 3B Backcountry (limited motor vehicle use) would increase in this alternative due to additions from MA 4A.

Within the Wallowa-Whitman National Forest, there would be a very slight decrease in area suitable for summer motor vehicle use, which would be due to the addition of MA 1B Preliminary Administratively Recommended Wilderness Areas. The 11 percent decrease in area suitable only for summer nonmotorized use would be due to the reallocation of MA 4C to MA 4A.

Effects from Alternative C on Areas Suitable for Motor Vehicle Route Designation and Use and Areas Suitable Only for Nonmotorized Use

For this alternative, management area allocations would depart from those presented in the 1990 forest plans. The alternatives are described in chapter 2, and the tables displaying acres by management area are in appendix A. The change in management area allocations would result in a change in acres suitable for motor vehicle use, both in summer and in winter (table 20).

This alternative emphasizes increased suitability for nonmotorized uses and low open motor vehicle route density in areas suitable for motor vehicle use. Alternative C presents the largest increase in acres allocated to MA 3A Backcountry (nonmotorized use), from 76,000 acres in the

existing condition to 630,000 acres for all three national forests. This eight-fold increase would affect motor vehicle routes and trails in areas that were previously suitable for motor vehicle use. Over time, this would reduce the trails and roads suitable for motor vehicle use. This alternative would not allocate any area to MA 3B Backcountry (limited motor vehicle use). Similarly, alternative C allocates more acres to MA 3C Wildlife Corridors compared to alternatives E and F. Alternatives B and D do not assign any acreage to this management area. MA 3C areas are designed to provide wildlife corridors to connect habitat, and the desired condition for open route density in this management area would be 1 mile per square mile.

Table 20. Change in acres suitable for summer motor vehicle use and summer nonmotorized use* for alternative C for each national forest

National Forest	Acres Suitable for Summer Motor Vehicle Routes	Change in Acres Suitable for Motor Vehicle Summer Routes (from existing condition)	Change in Acres Suitable for Nonmotorized Summer Use* (from existing condition)
MAL	876,000 (52%)	38% decrease	203% increase
UMA	507,000 (36%)	46% decrease	94% increase
WAW	605,600 (35%)	54% decrease	162% increase

* Nonmotorized use areas where motor vehicle use would be prohibited.

Management areas that contribute to a reduction in acres suitable for motor vehicle use would also be unsuitable for winter motor vehicle use on both routes and trails and for cross country travel. MAs 1A, 1B, 1C, 2B, 2I, and 3A would not be suitable for winter motor vehicle use. MA 3C would be suitable for over-the-snow motor vehicle use only on groomed trails (cross-country travel would not be allowed). The groomed winter trail system in MA 3C would not be allowed to exceed the summer open motor vehicle route density, which would be 1 mile per square mile.

Effects from Alternative D on Areas Suitable for Motor Vehicle Route Designation and Use and Area Suitable Only for Nonmotorized Use

Alternative D emphasizes maintaining or expanding the current amount of acres suitable for motor vehicle. This alternative would not allocate any National Forest System lands to MA 1B Preliminary Administratively Recommended Wilderness Areas or MA 3A Backcountry (nonmotorized use).

Table 21. Change in acres suitable for summer motor vehicle use and summer nonmotorized use* for alternative D for each national forest

National Forest	Acres Suitable for Summer Motor Vehicle Routes	Change in Acres Suitable for Motor Vehicle Summer Routes (from existing condition)	Change in Acres Suitable for Nonmotorized Summer Use* (from existing condition)
MAL	1,591,500 (94%)	11% increase	60% decrease
UMA	1,019,100 (73%)	9% increase	17% decrease
WAW	1,305,100 (74%)	1% decrease	3% decrease

* Nonmotorized use areas where motor vehicle use would be prohibited.

For alternative D, only MAs 1A, 2B, and 2I would not be suitable for winter motor vehicle use. The intent of this alternative is to minimize effects to motor vehicle use. Therefore, only the

management areas where motor vehicle use would be prohibited by law or by research would be unsuitable for winter motor vehicle use.

Effects from Alternatives E and F on Areas Suitable for Motor Vehicle Route Designation and Use and Areas Suitable Only for Nonmotorized Use

Approximately 91,000 acres would be allocated to MA 1B Preliminary Administratively Recommended Wilderness Areas. This would contribute to the change in acres suitable for motor vehicle use displayed in table 20 and table 21. Alternatives E and F allocate less acres to MA 3C Wildlife Corridors compared to alternatives C. Alternatives B and D do not assign any acreage to this management area. MA 3C areas are designed to provide wildlife corridors to connect habitat, and the desired condition for open route density in this management area would be 1 mile per square mile.

Table 22. Change in acres suitable for summer motor vehicle use and summer nonmotorized use* for alternatives E and F for each national forest

National Forest	Acres Suitable for Summer Motor Vehicle Routes	Change in Acres Suitable for Motor Vehicle Summer Routes (from existing condition)	Change in Acres Suitable for Nonmotorized Summer Use* (from existing condition)
MAL	1,543,500 (91%)	8% increase	42% decrease
UMA	884,600 (63%)	5% decrease	12% increase
WAW	1,182,500 (67%)	10% decrease	30% increase

* Nonmotorized use areas where motor vehicle use would be prohibited.

For alternatives E and F, MAs 1A, 2B, 2I, and 3A would be unsuitable for motor vehicles. There would be a slight reduction in winter motor vehicle access for all national forests.

Area Suitable for Winter Over-the-snow Motor Vehicle Use (Alternatives B, C, D, E, and F)

Key Indicator

- National Forest System lands that would be suitable for motor vehicle route designation and use or suitable only for nonmotorized use (acres)
    - Change in area suitable for winter over-the-snow motor vehicle use

Effects Common to Alternatives B, C, D, E, and F

There would be no desired conditions, standards, or guidelines for over-the-snow travel. Management direction for over-the-snow travel is provided by Code of Federal Regulations and site specific project decisions.

Effects from Alternative B on Areas Suitable for Over-the-snow Motor Vehicle Use

All three national forests would have very slight changes in acres suitable for winter motor vehicle use in this alternative. MA 3A would be slightly larger for this alternative in some locations, which would restrict winter motor vehicle use. The percent of the national forests available for winter motor vehicle use would change only minimally from the existing condition. The changes are due to minor adjustments in management area allocations.

Table 23. Acres suitable for over-the-snow motor vehicle use for alternative B for each national forest

National Forest	MAs Suitable for Winter Motor Vehicle Use	Acres Suitable for Winter Motor Vehicle Use	Percent Change from Existing Condition
MAL	MAs 1B, 3B, 4A, 4B, and 5	1,534,000 (90%)	3% decrease
UMA		1,005,000 (72%)	5% increase
WAW		1,300,000 (74%)	5% decrease

Effects from Alternative C on Areas Suitable for Over-the-snow Motor Vehicle Use

All three national forests would have large changes in acres suitable for winter motor vehicle use in this alternative. All of the acres allocated to back country management area designation would be allocated to MA 3A which restricts winter motor vehicle use. Winter motor vehicle use would be suitable in MAs 4A and 5. In addition, MA 1B would be closed to over-the-snow motor vehicle use in this alternative, as show in the general suitability matrix in appendix A. This alternative would have the greatest change in the availability of snow play areas of all alternatives, in addition to potential effect to the groomed snowmobile routes that travel through MA 3C, as additional route restrictions may occur to meet route density standards in the summer. Future project level planning and decision making would be conducted to determine if any closed summer routes would also be closed in winter.

Table 24. Acres suitable for over-the-snow motor vehicle use for alternative C for each national forest

National Forest	MAs Suitable for Winter Motor Vehicle Use	Acres Suitable for Winter Motor Vehicle Use	Percent Change from Existing Condition
MAL	MAs 4A, 4B, 4C, and 5	1,094,800 (64%)	-30%
UMA		650,300 (46%)	-39%
WAW		703,800 (40%)	-49%

Effects from Alternative D on Areas Suitable for Over-the-snow Motor Vehicle Use

For alternative D, only slight changes in acres suitable for winter motor vehicle use would occur, which would include increases in the total acres for the Umatilla and Malheur National Forests. There would be no allocations to MA 3A where winter motor vehicle use would be restricted for the other alternatives. In addition, there would be no allocations to MA 1B. Winter motor vehicle use would be suitable in MAs 3B, 4A, 4B, and 5.

Table 25. Acres suitable for over-the-snow motor vehicle use for alternative D for each national forest

National Forest	MAs Suitable for Winter Motor Vehicle Use	Acres Suitable for Winter Motor Vehicle Use	Percent Change from Existing Condition
MAL	MAs 3B, 4A, 4B, and 5	1,616,700 (95%)	+3%
UMA		1,096,300 (78%)	+3%
WAW		1,331,500 (76%)	-3%

Effects from Alternative E and F on Areas Suitable for Over-the-snow Motor Vehicle Use

All three national forests would have slight changes in acres suitable for winter motor vehicle use in this alternative. MA 3A would be slightly in this alternative in some locations, which would restrict winter motor vehicle use. Winter motor vehicle use would be suitable in MAs 1B, 3B, 4A, 4B, and 5, much like alternative B. Over-the-snow motor vehicle would still be allowed in MA 1B, as displayed in the suitability table in appendix A.

Table 26. Change in acres suitable for winter motor vehicle use by national forest for alternatives E and F for each national forest

National Forest	MAs Suitable for Winter Motor Vehicle Use	Acres Suitable for Winter Motor Vehicle Use	Percent Change from Existing Condition
MAL	MAs 1B, 3B,4A,4B, and 5	1,563,100 (92%)	-1%
UMA		990,800 (71%)	-7%
WAW		1,227,100 (70%)	-10%

Cumulative Effects – Access

Implementation of all alternatives, except for alternative A for the Umatilla National Forest, would affect access over time. In every other alternative, open motor vehicle route density would exceed desired conditions, which makes it likely that site-specific project level decisions would result in road closure or decommissioning as the Forest Service attempts to achieve or move toward the desired conditions.

Proposed open route densities for all alternatives are meant to be an upper limit, and all alternatives have many areas that would have open routes at a level that is far below the proposed upper limits. It is not the intent of the plan to increase open route density to that upper limit. Rather, in areas that currently have open route density above the level proposed by desired conditions, it is expected that open routes would be closed as project level decisions are made and implemented throughout the plan period. All alternatives, except alternative A for the Umatilla National Forest, propose management direction that would result in the closure or decommissioning of open motor vehicle routes in order to meet desired conditions. Minimal new road construction would occur for all alternatives.

Road reconstruction would emphasize user safety and prevention or correction of resource impacts. If maintenance funding decreases, roads determined to be unsafe and of low priority for maintenance would likely have to be closed, and the trend of reductions in road maintenance funds is likely to continue. Current trail maintenance levels would continue.

The cumulative effects analysis area for access is defined by the county boundaries for the counties within the planning area, which are Baker, Grant, Harney, Morrow, Umatilla, Union, Wallowa, and Wheeler counties in Oregon and Asotin, Columbia, and Garfield counties in Washington. This cumulative effects area is used because local communities and visitors to the area are generally looking for a type of motor vehicle or nonmotorized use that can occur on public or private lands, but normally would not occur outside of the county boundary.

Within the cumulative effects area, National Forest System lands, Bureau of Land Management lands, state lands, industrial timber lands, and other private lands are available for public access. The trend on these lands has been for more restrictions on motor vehicle uses. The Baker Field Office for the Bureau of Land Management released a Draft Resource Management Plan (USDI 2011) that describes the existing condition to be an array of roads that are currently open, and

much of the surrounding lands are open for cross-country motor vehicle travel. The draft plan states that a travel management plan to designate open routes would be completed within five years of signing the record of decision for the Final Resource Management Plan. However, the draft plan does propose interim direction to designate areas as open to cross country motor vehicle travel, limited to existing routes and trails, or closed to cross country motor vehicle travel. Alternative E designates only one existing off-highway vehicle area as open to cross country motorized travel, identifies several areas closed to cross-country motor vehicle travel, and designates the remaining areas as limited to existing roads and trails. Analyses of the management situation for other BLM lands within the analysis area associated with the southeast Oregon area and the John Day River Basin have identified a need to address unrestricted motor vehicle use. Completion of resource management plans and travel management plans for these areas will likely lead to future reductions of motor vehicle use opportunities.

On state, industrial timber lands, and other private lands, the trend for motor vehicle use is not evident because it is specific to the managing state agency, timber land owner, or private owner.

The cumulative effect of reduced motor vehicle access on Bureau of Land Management lands in conjunction with the action alternatives proposed for this DEIS is to intensify the adverse effect experienced by those who desire more motor vehicle access and intensify the beneficial effect experienced by those who desire less motor vehicle access. The opportunity to displace motor vehicle access from the national forests to other jurisdictions or ownerships would not be available under expected trends.

Issue 2: Economic and Social Well-being

Introduction and Purpose

Forest plan decisions create the framework for the range of uses, and products and services provided by the Blue Mountains national forests that contribute to the economic and social well-being of local communities, counties, and tribes. Forest products and services support the maintenance of local business infrastructure. The infrastructure, in turn, plays a critical role supporting and enhancing the Forest Service's capacity to conduct management activities. People are a part of the ecosystem and are essential to the vitality and resiliency of the ecosystem. They are the stewards, producers, distributors, and users whose actions and activities shape Forest Service policy and management.

This section provides existing condition and trend data for the key indicators related to the social and economic environment. The data provide a backdrop to facilitate evaluating and understanding how the alternatives address social and economic issues. These issues may be affected by management actions that would be guided by the forest plan alternatives. The issues also influence the design of the alternatives.

Relationships, Social and Economic Well-being, and Resilience

Changes in national forest management can affect traditions, lifestyles, and the economic livelihood of residents and communities. Those who depend on the national forests for their livelihoods and recreational pursuits are concerned that their relationship with the national forests may be compromised by other uses and restrictions. Forest Service managers depend on their relationships with local communities, people, and their institutions to help manage the national forests by providing a skilled workforce, labor, manufacturing infrastructure, business support, and other services cost effectively. All of these relationships are important to sustaining and

restoring the ecological integrity of the national forests as well as the social and economic conditions of the communities.

Factors that appear to help make communities resilient to economic and social change include population size and rates of change; economic, social, and cultural diversity; amenity settings; and quality of life. Communities with larger populations tend to have a broader array of industries and a higher number of businesses that function in each industry. More diversified economies do not depend heavily on any single industry or firm. When industries decline and jobs are lost, communities with greater economic diversity are better able to absorb the losses. Forest Service land use decisions often have few economic impacts on communities with large populations and diverse economies.

In contrast, communities with small populations usually have fewer industries and fewer businesses within those industries. A decline in one industry or loss of a business, especially a major employer, can result in job losses that affect many aspects of community life. Job losses can be especially disruptive if the community is geographically isolated with few alternative employment opportunities.

The three Blue Mountains national forests, though similar ecologically, exhibit sharp contrasts in community resiliency, and the communities may be affected differently by changes in national forest management. The following sections describe some of the social and economic characteristics that distinguish the areas affected by the three national forests.

Affected Environment – Economic and Social Well-being

This section describes the existing conditions as they relate to the social and economic components of the areas that may be affected by the plan revision for the Malheur, Umatilla, and Wallowa-Whitman National Forests. The following discussion identifies the economic and social systems in place within the communities surrounding the three national forests and the people using and valuing the natural resources and opportunities the national forests provide.

Population and Demographics

Population structural characteristics, such as size, composition, density, age, race, and ethnicity, along with population dynamics showing how the structure changes over time, are useful to describe the potential need for different types and amounts of national forest uses. The characteristics can be helpful to focus the potential effects and consequences of proposed activities on the social environment.

Increases in population can result in increased demands on existing uses and services, such as demands for additional access and recreation opportunities. When the population increase is primarily through in-migration, it can result in desires for a different mix of management activities and uses resulting in potential incompatibilities between people with differing values. An increase in users can result in conflicts even among people with similar values where crowding occurs.

Population Size, Growth, and Density

One of the important variables describing the resiliency of a community is the size of the population and the positive or negative rate the population is changing. Population trends show how the overall numbers of residents have varied in the past and indicate what the population level may be in the future. These numbers help to show whether there is the potential for a change

in demands for uses and products and services. Population change may lead to conflicts about the types of national forest uses, travel management, recreation activities, and opinions about the appropriateness of resource management activities.

The population size, growth, and density in each of the socio-economic impact zones for the three national forests are markedly different. With a density of about one person per square mile (Census 2000), the population within the Malheur socio-economic impact zone is small compared to the other socio-economic impact zones. The Oregon statewide density was 15 people per square mile (Census 2000). In addition, the population in Grant and Harney counties has declined between 2000 and 2009 (table 27) by 13 percent, or almost 2,000 residents (Census 2010).

Table 27. Population change 2000-09 by county in the Malheur socio-economic impact zone

County	Change in Population
Grant	-14% (-1,108)
Harney	-11% (-873)
Total Change	-13% (-1,981)

In the Umatilla socio-economic impact zone, the population overall has increased by 8,240, or about three percent (table 28). The change at the individual county level is more complex. Three counties within the socio-economic impact zone, Grant, Wheeler, and Garfield, lost more than 10 percent of their population and Wallowa County declined by five percent. Most of the population gain between 2000 and 2009 was in Umatilla County in Oregon, Nez Perce County in Idaho, and Walla Walla County in Washington. The decadal growth increases were generally five percent or less, except for Walla Walla County, which grew by seven percent. Although the Umatilla socio-economic impact zone grew the most, the overall growth was much less than the Oregon statewide growth during the same time period (15 percent). The Umatilla socio-economic impact zone is the most densely populated with about 11 people per square mile, four less than the Oregon statewide average. Nez Perce and Walla Walla counties have the highest population densities in the socio-economic impact zone with about 44 people per square mile, and Wheeler County has the lowest density with less than one person per square mile.

The Wallowa-Whitman socio-economic impact zone decreased overall by one percent between 2000 and 2009, or slightly less than 500 people (table 29). Both Baker and Wallowa counties decreased by four and five percent respectively, and Union County increased by two percent. The population density of this socio-economic impact zone is six people per square mile (Census 2010).

The population density data for all three socio-economic impact zones are lower than the density for Oregon. The low density rates emphasize the rural nature, especially of the Malheur and Wallowa-Whitman socio-economic impact zones, compared to the Oregon state average. Residents living in all socio-economic impact zones value the open space, personal independence, rural lifestyle, and the minimal crowding offered by a low population density. With the low population growth exhibited during the last decade, these conditions and values are likely to persist.

Table 28. Population change 2000-09 by county in the Umatilla socio-economic impact zone

County	Change in Population
Grant	-14% (-1,108)
Morrow	5% (+509)
Umatilla	4% (+2,647)
Union	2% (+494)
Wallowa	-5% (-326)
Wheeler	-12% (-180)
Nez Perce	5% (+1,814)
Asotin	4% (+877)
Columbia	-1% (-31)
Garfield	-12% (-288)
Walla Walla	7% (+3,832)
Total Change	3% (+8,240)

Table 29. Population change 2000-09 by county in the Wallowa-Whitman socio-economic impact zone

County	Change in Population
Baker	-4% (-635)
Union	2% (+494)
Wallowa	-5% (-326)
Total Change	-1% (-467)

Age

In the United States, the aging of the population may result in impacts to the national forests, especially travel and access. The impact of retirement-aged people on communities can be complex, but can include bringing in additional sources of income, and opinions about and the desire for different types of recreational activities and access needs.

Between 2000 and 2009, the median age in the Malheur socio-economic impact zone increased from about 41 to 48 years old. This change in median age is reflected in the declines within the portion of the population that are less than 65 years old and the increase of people that are 65 years old and older. In 2000, the less than 18 years old group comprised 26 percent of the total population. Ten years later, this portion of the population comprised 21 percent. Conversely, those people 65 years and older increased from 16 percent to 21 percent of the population. This change was in part due to an increase in people in this age class but also because the other classes decreased. Although the working years class (18 through 64 years old) declined, the portion of the total population remained constant at 58 percent of the total (Census 2010).

The age data in the Umatilla socio-economic impact zone portray a different picture than that found within the Malheur socio-economic impact zone. While the Umatilla socio-economic impact zone is aging, the rate of change is less. The median age increased from 37 to 40 years old but remains substantially younger compared to the Malheur socio-economic impact zone. The less than 18 years old group decreased by five percent, and its overall portion of the total decreased from 26 percent to 24 percent. The working ages class (18 through 64 years old) increased by five percent and continued to make up about 60 percent of the total population.

Those 65 years old and older increased by 12 percent, and now make up 16 percent of the total population, one percent more than in 2000 (Census 2010).

The Wallowa-Whitman socio-economic impact zone has also aged. The median age in 2009 was about 44 years old compared to 41 in 2000. The working age class (18 through 64 years old) remained unchanged between 2000 and 2009, and continues to make up about 59 percent of the total population. The less than 18 years old group decreased by 13 percent, and they now make up 21 percent of the population compared to almost 24 percent in 2000. The 65 years old and older group increased by 13 percent and now make up 19 percent of the total population compared to 17 percent in 2000 (Census 2010).

Gender, Race, and Ethnicity

Annual data estimates for the number of people in the Malheur and Umatilla socio-economic impact zones during 2000 through 2009 show that the male and female components of the population are evenly split. The Wallowa-Whitman socio-economic impact zone is split fairly even with 49 percent of the population male and 51 percent female. At about age 75, women make up more than 55 percent of the population (Census 2010).

Race and ethnic diversity is increasing gradually in the three socio-economic impact zones. From 2000 to 2009, the white, not Hispanic or Latino population for the Malheur socio-economic impact zone decreased from 92 to 90 percent of the total population, or a decrease of about 2,100 people. The white, not Hispanic or Latino population was the only component of the population that decreased. The rest of the race and ethnic components remained the same or increased. The largest components of the minority population include American Indian, two or more races, and Hispanics of any race (Census 2010).

In the Umatilla socio-economic impact zone, the white, not Hispanic or Latino population decreased by about 1,900 people between 2000 and 2009, decreasing from 84 to 81 percent of the total population. Hispanic or Latino of any race increased by 7,500 people, and the two or more races category increased by about 1,000 people. The remaining races increased by 190 to 740 people (Census 2010).

Within the Wallowa-Whitman socio-economic impact zone, the pattern continued, as the white not Hispanic or Latino population decreased by about 1,600 between 2000 and 2009. From 94 to 93 percent of the total population. The Hispanic or Latino of any race category population increased by about 540 people, and the two or more race population increased by about 240 people. The remaining race category populations all increased, as well (Census 2010).

The three socio-economic impact zones in the plan revision area are becoming more diverse with the in-migration of minorities and Hispanics or Latinos, and, because of the out migration of white, not Hispanic or Latino people. The increase in diversity is important because new and potentially different views on natural resource management activities may be present, and desired uses and services, such as recreational activities and special forest products, may change.

Evaluating the minority components of the population is also important because Executive Order 12898 requires all Federal agencies to analyze the potential for their actions to disproportionately affect minority and low-income populations. The Council on Environmental Quality issued supplemental guidance and provided the following criteria for identifying potential environmental justice populations:

> Minority population: Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis…
>
> Low-income population: Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.

The minority and ethnic populations of the three socio-economic impact zones are compared with the state of Oregon in table 30. The state is used as an appropriate unit of geographic analysis to represent a general population. Based on this comparison, Hispanics of any race in the Umatilla socio-economic impact zone make up a larger portion of the population than statewide. American Indians and Alaska Natives make up a larger portion of the population in both the Umatilla and Malheur socio-economic impact zones than statewide.

Table 30. Race and ethnicity comparisons for Oregon and the socio-economic impact zones, 2009

		Socio-economic Impact Zone		
Race or Ethnicity	**Oregon**	**Malheur**	**Umatilla**	**Wallowa-Whitman**
Hispanic or Latino	11%	4%	13%	3.5%
Two or more races	3%	2.5%	2%	2%
Native Hawaiian and other Pacific islander	< 1%	< 1%	< 1%	< 1%
Asian	4%	< 1%	< 1%	< 1%
Native American and Alaska native	2%	4%	3%	1%
Black or African-American	2.5%	< 1%	< 1%	< 1%

Poverty Rates

Overall poverty in the three socio-economic impact zones exceeds that found statewide in Oregon with the gap dramatically widening in 2009 for the Malheur and Wallowa-Whitman socio-economic impact zones. Poverty does not occur equally across all races and ethnic groups and is generally higher among minorities and Hispanics or Latinos.

In order to analyze poverty by race and ethnicity, 2000 census data are evaluated. At that time, the white, not Hispanic or Latino population had poverty rates of 10 percent for Oregon and 12 to 14 percent for the three socio-economic impact zones (see table 31). Poverty rates for Native Americans and Alaskan Natives, Hispanics or Latinos, and all other minority populations are about twice that of the white, not Hispanic or Latino population. The Native American and Hispanic categories are identified separately because these categories are proportionately larger than they are for Oregon. The high poverty rates show that environmental justice impacts may be an important consideration, even for the white, not Hispanic or Latino population in the evaluation of alternatives and decision making.

Table 31. Poverty in Oregon and the socio-economic impact zones by race and ethnicity, 2000 (Census 2000)

Population	Oregon	Socio-economic Impact Zone		
		Malheur	Umatilla	Wallowa-Whitman
White, not Hispanic or Latino	10%	12%	12%	14%
Native American, Alaska native	22%	34%	23%	29%
Hispanic or Latino	25%	22%	26%	26%
All other minorities	21%	20%	25%	23%

Education

Another important measure of socio-economic resiliency is educational attainment. The number of people with a high school diploma or bachelor's degree can indicate the ability of an area to adapt to change. Table 32 identifies the portions of the adult population in Oregon and the three socio-economic impact zones in these two categories.

The percentage of adults with at least a high school diploma in Oregon exceeds all three socio-economic impact zones by one to three percentage points. The gap between the state and the three socio-economic impact zones is much greater with respect to higher education, especially for the Malheur socio-economic impact zone, where there is an 11 percent difference. Education is an important component of human capital that can increase the capability of a community to adapt to complex issues associated with social and economic change.

Table 32. Educational attainment in Oregon and the socio-economic impact zones, 2000 (Census 2000)

State/Socio-economic Impact Zone	Percent of Population 25 Years and Older	
	High School Graduate or Higher	Bachelor's Degree or Higher
Oregon	85%	25%
Malheur	83%	14%
Umatilla	82%	19%
Wallowa-Whitman	84%	20%

Per Capita Income and Income Sources

Per capita income is an indicator of the socio-economic well-being of an area. It measures total annual income from all sources divided by the population. It shows the relative capability of the population to consume goods and services and potentially save for the future. Per capita income increased across Oregon and the three socio-economic impact zones comparing 2008 with 1999. However, the Malheur socio-economic impact zone has decreased from the high of 2003. Per capita income in 2008 for the Malheur and Wallowa-Whitman socio-economic impact zones was about 20 percent less than the statewide figure, which includes the major metropolitan areas. The per capita income for the nonmetropolitan counties of Oregon was similar to the per capita income in the three socio-economic impact zones (U.S. Department of Commerce 2010).

Comparing 1999 with 2008, all of the socio-economic impact zones increased in per capita income more than the statewide increase in Oregon of nine percent. The Umatilla socio-economic impact zone had the greatest increase (15 percent), while the Malheur socio-economic impact

zone increased the least (10 percent). The increase in per capita income provides an incomplete picture of socio-economic well-being. An evaluation of the components of income showing the drivers of the change in per capita income can provide a more comprehensive picture of the emerging trends.

The components of income include wages (labor and proprietor income), dividends, interest and rent (investment income), and transfer payments (retirement, unemployment, Medicare, etc.). Within the Malheur socio-economic impact zone, wage earnings, dividends and interest, and rent declined to offset the increase in transfer payments. Total income was less in 2009 than in 1999. Per capita income increased in the Malheur socio-economic impact zone because the population loss was greater than the income loss. Wage earnings decreased from 55 to 50 percent of total income, and transfer payments increased from 20 to 28 percent of total income (U.S. Department of Commerce 2010).

Data for the components of income in the Umatilla socio-economic impact zone show a different picture. Each of the income components increased between 1999 and 2008. Wage income in 1999 comprised 61 percent of total income and decreased one percent by 2008. Transfer payments increased the most with a 41 percent gain so that it comprised 22 percent of total income in 2008, a four percent increase compared to 1999 (U.S. Department of Commerce 2010).

In the Wallowa-Whitman socio-economic impact zone during the period, wages increased by eight percent and transfer payments increased by 39 percent. These two components offset the two percent decrease in investment income so that overall income increased by 12 percent. The wage earnings portion of total income decreased two percent during the decade to 53 percent of total income). The transfer payments portion of total income increased by five percent (U.S. Department of Commerce 2010).

Urban-rural Distribution

The U.S. Census Bureau classifies population as being urban or rural. Urban populations live in urban areas that have at least 50,000 residents or in urban places with 2,500 residents outside of urban areas. The urban-rural distinction is important because people classified as urban generally have better access to work opportunities, goods and services, and other amenities associated with more densely populated areas. All of the socio-economic impact zones have proportionately more of their residents living in rural areas than Oregon overall. The Malheur socio-economic impact zone has more than 70 percent of its population classified as rural, compared to just greater than 20 percent for the state. Slightly more than one-half of the Wallowa-Whitman socio-economic impact zone residents are rural, and 25 percent of the Umatilla socio-economic residents are rural (Census 2010).

Employment and Income by Industry

Examining employment and income data by industry provides an indication about the relative importance of industries in the socio-economic impact zones and how those industries have changed between 2001 and 2009. A comparison of employment and income can reveal which types of jobs are high paying.

National forest management activities and the production of goods and services affect and influence several businesses within the industry sectors. Recreation expenditures contribute directly to lodging and restaurants under accommodation and food services as well as retail trade; timber production contributes directly to logging in agriculture and forestry as well as manufacturing; forage production contributes directly to ranching in the agriculture industry; and

agency budgets contribute directly to a number of different businesses in addition to directly providing employment opportunities. These businesses in turn are important to accomplishing the Forest Service mission to sustain and restore the ecological integrity of the national forests as well as provide uses and goods and services to the public.

The job and income information presented here is from IMPLAN model data primarily based on the U.S. Census County Business Patterns, Bureau of Labor Statistics Covered Employment and Wages Program, and Bureau of Economic Analysis Regional Economic Information System. The data are organized by industry or industry group using the North American Industrial Classification System (NAICS). NAICS is the standard used by Federal agencies for classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. The employment data includes both full- and part-time jobs, and the income data includes wages and proprietor income. Estimates for the self-employed are included, which is important in the logging industry. Income data for 2001 is converted to 2009 dollars using gross domestic product price deflators.

The Malheur socio-economic impact zone employment picture is changing (see figure 2, next page). In 2001, the agriculture, forestry, fishing, and hunting sector provided the most full- and part-time jobs followed closely by the government sector, with each providing more than 2,000 jobs. The agriculture, forestry, fishing, and hunting sectors include jobs related to commercial hunting and fishing. Jobs related to recreational hunting and fishing are accounted for in several sectors. State and local employment comprised about 78 percent of all government jobs in 2009. The services sectors and retail trade also provided a large amount of employment. By 2009, employment decreased in all sectors except government and health and social services, with the largest declines occurring in agriculture, retail trade, and other services. About one-third of the job loss in the agriculture, forestry, fishing and hunting sector was associated with declines in logging industry.

Income by industry for the Malheur socio-economic impact zone shows the dominance of the government sector (see figure 3, next page). About 50 percent of all labor income occurs in the government sector. There were general declines in income for most sectors similar to the declines in employment. However, there was an increase in health and social services, finance and retail trade, and the decline in agriculture was not as great as the decrease in employment.

Employment within the Umatilla socio-economic impact zone is not dominated by one or two sectors (see figure 4 on page 91). Employment is more evenly spread across several sectors providing less dependence on a single industry.

Similar to the Malheur socio-economic impact zone, there were declines in employment for most sectors and increases in government and health and social services. Government makes up less than 20 percent of all employment. State and local employment comprised about 92 percent of all government jobs in 2009.

Although income by industry for the Umatilla socio-economic impact zone shows the dominance of the government sector with more than 25 percent of all labor income, the rest of the income is distributed fairly evenly across several sectors (see figure 5 on page 91). Unlike the Malheur socio-economic impact zone, there were general increases in income for most sectors. Declines were notable in the construction and manufacturing sectors.

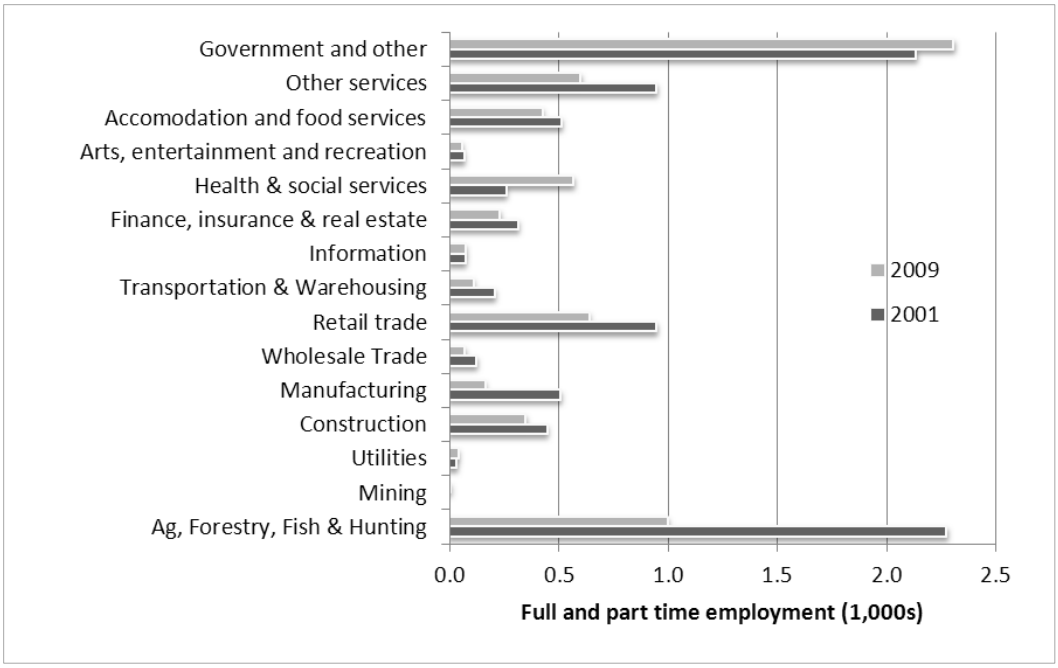

Figure 2. Employment by industry for the Malheur socio-economic impact zone for 2001 and 2009 (Source: Minnesota Implan Group 2001 and 2009)

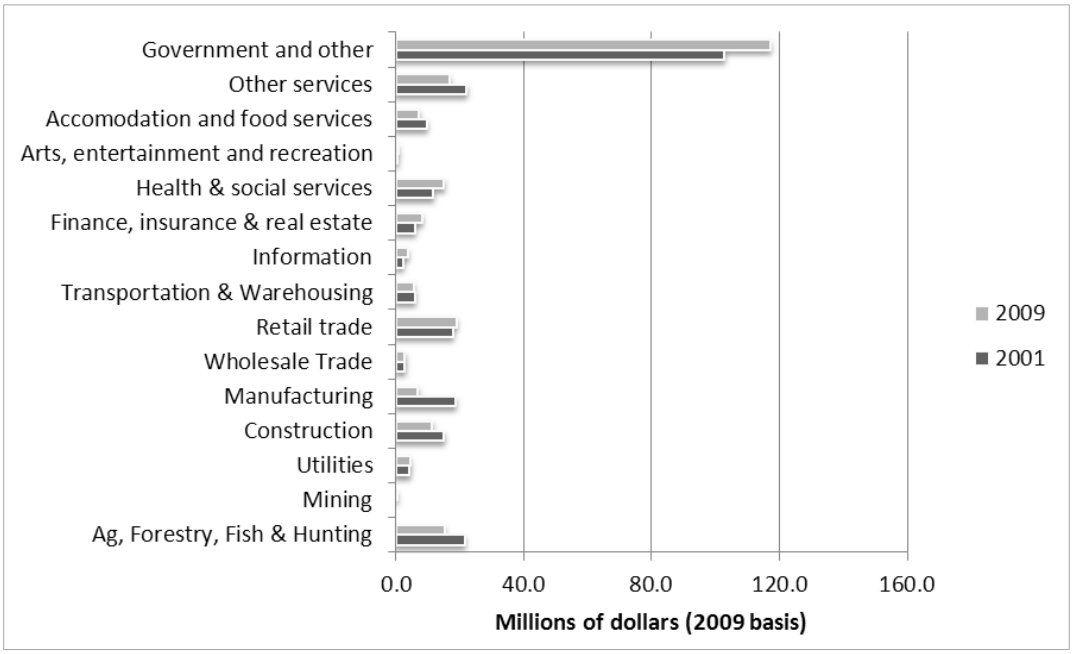

Figure 3. Total wage and proprietor income by industry for the Malheur socio-economic impact zone for 2001 and 2009 (Source: Minnesota Implan Group 2001 and 2009)

The distribution of employment within the Wallowa-Whitman socio-economic impact zone is similar to the Umatilla socio-economic impact zone in that it is more evenly spread across several sectors providing less dependence on a single industry (see figure 6 on page 92). Similar to the Malheur socio-economic impact zone, there were declines in employment for most sectors. However, in this socio-economic impact zone, government employment did not increase. The

most prominent increase was in health and social services. The government sector contributes slightly less than 20 percent of all employment. State and local employment comprised about 87 percent of all government jobs in 2009.

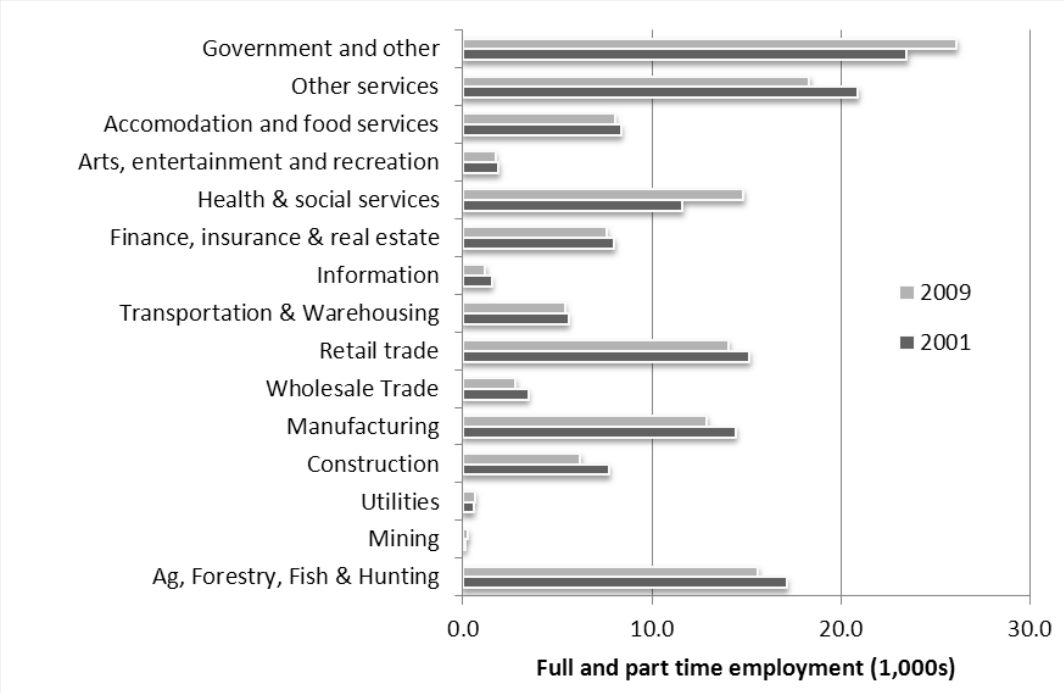

Figure 4. Employment by industry for the Umatilla socio-economic impact zone for 2001 and 2009 (Source: Minnesota Implan Group 2001 and 2009)

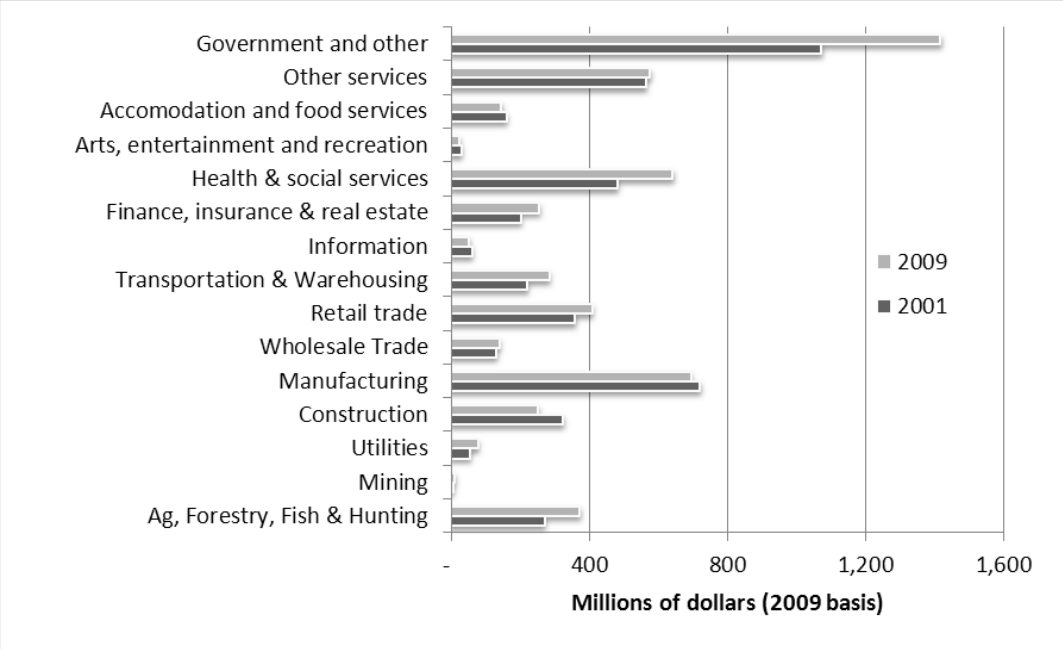

Figure 5. Total wage and proprietor income by industry for the Umatilla socio-economic impact zone for 2001 and 2009 (Source: Minnesota Implan Group 2001 and 2009)

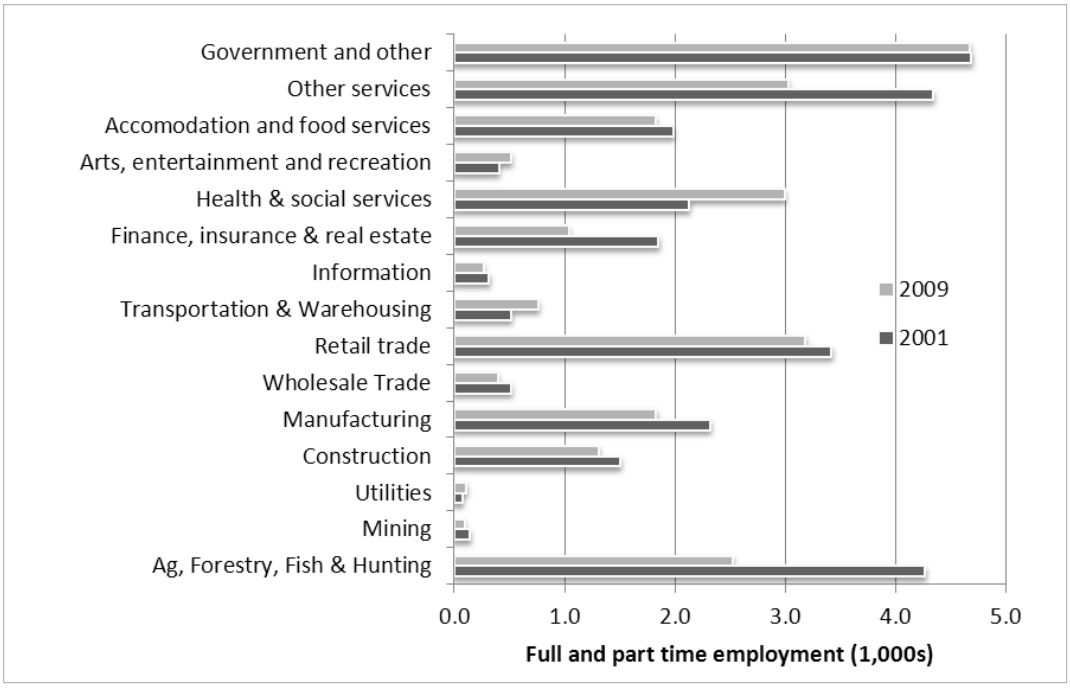

Figure 6. Employment by industry for the Wallowa-Whitman socio-economic impact zone for 2001 and 2009 (Source: Minnesota Implan Group 2001 and 2009)

There is a mix of increases and decreases with regards to the income by industry within the Wallowa-Whitman socio-economic impact zone. Government, health and social services, transportation and warehousing, and retail trade show sizeable increases in income (figure 7).

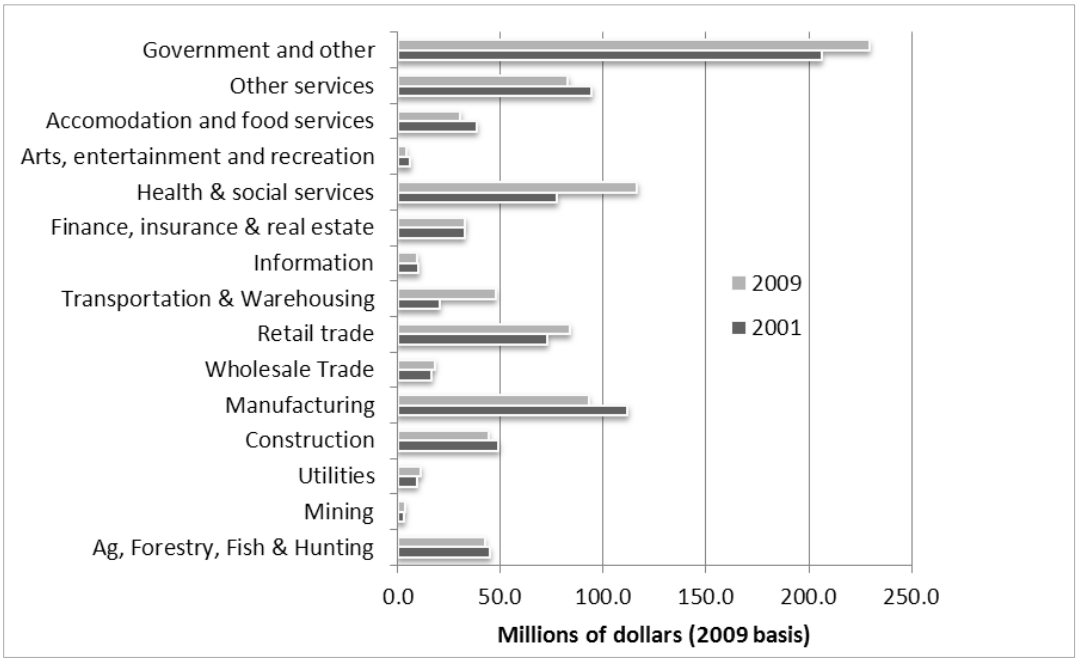

Figure 7. Total wage and proprietor income by industry for the Wallowa-Whitman socio-economic impact zone for 2001 and 2009 (Source: Minnesota Implan Group 2001 and 2009)

The dominance of the government sector is similar to the Umatilla socio-economic impact zone with more than 25 percent of all labor income. The rest of the income is distributed fairly evenly across several sectors. Declines were notable in the construction, manufacturing, accommodations and food services, and other services sectors.

Economic Diversity

A diverse economy with varied employment opportunities can better withstand economic change. Specialized economies with dependence on a few industries for employment and income are less resilient to local changes and national fluctuations. A Shannon-Weaver diversity index is used to indicate the degree of economic specialization (Minnesota Implan Group 2009). The index ranges from zero, the most specialized, to one, the most diverse. Table 33 displays the diversity index of the three socio-economic impact zones and Oregon. The state's index is highest since it represents a diverse, statewide economy. The Malheur socio-economic impact zone has the lowest diversity index and may be the least resilient.

Table 33. Economic diversity in Oregon and the socio-economic impact zones, 2009

Geographic Area	Diversity Index
Oregon	0.75
Malheur	0.58
Umatilla	0.71
Wallowa-Whitman	0.69

Source: Minnesota Implan Group 2009

Unemployment

Unemployment data for 2001 through 2010 are presented in table 34 for Oregon and the socio-economic impact zones; the figures are approximate. The data are annual rates and are not seasonally adjusted. Across the decade, the Umatilla socio-economic impact zone has fared the best with an unemployment rate equal to or less than the statewide rate. Unemployment within the Malheur socio-economic impact zone was always two to four percent greater than the state average, and the Wallowa-Whitman socio-economic impact zone was generally the same as or slightly higher than the state average.

Table 34. Annual unemployment figures for Oregon statewide and the socio-economic impact zones for 2000-2010

Year	Oregon	Socio-economic Impact Zone		
		Malheur	Umatilla	Wallowa-Whitman
2001	6.5%	11%	6.5%	7.5%
2002	7.5%	9.5%	7%	7.5%
2003	8%	10.5%	7.5%	8%
2004	7.5%	9.5%	7%	8%
2005	6.5%	9.5%	6.5%	7%
2006	5.5%	8.5%	5.5%	6%
2007	5%	8%	5%	5.5%
2008	6.5%	10%	6%	7.5%
2009	11%	15%	9%	11%
2010	10.5%	14.5%	9%	10.5%

Source: U.S. Bureau of Labor Statistics

Human Uses and Values

The Blue Mountains national forests currently contribute to the area's economy and social conditions in a variety of ways that include the supply of products, services, and uses. These activities support direct, indirect, and induced jobs and income and generate tax revenue in the socio-economic impact zones. Not all resource outputs and purchases result in local economic activity. For example, logs harvested from one national forest may be sent to sawmills outside of its socio-economic impact zone. Similarly, a national forest may purchase goods and services from business from outside the socio-economic impact zone, such as restoration work contracted by non-local businesses or helicopter logging services. These activities do not contribute to local employment and income.

The following sections discuss the economic impacts related to recreation, range and timber uses, Forest Service expenditures, and revenue sharing and payments to counties. Not covered are minerals and non-timber forest products. Mineral production affects very few people and businesses. Non-timber forest products use and production data are limited and are not in a format useful for economic impact analysis.

Recreation (Dispersed, Developed, and Wildlife Related)

Visitors to the Blue Mountains national forests have the opportunity to participate in a variety of activities in developed and dispersed settings. These activities include hiking, camping, and driving for pleasure as well as wildlife and fish use, such as hunting, fishing, and wildlife viewing. Recreation activities contribute to social and economic well-being in the socio-economic impact zones. In addition to economic benefits, recreation opportunities within the national forests enhance the quality of life for nearby residents.

Survey data for Forest Service related recreation were collected and analyzed for the National Visitor Use Monitoring (NVUM) system. Data for the first survey were collected between 2000 and 2003. The second round of NVUM data were collected for the three national forests in 2009. The scientists conducting the NVUM survey state that comparisons of the first and second round results are not appropriate due to changes in the study protocols. Only round 2 results are presented in table 35.

Table 35. Total national forest site visits for 2009

National Forest	Number of Visits
Malheur	261,400
Umatilla	379,800
Wallowa-Whitman	447,400

USDA Forest Service National Visitor Use Monitoring (NVUM) 2009

Economic effects are based on expenditures for goods and services associated with recreation, including shopping at convenience stores or purchasing gasoline, food, lodging, outfitter guides, and sporting goods to name a few. The process used estimated visitor expenditures and is based on the procedures identified in the "Spending Profiles of National Forest Visitors, NVUM Round 2 Update" (White and Stynes. 2010). The visits are divided into six market segments to identify key differences in spending patterns of visitors (see table 36). The differences are local versus non-local visitors to identify dollars that are being brought into the socio-economic impact zones and overnight stays within the national forest versus overnight stays outside the national forest. The classifications are important because recreation expenditures and their effects on local

economies are different. Trip expenditures by local day visitors are much less than expenditures by non-local visitors staying overnight. Day use visitors do not require lodging and typically spend less on other goods and services. Two additional market segments, downhill skiing day and downhill skiing overnight, are also considered to recognize the expense of lift tickets.

Table 36. Market segments of national forest visitors for 2009

Market Segment	National Forest		
	MAL	UMA	WAW
Non-local day	13,072	73,163	59,465
Non-local overnight within the national forest	120,260	44,888	84,949
Non-local overnight outside of the national forest	13,072	7,595	63,712
Local day	75,816	44,888	55,217
Local overnight within the national forest	10,457	20,717	12,742
Local overnight outside of the national forest	0	7,250	12,742
Non-primary	28,758	25,549	135,919

The Forest Service also bridged the recreational expenditures to IMPLAN model sectors so the economic effects of recreational uses can be estimated. These expenditure profiles are developed for each of the six market segments and downhill skiing. The IMPLAN model expenditure profiles are combined with the recreation use by market segment to estimate the direct, indirect and induced employment, income and tax effects (see table 37).

Table 37. Recreation, wildlife, and fish economic impacts by national forests and their socio-economic impact zones (dollar estimates are in 2010 dollars)

Impact	National Forest/Socio-economic Impact Zone		
	Malheur	Umatilla	Wallowa-Whitman
Non-local recreation use			
Jobs	88	95	251
Income	$1,721,000	$2,199,000	$4,659,000
State and local tax	$503,000	$527,000	$1,309,000
Federal tax	$462,000	$563,000	$1,325,000
Non-local wildlife recreation use			
Jobs	116	22	70
Income	$2,292,000	$573,000	$1,412,000
State and local tax	$687,000	$146,000	$406,000
Federal tax	$615,000	$146,000	$400,000
Local recreation use			
Jobs	13	55	57
Income	$256,000	$1,349,000	$1,149,000
Local wildlife recreation use			
Jobs	16	15	20
Income	$321,000	$405,000	$458,000

Rangeland and Grazing

Livestock grazing within the Blue Mountains national forests is an important use to the local ranching industry. Grazing on public lands contributes directly to livestock forage needs. In 2009, the counties in the Oregon portion of the plan revision area had about 40 percent of the total cattle inventory of the state (USDA National Agriculture Statistics Service). Grazing on National Forest System lands (see table 38) directly provided about three percent of the forage needs of the local cattle inventory. The total contribution of grazing on National Forest System lands is likely understated since it affords ranchers the opportunity to grow forage on other ranch lands for feed.

Livestock grazing is measured in head months (HMs) and animal unit months (AUMs) for permitted use and authorized use. One AUM is the amount of forage a 1,000-pound mature cow and a calf consume in a 30-day period, which is about 780 pounds of dry weight. A head month is a month's use and occupancy of range by one adult (including weaned) animal, except for sheep or goats. Five sheep or goats, weaned or adult, are considered equivalent to one cow.

Table 38. Average livestock grazing data by national forest for 2007 through 2009

Livestock Grazing	MAL	UMA	WAW
Permitted Grazing (proclaimed and administered lands)			
Cattle (HMs)	94,128	30,499	90,810
Cattle (AUMs)	124,028	40,259	119,321
Horses and burros (HMs)	110	0	252
Horses and burros (AUMs)	132	0	302
Sheep and goats (HMs)	23,995	25,503	15,118
Sheep and goats (AUMs)	7,199	7,651	4,535
Authorized Grazing (proclaimed and administered lands)			
Cattle (HMs)	70,989	26,782	83,309
Cattle (AUMs)	92,937	35,352	109,808
Horses and Burros (HMs)	72	0	206
Horses and Burros (AUMs)	86	0	234
Sheep and Goats(HMs)	10,910	16,511	12,769
Sheep and Goats(AUMs)	3,273	4,953	3,830
Authorized Grazing as percent of Permitted Grazing			
Cattle (HMs)	75%	88%	92%
Cattle (AUMs)	75%	88%	92%
Horses and burros (HMs)	65%	NA	82%
Horses and burros (AUMs)	65%	NA	78%
Sheep and goats (HMs)	45%	65%	84%
Sheep and goats (AUMs)	45%	65%	84%

Source: USDA Forest Service, iWeb Grazing Reports

Permitted AUMs are measures of planned capacity and are the number of AUMs that are specified by the grazing permit for the duration of the permit (FSM 2230.5). The permit is usually valid for 10 years (FSM 2231.03). Permitted AUMs provides a comparable indicator for Forest Service and BLM grazing capacity. Authorized AUMs is the amount of forage permittees pay for

and are authorized to use in a given year. Authorized AUMs indicate how much of the planned capacity is used annually. It is this use amount that contributes to jobs and income. Authorized cattle use across all three national forests is about 80 percent of permitted use. Sheep and goats authorized use is about 50 percent of permitted use. Sheep and goats make up about five percent of grazing use on the three national forests.

The economic activity associated with Forest Service livestock grazing is based on the proportion of livestock forage consumed by animals authorized to graze on Forest Service allotments to total annual forage needs in each socio-economic impact zone. The Forest Service contribution is identified as part of the total cattle and sheep inventory, marketing, and income data from the USDA National Agriculture Statistics Service. Average grazing data for 2007 through 2009 are displayed in table 38. This data is then integrated into IMPLAN model to generate the direct, indirect, and induced employment, income, and tax revenues that are contributed by each national forest.

The jobs, income, and tax contributions associated with current livestock grazing on the three national forests and their socio-economic impact zones are displayed in table 39. The effects are based on the average authorized grazing for 2007 through 2009 (as displayed in table 38) and the IMPLAN 2010 model year. The data include direct, indirect, and induced effects and include estimates for unpaid or family labor contributions.

Table 39. Livestock grazing economic impacts by national forests and their socio-economic impact zones (dollar estimates are in 2010 dollars)

	National Forest/Socio-economic Impact Zone		
Impact	**Malheur**	**Umatilla**	**Wallowa-Whitman**
Jobs	389	153	258
Income	$5,195,000	$1,874,000	$3,435,000
State and local tax	$909,000	$439,000	$836,000
Federal tax	$998,000	$606,000	$932,000

Forest Products

The Blue Mountains national forests have a long history of providing timber and other forest products to address local community and national needs. Until recently, communities throughout the socio-economic impact zones had strong economic components related to the wood products industry. Increased environmental protection, a focus on sustaining and restoring a broader range of resources, and changing mill technology have resulted in significant declines in the timber industry and in the businesses that support the timber industry.

Annual timber volume harvested from the three national forests, excluding fuelwood, has declined dramatically, from a high of almost 600 million board feet during the early 1990s to about 50 million board feet in 2010. Harvest on all other ownerships has also declined during the same period. The recent three-year average timber harvest by national forest is displayed in table 40. Non-sawtimber includes pulpwood and biomass, such as clean chips. Fuelwood includes both personal and commercial use.

Table 40. Timber harvest volume three-year average by national forest (in MBF and CCF)

Timber Product	MAL (2006-08)*		UMA (2007-09)		WAW (2007-09)	
	MBF	CCF	MBF	CCF	MBF	CCF
Sawtimber	13,024	26,048	20,480	40,961	10,160	20,321
Non-sawtimber	191	382	9,402	22,386	3,958	9,425
Poles	77	172	66	146	73	162
Posts	4	9	2	5	0	1
Fuelwood	3,110	6,219	5,493	10,986	6,003	12,007
Totals	16,406	32,830	35,444	74,484	20,195	41,915

* The average data for the Malheur National Forest are based on 2006-08 because there was an uncommonly large amount of biomass volume included in the timber harvest statistics in 2009.

Between 1989 and 2008, wood products processing capacity changed in the Oregon counties across all of the socio-economic impact zones. Data for Washington and Idaho were not available. There was a decrease in sawmill production capacity of almost 60 percent (see figure 8). Manufactured board processing decreased by about 30 percent, and there was close to a 10 percent reduction in plywood and veneer processing. Pulp processing capacity remained about the same. Processing capacity is important for several reasons. It generates value added jobs and income in addition to those jobs associated with logging. Local processing capacity increases the net value of stumpage since it costs more to ship logs to distant mills. A higher stumpage value means projects are more likely to be economically viable.

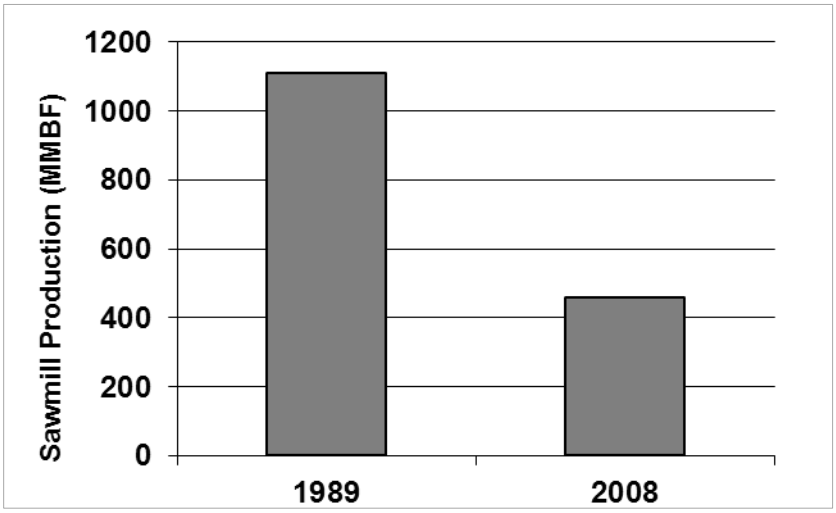

Figure 8. Sawmill production in the Oregon portion of the three socio-economic impact zones (Source: Ehinger and Assoc. 2008)

The economic activity associated with timber harvest is calculated on a per hundred cubic feet (CCF) basis. The flows of stumpage through logging companies and primary processors (such as sawmills, veneer and plywood mills, and paperboard manufactures) are considered. The harvest data in MBF and CCF by national forest are displayed in table 41.

Table 41. Timber harvest by product type for the Blue Mountains national forests

Timber Product	Malheur (2006-08)*		Umatilla (2007-09)		Wallowa-Whitman (2007-09)	
	MBF	CCF	MBF	CCF	MBF	CCF
Sawtimber	13,024	26,048	20,480	40,961	10,160	20,321
Non-sawtimber	191	382	9,402	22,386	3,958	9,425
Poles	77	172	66	146	73	162
Posts	4	9	2	5	0	1
Fuelwood	3,110	6,219	5,493	10,986	6,003	12,007
Totals	16,406	32,830	35,444	74,484	20,195	41,915

* includes timber volume from the Ochoco National Forest

The direct economic effect of the timber program is derived using mill survey data provided by Charles E. Keegan, Bureau of Business and Economic Research, The University of Montana. The direct job effect of timber harvest is determined by identifying the timber volume processed or handled by an industry, such as sawmills, and dividing the total employment for that industry by that number. The process derives a response coefficient for jobs per CCF. The response coefficient is integrated with the IMPLAN models for each socio-economic impact zone to calculate the rest of the direct, indirect and induced employment, income, and tax effects for the timber industries and supporting businesses that exist in each socio-economic impact zone. These contributions associated with the timber harvested from the three national forests and their socio-economic impact zones are displayed in table 42.

Table 42. Timber harvest economic impacts for the socio-economic impact zones (dollar estimates are in 2010 dollars)

Impact	National Forest/Socio-economic Impact Zone		
	Malheur	Umatilla	Wallowa-Whitman
Jobs	74	321	158
Income	$3,994,000	$18,306,000	$8,717,000
State and local tax	$510,000	$2,516,000	$1,365,000
Federal tax	$752,000	$4,192,000	$2,028,000

National Forest Expenditures (Salary and Non-salary)

Within the Blue Mountains national forests, Forest Service people, budgets, buildings, and other infrastructure contribute to social and economic well-being in the communities making up each of the socio-economic impact zones. The management of each of the national forests requires a budget that is spent on employees, contractors, goods and services, and the construction and maintenance of infrastructure. In addition to the day-to-day scheduled management activities, the Forest Service sometimes spends additional money for unplanned activities, such as wildfire suppression and management. The expenditures for each national forest are divided into salary and non-salary components and displayed including and excluding wildfire suppression costs (see table 43).

Table 43. Average national forest expenditures for 2007 through 2009

Expenditures	Malheur	Umatilla	Wallowa-Whitman
Salary excluding fire suppression	$11,086,000	$11,116,000	$14,229,000
Non-salary excluding fire suppression	$7,913,000	$8,378,000	$8,735,000
Salary including fire suppression	$21,094,000	$18,852,000	$19,697,000
Non-salary including fire suppression	$14,055,000	$14,519,000	$17,424,000

The economic effects of salary and non-salary expenditures by the Forest Service are estimated using the disposable income spent locally by Forest Service employees and the non-salary expenditures spent locally on materials, contracts, and services (see table 44). Salary expenditures are converted to disposable income spent by employees using a factor of slightly more than 60 percent. The remaining salary generally pays taxes and is saved for retirement, which is not spent locally by the employees. The non-salary expenditures are modeled with the assumption that if the good or service exists within the socio-economic impact zone, it will be purchased locally. The economic impacts are calculated using budgets excluding fire suppression costs. The reason for not identifying the economic effects associated with fire suppression expenditures is that suppression activities are not predictable, and most of the expenditures are spent on resources from outside of the national forests' socio-economic impact zones. The portion spent locally is not identified.

Table 44. The economic impacts of national forest budgets (excluding fire suppression) within their socio-economic impact zones (dollar estimates are in 2010 dollars)

Impact	National Forest/Socio-economic Impact Zone		
	Malheur	Umatilla	Wallowa-Whitman
Jobs	362	394	467
Income	$17,179,000	$19,377,000	$22,829,000
State and local tax	$1,097,000	$1,237,000	$1,531,000
Federal tax	$1,537,000	$2,036,000	$2,273,000

Revenue Sharing and Payments to Counties

Counties receive Federal payments based on revenue sharing under the Payments to States Act, also known as 25-percent receipts, and based on the percentage of their land base that is federally administered under the Payments in Lieu of Taxes (PILT) program. Due to declining revenues, especially from timber receipts, the Payments to States Act money was supplemented with the Secure Rural Schools and Communities Self-Determination Act (SRS). SRS money is divided into three separate parts identified as Title 1, Title 2 and Title 3. Title 1 money, about 80 percent of the total, is spent on local roads and schools. The split of Title 1 money between roads and schools is 50:50 in Washington and Idaho. In Oregon, the split is 75:25 with roads getting the larger share. The remaining money is spent on ecosystem management projects on National Forest System lands and local government projects enhancing environmental education, public safety, and other projects. PILT money can be spent on any local government purpose.

The last payment under the original SRS was originally planned for 2006. An extension of the SRS payments was signed into law in 2007, and the next year, the Emergency Stabilization Act of 2008 was signed into law authorizing the SRS payments through 2011. The SRS payment was extended again for 2012 and congress is discussing continuing SRS in 2013. Because SRS

payments are subject to congressional approval, an analysis of revenue sharing without the SRS adjustment is provided.

Table 45 displays the amounts of SRS and PILT money paid in 2009 to the counties in each of the socio-economic impact zones. The payments are based on the acreage of the national forest in each county for their respective socio-economic impact zone. For example, the Malheur and Umatilla National Forests have acreage in Grant County and the county is included in each of their socio-economic impact zones. The payment was prorated based on the number of acres of each national forest in their respective socio-economic impact zone. The allocation of SRS payments from each national forest to their socio-economic impact zone was accomplished using a similar proration of acreage by county. In 2009, Umatilla County did not choose the SRS payment and opted for the 25-percent receipts payment. This payment is included in table 45.

Table 45. Total Forest Service SRS and PILT payments to socio-economic impact zones for 2009

Payment Type	National Forest/Socio-economic Impact Zone		
	Malheur	**Umatilla**	**Wallowa-Whitman**
SRS	$7,900,754	$3,151,705	$2,714,318
PILT	$453,467	$745,694	$1,157,956
Totals	**$8,354,221**	**$3,897,399**	**$3,872,274**

Since it is unknown whether the SRS payments will be continued into the future, an estimate of payments to states is provided in table 46. The revenue sharing data are based on forest fund receipts received in 2007. The data are used to reconstruct what the payments would have been without SRS. The payments estimated in table 46 show a drop of 85 percent or greater from payments received under SRS.

Table 46. Reconstructed Forest Service 25-percent payments to socio-economic impact zones based on 2007 data

Payment Type	Socio-economic Impact Zone		
	Malheur	**Umatilla**	**Wallowa-Whitman**
25-Percent (reconstructed)	$294,487	$475,001	$182,314

In order to understand the importance and variability of revenue sharing and PILT payments to the individual counties, total SRS and 25-percent payments by county for selected years are provided in table 47 and PILT payment are displayed in table 48. The data displayed in table 47 are total payments received from all national forests. The years that are selected show key differences in payment amounts. The 1986 and 1991 years show fairly high amounts typical of the 1980s when there was an emphasis on timber production. In the year 2000, there are large decreased in revenue sharing dollars due to the impacts of several environmental protection policies. However, with the passage of the SRS in 2000, levels of payments increased to the higher levels received during the 1980s as shown by the data in 2003 and 2009. Nez Perce is not included since historic data are not readily available.

Table 47. Total payments (SRS or 25 percent) to counties for selected years

County	1986	1991	2000	2003	2009
Baker	$1,215,705	$1,176,072	$240,973	$1,236,929	$1,048,663
Grant	$9,104,248	$10,754,046	$380,293	$9,867,839	$8,365,916
Harney	$4,136,316	$5,089,341	$93,847	$4,050,347	$3,433,869
Morrow	$216,029	$376,524	$42,841	$363,432	$308,116
Umatilla	$608,983	$1,018,318	$122,239	$991,609	$123,493
Union	$907,936	$944,078	$226,741	$832,113	$858,555
Wallowa	$1,275,445	$1,117,680	$392,763	$1,352,045	$1,146,258
Wheeler	$1,243,518	$1,640,000	$28,337	$1,145,063	$970,780
Asotin	$81,096	$141,348	$16,083	$142,603	$120,899
Columbia	$240,461	$419,076	$47,683	$422,746	$358,403
Garfield	$143,914	$250,833	$28,540	$253,069	$214,551
Walla Walla	$3,668	$6,393	$727	$6,407	$5,432

The reasons for differences in PILT payments across the years displayed in table 48 are difficult to identify. The amount of PILT payment was affected by new PILT legislation passed in 1994, changes based on consumer price indices, the amount of prior year payments such as SRS, changing population and the amount of payment actually appropriated by Congress. The major point to take from table 48 is PILT payments are an important source of revenue to the counties.

Table 48. Total PILT payments to counties for selected years

County	1988	1991	2000	2002	2009
Baker	$101,718	$101,799	$377,545	$675,881	$500,966
Grant	$174,177	$174,733	$185,980	$347,883	$571,881
Harney	$308,000	$308,000	$324,916	$518,880	$971,822
Morrow	$15,936	$15,431	$95,999	$158,929	$66,704
Umatilla	$42,787	$41,668	$265,205	$440,521	$264,036
Union	$62,316	$62,313	$388,683	$640,353	$636,858
Wallowa	$116,334	$116,313	$153,028	$313,148	$381,307
Wheeler	$27,545	$29,022	$56,722	$99,743	$98,551
Asotin	$8,238	$6,564	$48,429	$76,353	$103,553
Columbia	$16,452	$16,451	$113,505	$180,939	$199,481
Garfield	$10,118	$10,118	$70,415	$112,410	$107,867
Walla Walla	$13,641	$8,363	$18,177	$28,352	$49,671
Nez Perce	$15,501	$14,433	$26,393	$40,952	$72,721

The amount of Federal land in a county is an indicator of the social and economic relationships, including PILT payments, to the counties. Table 49 displays the total acres of each county and acres administered by the Forest Service, BLM, and all Federal public acres.

Table 49. Total acres and federal components by county (2009)

County	Total	BLM	FS	All Federal	Percent Federal
Baker	1,963,750	367,086	651,866	1,020,858	52%
Grant	2,897,920	171,211	1,578,057	1,752,049	60%
Harney	6,545,920	3,881,161	520,616	4,462,276	68%
Morrow	1,311,360	1,609	143,305	149,695	11%
Umatilla	2,067,840	7,345	401,398	419,459	20%
Union	1,304,320	6,452	617,288	624,349	48%
Wallowa	2,017,920	18,207	1,149,980	1,168,195	58%
Wheeler	1,160,320	131,498	169,345	301,927	26%
Asotin	407,174	13,936	53,797	69,475	17%
Columbia	555,923	519	159,500	164,287	30%
Garfield	454,842	363	95,466	101,788	22%
Walla Walla	812,883	630	2,433	22,510	3%
Nez Perce	542,778	27,277	2,705	31,524	6%

SRS and PILT payments to counties are a component of local government expenditures. In order to calculate the economic contribution of the payments, the money is applied to several sectors using the IMPLAN model. All of the PILT payment is applied to the non-schools local government sector. The SRS payment is split four ways to recognize the split between roads and schools, and SRS Title allocations.

The jobs, income and tax impacts are identified in table 50. The effects are based on the payments received by socio-economic impact zone identified in table 49 and the IMPLAN 2010 model year. The data include direct, indirect, and induced effects.

Table 50. Economic impacts of Forest Service payments to counties within the socio-economic impact zones (dollar estimates are in 2010 dollars)

	National Forest/Socio-economic impact Zone		
Impact	Malheur	Umatilla	Wallowa-Whitman
Jobs	139	68	72
Income	$4,479,000	$2,547,000	$2,389,000
State and local tax	$409,000	$212,000	$232,000
Federal tax	$680,000	$441,000	$433,000

If SRS payments are not extended and revenue sharing is based on 25-percent payments, the jobs, income and tax impacts would be greatly reduced. Table 51 displays the estimated job, income and tax impacts of the estimated 25-percent payments reconstructed from 2007 data and actual PILT payment data for 2009.

Table 51. Estimated economic impacts of Forest Service payments to counties without SRS within the socio-economic impact zones

Impact	National Forest/Socio-economic impact Zone		
	Malheur	Umatilla	Wallowa-Whitman
Jobs	12	20	24
Income	$425,000	$792,000	$862,000
State and local tax	$43,000	$69,000	$91,000
Federal tax	$82,000	$157,000	$194,000

Social and Economic Contributions Summary

The economic effects of recreation, range, timber, agency expenditures, and payments to counties discussed previously are combined and displayed in a table for each national forest and its socio-economic impact zone (see table 52 through table 54). The data for jobs and income contributed by the Forest Service are compared to the total jobs and income by industry sector to identify the relative importance of the national forest to that sector and to the socio-economic impact zone overall. The data are from IMPLAN 2010 data sets.

The Forest Service economic relationship to the Malheur socio-economic impact zone shows strong economic ties with about 15 percent overall contribution to total employment and labor income. Several industries with large numbers of jobs show contributions of 10 percent or more based on goods and services provided by the national forest and budget expenditures and payments to counties. The jobs and income supported through Forest Service management activities are very important components of the Malheur socio-economic impact zone's socio-economic well-being.

The Forest Service contributes slightly more than 1 percent to total employment and 2 percent of labor income in the Umatilla socio-economic impact zone. The contributions by industry sector are also generally 1 percent or less. The jobs and income supported through Forest Service management activities, though less important to socio-economic impact zone's economy overall, are important to the socio-economic well-being of some individual businesses, workers, and families.

The Forest Service economic relationship to the Wallowa-Whitman socio-economic impact zone shows moderate economic ties with an almost 5 percent contribution to total employment and slightly more than a 5 percent contribution to labor income. Recreation related industries, such as retail trade, arts, entertainment and recreation, and accommodation and food services, show contributions of 10 percent or more. The jobs and income supported through Forest Service management activities are moderately important components of the Wallowa-Whitman socio-economic impact zone's socio-economic well-being.

Table 52. Current contribution of the Forest Service to the Malheur socio-economic impact zone excluding fire suppression dollars

Industry	Employment (jobs)			Labor Income (thousands of 2010 dollars)		
	Area Totals	National Forest Related	National Forest Percent of Total	Area Totals	National Forest Related	National Forest Percent of Total
Agriculture	1,457	385	26.4%	25,390	4,346	17.1%
Mining	21	20	94.1%	143	356	249.3%
Utilities	18	2	9.1%	1,943	185	9.5%
Construction	365	13	3.6%	10,383	406	3.9%
Manufacturing	177	36	20.5%	6,124	1,944	31.7%
Wholesale trade	103	19	18.2%	4,373	1,042	23.8%
Transportation and warehousing	104	24	22.6%	3,469	1,004	28.9%
Retail trade	845	81	9.6%	17,112	1,697	9.9%
Information	81	9	10.8%	3,214	396	12.3%
Finance and insurance	254	25	9.9%	7,812	1,083	13.9%
Real estate and rental and leasing	237	29	12.3%	3,044	563	18.5%
Professional, scientific, and technical services	186	42	22.3%	4,725	1,210	25.6%
Management of companies	9	1	6.6%	651	66	10.2%
Administrative, waste management, and removal services	232	19	8.1%	3,357	371	11.0%
Educational services	67	7	10.3%	438	109	24.8%
Health care and social assistance	695	43	6.2%	18,134	1,480	8.2%
Arts, entertainment, and recreation	118	36	30.1%	519	276	53.1%
Accommodation and food services	489	108	22.0%	6,381	1,510	23.7%
Other services	369	21	5.7%	8,568	640	7.5%
Government	2,054	251	12.2%	103,058	16,152	15.7%
Totals	7,881	1,168	14.8%	228,838	34,837	15.2%

Table 53. Current contribution of the Forest Service to the Umatilla socio-economic impact zone excluding fire suppression dollars

Industry	Employment (jobs)			Labor Income (thousands of 2010 dollars)		
	Area Totals	National Forest Related	National Forest Percent of Total	Area Totals	National Forest Related	National Forest Percent of Total
Agriculture	18,959	241	1.3%	$326,659	$6,942	2.1%
Mining	274	8	2.8%	$12,999	$144	1.1%
Utilities	611	3	0.5%	$69,527	$383	0.6%
Construction	6,163	9	0.2%	$234,201	$406	0.2%
Manufacturing	13,089	116	0.9%	$693,676	$7,957	1.1%
Wholesale trade	3,081	19	0.6%	$143,487	$1,000	0.7%
Transportation and warehousing	4,761	26	0.5%	$275,252	$1,537	0.6%
Retail trade	14,859	67	0.4%	$378,623	$1,728	0.5%
Information	1,396	8	0.5%	$50,682	$288	0.6%
Finance and insurance	6,518	28	0.4%	$264,321	$1,242	0.5%
Real estate and rental and leasing	4,013	23	0.6%	$52,815	$354	0.7%
Professional, scientific, and technical services	5,401	40	0.7%	$175,315	$1,384	0.8%
Management of companies	464	2	0.4%	$36,087	$167	0.5%
Administrative, waste management, and removal services	5,201	23	0.4%	$139,256	$473	0.3%
Educational services	2,044	6	0.3%	$73,919	$188	0.3%
Health care and social assistance	16,548	62	0.4%	$694,810	$2,844	0.4%
Arts, entertainment, and recreation	1,940	31	1.6%	$18,157	$376	2.1%
Accommodation and food services	8,403	78	0.9%	$134,731	$1,319	1.0%
Other services	7,715	29	0.4%	$211,656	$971	0.5%
Government	24,056	237	1.0%	1,225,030	15,200	1.2%
Totals	18,959	241	1.3%	$326,659	$6,942	2.1%

Table 54. Current contribution of the Forest Service to the Wallowa-Whitman socio-economic impact zone excluding fire suppression dollars

Industry	Employment (jobs)			Labor Income (thousands of 2010 dollars)		
	Area Totals	National Forest Related	National Forest Percent of Total	Area Totals	National Forest Related	National Forest Percent of Total
Agriculture	3,904	291	7.5%	48,092	4,927	10.2%
Mining	101	1	1.1%	2,258	38	1.7%
Utilities	127	3	2.6%	11,803	356	3.0%
Construction	1,445	10	0.7%	42,261	378	0.9%
Manufacturing	1,875	62	3.3%	93,044	3,719	4.0%
Wholesale trade	412	20	4.9%	16,958	1,015	6.0%
Transportation and warehousing	857	26	3.0%	47,114	1,283	2.7%
Retail trade	3,227	87	2.7%	75,029	1,971	2.6%
Information	291	11	3.9%	8,285	366	4.4%
Finance and insurance	1,039	27	2.6%	31,600	1,036	3.3%
Real estate and rental and leasing	1,044	33	3.2%	9,164	407	4.4%
Professional, scientific, and technical services	1,017	42	4.1%	28,293	1,461	5.2%
Management of companies	104	3	3.0%	1,428	82	5.8%
Administrative, waste management, and removal services	742	28	3.8%	9,734	452	4.6%
Educational services	194	6	3.4%	2,608	122	4.7%
Health care and social assistance	3,378	71	2.1%	119,640	2,925	2.4%
Arts, entertainment, and recreation	411	64	15.5%	2,882	604	20.9%
Accommodation and food services	1,880	182	9.7%	27,208	2,754	10.1%
Other services	1,601	31	1.9%	39,101	865	2.2%
Government	4,345	277	6.4%	205,198	18,681	9.1%
Totals	27,996	1,276	4.6%	821,701	43,441	5.3%

Nonuse and Non-Monetary Human Values

The preceding discussion focuses on Forest Service goods and services and uses that can be exchanged in a market place and generate quantitative values measured in jobs and income. Forest Service management activities also result in non-dollar or difficult to measure benefits and costs. These costs and benefits are value changes that can be expressed as increases or decreases in water quality, changes in habitat for wildlife and fish, and reduced risk of large scale fire to name a few. The nonuse and nonmonetary values include: option value for a good or service to be available in the future, such as ecosystem restoration of stream habitat for future fishing options, bequest value from ensuring certain goods and services will be preserved for future generations, and existence value from simply knowing that a certain good or service exists (endangered species protection). These benefits and costs are documented in the other resource qualitative and quantitative discussions and contribute to an overall value determination for each alternative.

Social Values

Throughout the planning process, the public shared information about their uses, interests, and values for the Blue Mountains national forests related to social, economic, and ecological factors. The public provided comments about what uses, benefits, services, or opportunities they wanted and why. Public comments reflect a diverse range of social and economic values. Residents and visitors expressed deeply intertwined relationships between the ecological health of the national forests, their personal enjoyment, lifestyles, customs, culture, and social and economic well-being of communities. They identify diverse connections to and meaning for these connections to the land, (referred to as “sense of place”).

Sense of place describes how individuals or groups identify and value a place. There is a common understanding of how the resources of their place should be managed, and a common understanding of how things are normally done. People’s identification with places sometimes comes from personally interacting with those places and experiencing them with one’s senses. For many people, sense of place is anchored in working in the timber industry or in ranching, restoration, or recreation related jobs on public lands. For others, sense of place involves a hunting camp that is used annually by a group of longtime friends, a rural community that hosts pancake feeds to fund fire protection projects, a grazing allotment dotted with old homestead sites whose natural springs provide water even during droughts, areas that have traditional importance to tribes for gathering, hunting, and spiritual renewal.

Sense of place can also describe an appreciation of and an attachment to a place that has not been experienced first-hand. Examples include people who support conservation efforts but have never visited the place they support conserving. Those who value the existence of cowboys or wilderness areas, but have never encountered them personally, could be described in this category.

A value typology was developed to document and communicate distinct values for the people that commented throughout planning forums. The values represent both tangible and intangible factors. The management activities, uses, and goods and services proposed under the alternatives have a multitude of potential effects on these values depending on who holds the values and where the effect of the alternative is being realized. Individuals and groups often can hold diverse and even conflicting opinions on how their values are affected.

Approximately 1,700 comments were coded using the values identified in the preceding table. A single comment was often assigned to more than one of the values. About 3,800 value statements were generated. The number of comments classified under each value is displayed in figure 9.

The number of comments by category identifies the level of interest in a particular value. It does not imply that any value is more important than another.

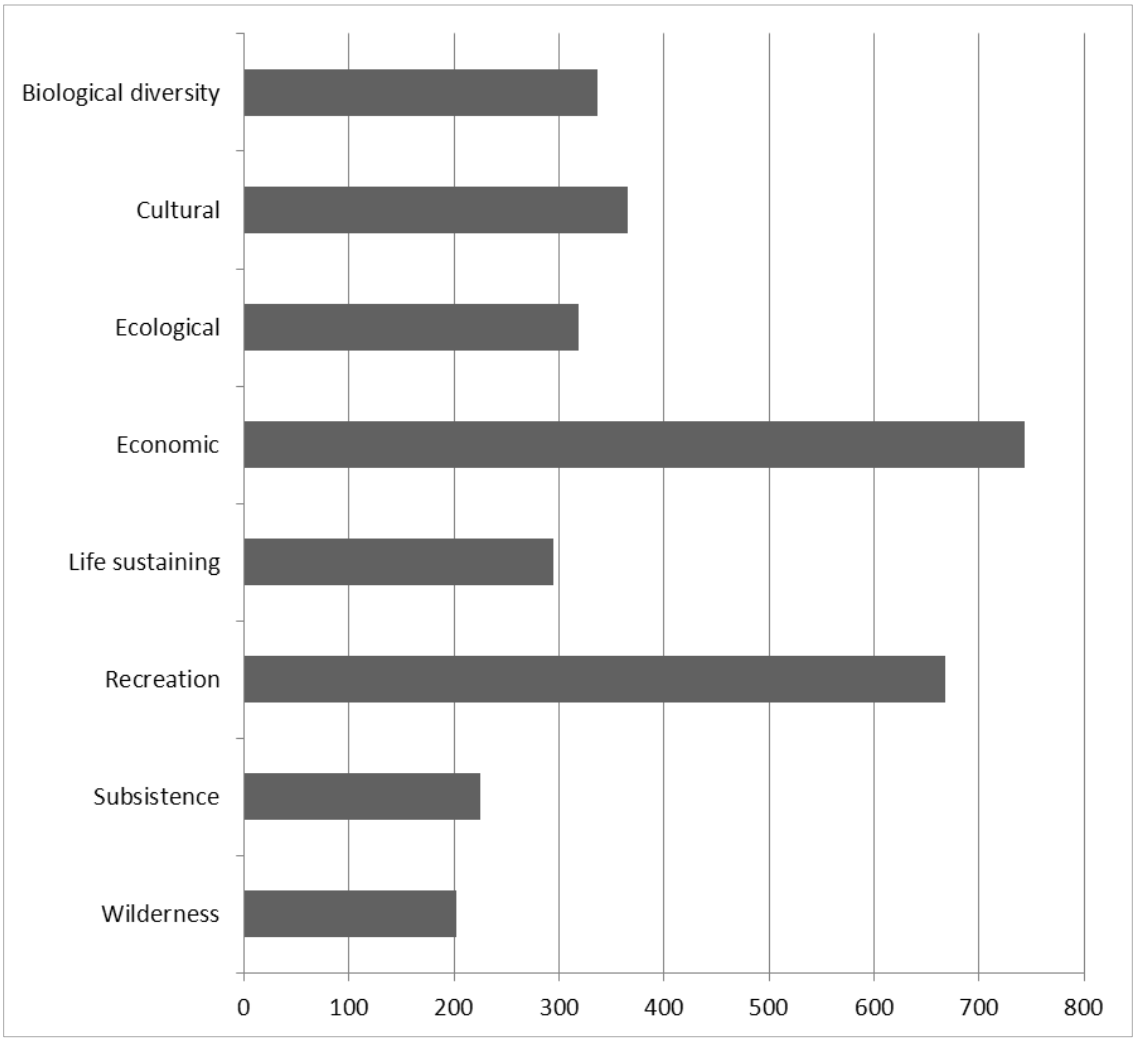

Figure 9. Comment counts by sense of place values

In summary, James Kent and Associates characterize the key values expressed by many of the residents of the Blue Mountains area in the following statement:

> The people in the Blue Mountains SRU are extremely outdoor oriented in work and play, linked to the core with grazing, agriculture and timber management. They have created communities which are relatively safe and family-oriented, and which comfortably absorb newcomers who make an effort to fit in. Residents pride themselves on self-sufficiency and interdependence and want government influence to be practical, effective, and minimal. (James Kent and Associates 2006)

Although the statement was specific to residents in a subset of all the counties addressed in the socio-economic impact zones, it generally fits throughout.

Social and Economic Resilience

The Blue Mountains national forests continue to make contributions to local social and economic systems. Traditional uses center on wood products, livestock forage, and dispersed recreation. Many people depend on the national forests directly or indirectly for a wide range of goods and services and employment opportunities. These include wood for local sawmills and biomass fuel, forage for livestock, water for drinking and irrigation, recreational opportunities, and minerals.

Industries customarily served by agency land uses, such as logging, wood products manufacturing, and livestock grazing, may no longer dictate the economic prosperity of the socio-economic impact zones, but they remain economically and culturally important. The economic dependence of communities on these industries is highest in areas that are geographically isolated with few alternative employment opportunities.

In order to measure and compare the importance of wood products and forage from public lands, a timber and forage importance index was developed in conjunction with the Interior Columbia Basin Ecosystem Management Project (ICBEMP). The index functions on a county level, rather than a socio-economic impact zone level. It consists of five factors: county population change, percent of Forest Service and BLM administered lands in the county, percent of Forest Service and BLM forage and timber supply within the county, and percent of county budget from Federal payments and recreation visits. Table 55 displays qualitative levels of timber/forage dependence as calculated by ICBEMP (USDA and USDI 1996).

Table 55. Timber/forage dependency (1996)

Socio-economic Impact Zone	County	Timber/Forage Dependency Rating
Malheur	Grant County, OR	High
	Harney County, OR	High
Umatilla	Grant County, OR	High
	Morrow County, OR	Medium high
	Umatilla County, OR	Medium high
	Union County, OR	High
	Wallowa County, OR	High
	Wheeler County, OR	Medium high
	Asotin County, WA	Medium high
	Columbia County, WA	Medium high
	Garfield County, WA	Medium high
	Walla Walla County, WA	Low
	Nez Perce County, ID	Medium high
Wallowa-Whitman	Baker County, OR	High
	Union County, OR	Medium high
	Wallowa County, OR	High

Most of the counties in the three socio-economic impact zones have medium high to high timber forage dependency ratings. In general, counties with a higher dependency on timber and forage have lower socio-economic resiliency, which is the ability to adapt to social and economic change. The potential for low resiliency in the Malheur and Wallowa-Whitman socio-economic impact zones is also shown in the negative population growth rates and declining working age population components in these socio-economic impact zones.

A predictable and steady flow of goods and services from national forests helps to sustain the worker skill base and infrastructure supporting work within the national forests. Producing predictable and sufficient timber volume from National Forest System lands has become increasingly difficult. Natural disturbances, such as wind storms, wildfires, and insects and disease disturbances, can change the amount and rate of timber volume that can be offered for sale. Market conditions affect the flow of goods and services. The recent national economic recession has caused wood product prices to drop. As a result, some timber sales on the Blue Mountains national forests received no bids and were not sold. Changing Forest Service policy, law, and national budget priorities also affect the flow of goods and services.

Malheur Socio-economic Impact Zone

The Malheur socio-economic impact zone has a number of indicators showing a potential for low resiliency. The population is declining overall, as is the workforce. The median age is 48, and the population density is one person per square mile. Most of the residents are classified as rural. Poverty in the socio-economic impact zone is approaching 18 percent, and it has a low percentage of residents with higher education degrees. The Malheur socio-economic impact zone has a low per capita income that is more than 20 percent lower than the Oregon average. The economy is dominated by the government sector, and it has an economic diversity index of 0.58 compared to the Oregon index of 0.75. Current unemployment levels are 14 percent, about three percent higher than Oregon data.

Harney and Grant counties have comparatively low populations, are geographically isolated, and their social and economic systems traditionally have been natural resource dependent. Both counties were given low socio-economic resiliency ratings in an assessment completed for ICBEMP (Horne and Haynes 1999). Job losses have cut across many industries. Since 1990, three sawmills have closed, and several logging companies have either left the area or have gone out of business.

Many people working in the timber industry are adapting their skills and infrastructure to support a restoration-based economy. Work associated with this economy includes tree thinning, culvert removal, and watershed restoration. A biomass facility is being constructed in Grant County. It will use noncommercial logs being removed in restoration-focused projects. The one remaining sawmill remains viable by producing special order products for individual customers. There are community concerns about whether the quantity and flow of forest products will be enough to sustain local businesses.

Umatilla Socio-economic Impact Zone

Encompassing the largest geographic area, the Umatilla socio-economic impact zone has the largest population and has experienced the most population growth. Collectively, the Umatilla socio-economic impact zone indicators more closely resemble Oregon data. However, data for individual counties show a more complicated picture. The population is gradually growing overall with increases in the more urban counties: Umatilla, Nez Perce, and Walla Walla. Most of the remaining counties show population increases and decreases of five percent or less, except for Wheeler and Garfield counties, with population decreases of 12 percent during the last decade. The population density is about 11 people per square mile. The median age is 40, and most of the population is classified as urban. Per capita income in the socio-economic impact zone is higher than the average for all Oregon non-metropolitan counties, and poverty levels overall are close to the Oregon statewide average. The socio-economic impact zone’s economic diversity index is 0.71. The unemployment rate in this socio-economic impact zone is about nine percent, which is less than the Oregon statewide non-metropolitan average.

Viewed at the broader socio-economic impact zone scale, this area has the highest level of socio-economic resiliency. The most populous counties within the socio-economic impact zone are Walla Walla, Umatilla, and Nez Perce, all of which were labeled highly resilient in the ICBEMP assessment (Horne and Haynes 1999). Economies of these urban counties are not likely to be strongly affected by Forest Service management decisions. However, other counties within the socio-economic impact zone and some communities within the highly resilient counties are more sparsely populated and have fewer economic opportunities. These places are often more dependent on natural resource-related revenues.

Wallowa-Whitman Socio-economic Impact Zone

The indicators of resiliency for the Wallowa-Whitman socio-economic impact zone generally fall between the Malheur and the Umatilla socio-economic impact zones' data. There was an overall population decline with Baker and Wallowa counties, declining four and five percent respectively, while Union County population increased by two percent. The median age of the socio-economic impact zone is 44, and the population density is six people per square mile. Per capita income closely resembles the data for all Oregon non-metropolitan counties, and poverty levels are similar to the high levels in the Malheur socio-economic impact zone. The economic diversity index for the Wallowa-Whitman socio-economic impact zone is 0.69. Unemployment is slightly greater than 10 percent.

The economy is smaller and less diversified than that of the Umatilla socio-economic impact zone; however, it includes advanced education opportunities that include a university and a growing service sector. There are several manufacturing businesses in diversified sectors, including two recreational trailer plants, sawmill and plywood plants and a particle board plant. Since 1990, two biomass-focused operations have opened and four sawmills have closed.

Overall, the socio-economic impact zone has medium socio-economic resiliency. However, Wallowa County is isolated, has a small population, and logging and grazing traditionally have been key components of the economy. The ICBEMP assessment gave Wallowa County a low socio-economic resiliency rating; towns within the county have had difficulty retaining physical and community infrastructure, such as sawmills and community volunteers.

Environmental Consequences – Economic and Social Well-being

The following discussion describes the potential direct, indirect, and cumulative effects on social and economic well-being for each alternative. The social and economic issue is evaluated using the key indicators identified in chapter 1. The evaluation of effects focuses on the economic contribution of the alternatives on local economies, the effect of changes in management activities on goods and services, and the resulting impacts on users and their values. The indicators include acres suitable for timber production, estimated timber harvest volume, grazing use, and employment and income contributions. The employment and income contributions are measured for recreation, range, timber, budgets, and revenue sharing and payments to counties. Impacts to non-use and nonmarket values are also discussed.

Key Indicators of Social and Economic Contributions to Well-being

Recreation

For all alternatives, the quantity of recreation visits, including wildlife-related recreation, and local visits, to the national forests is not expected to vary from current use levels. The current supply of recreational opportunities is expected to exceed demand for the foreseeable future. Therefore there is no estimated change to the overall level of recreation related expenditures, so

no change is estimated for jobs and income supported by these expenditures (see table 56). It is possible that use patterns may change within a socio-economic impact zone due to changes in access and use patterns, causing localized economic impacts. However, that level of scale is not addressed in this forestwide evaluation.

Table 56. Estimated jobs and income supported by recreation to counties by alternative

National Forest	Estimated Related Employment Contribution					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	233	233	233	233	233	233
UMA	187	187	187	187	187	187
WAW	397	397	397	397	397	397
National Forest	**Estimated Related Wage Income Contribution ($1,000)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
MAL	$4,589	$4,589	$4,589	$4,589	$4,589	$4,589
UMA	$4,527	$4,527	$4,527	$4,527	$4,527	$4,527
WAW	$7,678	$7,678	$7,678	$7,678	$7,678	$7,678

Livestock grazing and rangeland vegetation

Estimates of permitted cattle and sheep grazing are used to generate the economic effects of the alternatives. Permitted grazing use rather than authorized use is evaluated because it represents the strategic intent of the alternatives. The grazing economic impacts may be overestimated.

The projected amounts of permitted cattle grazing are displayed in table 57. The amount of cattle grazing within each national forest would be generally the same for alternatives A, B, D, E, and F. The amount of forage available for sheep would vary across alternatives A, B and C. Sheep grazing levels for alternatives D, E and F are the same for each national forest. Alternative C would provide the least amount of forage available to cattle and sheep on each national forest.

Table 57. Estimated cattle and sheep permitted animal unit months (AUMs) by alternative

National Forest	Estimated Cattle AUMs (permitted)					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	117,000	120,000	61,000	119,000	117,000	117,000
UMA	30,000	31,000	3,000	30,000	30,000	30,000
WAW	77,000	74,000	26,000	80,000	77,000	77,000
National Forest	**Estimated Sheep AUMs (permitted)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
MAL	6,500	6,500	1,200	6,500	6,500	6,500
UMA	7,800	4,600	1,200	4,600	4,600	4,600
WAW	4,500	3,500	3,500	4,500	4,500	4,500

The total of direct, indirect, and induced jobs and wage income including estimates for unpaid or family labor contributions supported by permitted cattle and sheep grazing are displayed in table 58 by national forest and by alternative. The results are consistent with the alternative estimates of permitted forage. Alternative C would support the least amount of jobs and income. The rest of the alternatives would support plus or minus 10 percent of the jobs and income supported by alternative B except for alternative A on the Umatilla, which is about 20 percent higher.

Table 58. Estimated jobs and income supported by grazing by alternative

National Forest	Estimated Grazing Related Employment Contribution					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	389	398	187	439	395	389
UMA	153	130	19	127	127	127
WAW	258	242	102	267	258	258
National Forest	**Estimated Grazing Related Wage Income Contribution ($1,000)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
MAL	$5,195	$5,316	$2,550	$5,881	$5,276	$5,195
UMA	$1,874	$1,674	$219	$1,631	$1,631	$1,631
WAW	$3,435	$3,241	$1,304	$3,556	$3,435	$3,435

Timber (Including Fuelwood)

The predicted levels of timber harvest are used to estimate the amount of economic activity for each alternative. The harvest amounts are mostly made up of sawtimber and non-sawtimber, such as pulpwood and biomass and fuelwood (see table 59). Smaller amounts of posts and poles, which are harvested mostly for personal use, are also included. The posts, poles, and fuelwood amounts are not predicted to vary by alternative.

Table 59. Estimated timber harvest by alternative (CCF)

Timber Product	Estimated Timber Harvest (CCF)					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Malheur						
Sawtimber	40,060	42,620	20,100	126,000	79,060	51,320
Non-sawtimber	15,905	16,929	7,976	50,000	31,381	20,381
Fuelwood	6,000	6,000	6,000	6,000	6,000	6,000
Other	181	181	181	181	181	181
Totals	62,146	65,730	34,257	182,181	116,622	77,882
Umatilla						
Sawtimber	33,300	36,000	16,060	106,520	76,960	46,520
Non-sawtimber	13,214	14,286	6,381	42,286	30,548	18,476
Fuelwood	10,000	10,000	10,000	10,000	10,000	10,000
Other	151	151	151	151	151	151
Totals	56,665	60,437	32,592	158,957	117,659	75,147
Wallowa-Whitman						
Sawtimber	26,260	31,960	13,520	110,400	66,160	41,860
Non-sawtimber	10,400	12,690	5,381	43,810	26,262	16,619
Fuelwood	12,000	12,000	12,000	12,000	12,000	12,000
Other	0	0	0	0	0	0
Totals	48,660	56,650	30,901	166,210	104,422	70,479

Timber harvest levels would vary with the amount of acres suitable for timber production (see table 60) and the emphasis on timber production versus ecosystem restoration. A timber production emphasis focuses more on the production of saw logs. Alternative D, with an

emphasis on high levels of sawtimber production, requires the most suitable acres and would have the greatest timber production level. The proportion of sawtimber harvest compared to total harvest would also be greatest in alternative D. Conversely, alternative C, with a decreased emphasis on timber harvest, would have the fewest suitable acres. The rest of the alternatives would have the same suitable acres base, but emphasis on timber production would differ so that the total amount of harvest, sawtimber, and non-sawtimber would vary.

Table 60. Acres suitable for timber production by alternative

National Forest	Acres Suitable for Timber Production					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	NA	770,000	530,000	1,080,000	770,000	770,000
UMA	NA	420,000	260,000	610,000	420,000	420,000
WAW	NA	530,000	310,000	770,000	530,000	530,000

Employment and income by alternative is based on the harvest level by product type displayed in table 59. The estimated timber related economic effects are displayed in table 61. The timber production emphasis of alternative D would result in a job contribution more than three times the level of employment of alternative A for the Malheur and Umatilla National Forests and four times the level of employment of alternative A for the Wallowa-Whitman National Forest (see table 62). Timber harvest related employment under alternative C would be about one-half of the level for alternative A across all three national forests. The rest of the alternatives compared to alternative A and ranked in declining order are alternative E, F, and B for all three national forests.

Table 61. Estimated jobs and income supported by timber harvest by alternative

National Forest	Estimated Timber Harvest Related Employment Contribution					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	133	142	67	418	263	170
UMA	243	263	117	777	561	339
WAW	201	245	104	845	506	320
National Forest	**Estimated Timber Harvest Related Wage Income Contribution ($1,000)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
MAL	$7,214	$7,674	$3,625	$22,660	$14,224	$9,238
UMA	$13,882	$15,006	$6,707	$44,365	$32,058	$19,388
WAW	$11,112	$13,526	$5,723	$46,722	$28,000	$17,716

Table 62. Estimated jobs and income by alternative compared to alternative A

National Forest	Percent of Alternative A Employment					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	100%	107%	50%	314%	198%	128%
UMA	100%	108%	48%	320%	231%	140%
WAW	100%	122%	52%	420%	252%	159%

Expenditures (Salary and Non-salary)

The national forest budgets are made up of salary and non-salary expenditures. Non-salary expenditures are the purchases of goods and services, including contracting for restoration activities, and are for acquiring and maintaining facilities and other infrastructure. The type and amount of management activities needed to achieve the desired conditions within the specified time period would require changes in budgets for alternatives D, E, and F (see table 63). The budget increases would be divided into salary and non-salary components with the salary expenditure receiving less of the budget increase. Salary expenditure receives less of the budget increase because it is not necessary to add Forest Service positions for management and for staffing to areas where there are no budget increases.

Table 63. Estimated budget expenditures by alternative

National Forest	Estimated Budget Expenditures (salary and non-salary) ($1,000)					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	$19,200	$19,200	$17,162	$23,514	$20,472	$18,701
UMA	$19,331	$19,331	$17,936	$24,209	$21,277	$19,296
WAW	$22,900	$22,900	$20,616	$27,776	$24,031	$221,158

The job and income effects of the total budgets are displayed in table 64. The job and income changes by alternative would be consistent with the budget increases and decreases. Alternative D would support the most jobs and labor income at about 20 percent greater than alternative A. Alternative C supports the lowest jobs and income levels at about 5 to 10 percent less than alternative A.

Table 64. Estimated jobs and income supported by total budget expenditures by alternative

National Forest	Estimated Budget Expenditures Related Employment Contribution					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	362	362	331	428	382	355
UMA	393	393	370	470	424	392
WAW	466	466	429	545	484	454
National Forest	**Estimated Budget Expenditures Related Wage Income Contribution ($1,000)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
MAL	$17,179	$17,179	$15,915	$19,852	$17,967	$16,869
UMA	$19,215	$19,215	$18,217	$22,706	$20,607	$19,190
WAW	$22,766	$22,766	$21,166	$26,181	$23,558	$22,245

Forest Service employment currently accounts for about 60 percent of the jobs and income associated with budget expenditures. Restoration work supported by budgets is the next largest component of all jobs and income supported by budgets. Restoration work includes restoring existing ecosystem conditions to meet alternative desired conditions as well as maintaining and protecting existing desired conditions. Table 65 displays how employment and income supported by restoration work would differ by alternative. Restoration activities within the national forests currently support about 20 percent of all budget related jobs. Under alternative C, active restoration activities and the supported jobs and income would decrease by about 40 percent on the Malheur and Wallowa-Whitman National Forests and by 25 percent on the Umatilla. Under

alternative D, restoration supported jobs and income would increase by 85 to 95 percent across the national forests. Alternative E would result in additional restoration jobs and income varying between 20 to 35 percent compared to alternative A across the national forests.

Table 65. Estimated jobs and income supported by restoration related expenditures by alternative

National Forest	Estimated Restoration Related Employment Contribution					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	68	68	41	125	85	62
UMA	75	75	56	143	102	75
WAW	81	81	45	156	98	69
National Forest	**Estimated Restoration Related Wage Income Contribution ($1,000)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
MAL	$2,066	$2,066	$1,252	$3,790	$2,575	$1,867
UMA	$2,907	$2,907	$2,163	$5,511	$3,946	$2,889
WAW	$2,582	$2,582	$1,449	$5,001	$3,143	$2,215

Revenue Sharing and Payments to Counties

SRS payments used for revenue sharing are divided into three separate parts. Title 1 money, about 80 percent of the total, is spent on local roads and schools. The split of Title 1 money between roads and schools in Oregon is 75:25 with roads getting the larger share. The percentage split of Title 1 money is 50:50 in Washington and Idaho. The remaining SRS payment is spent on ecosystem management projects on National Forest System lands and on local government projects enhancing environmental education, public safety, and other projects. PILT money can be spent on any local government purpose (see table 66).

Table 66. Total Forest Service payments based on Secure Rural Schools to socio-economic impact zones for 2009

Payment Type	Socio-economic Impact Zone		
	Malheur	Umatilla	Wallowa-Whitman
SRS	$7,900,754	$3,151,705	$2,714,318
PILT	$453,467	$745,694	$1,157,956
Totals	$8,354,221	$3,897,399	$3,872,274

Table 67 displays the expected jobs and income by national forest. Although there will be future variations in payments based on the PILT and SRS payments formulas, these variances are not caused by differences in the alternatives. Therefore, the payment dollars are not projected to vary by alternative while the SRS payments are in place.

If the SRS payments cease, revenues to the socio-economic impact zones and the jobs and income those dollars support will be based on national forest revenues. Based on the 2007 receipt data, payments would be much less than dollars received under the SRS payments (table 68). These dollars are split between local roads and schools with a 50:50 split in Washington and Idaho and 75 percent going to local roads in Oregon.

Table 67. Estimated jobs and income supported by receipt-based payments to counties by alternative

National Forest	Estimated Related Employment Contribution					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	139	139	139	139	139	139
UMA	68	68	68	68	68	68
WAW	72	72	72	72	72	72
National Forest	**Estimated Related Wage Income Contribution ($1,000)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
MAL	$4,479	$4,479	$4,479	$4,479	$4,479	$4,479
UMA	$2,574	$2,574	$2,574	$2,574	$2,574	$2,574
WAW	$2,389	$2,389	$2,389	$2,389	$2,389	$2,389

Table 68. Reconstructed Forest Service 25-percent and PILT payments to socio-economic impact zones (2007)

Payment Type	Socio-economic Impact Zone		
	Malheur	Umatilla	Wallowa-Whitman
25-percent (reconstructed data)	$294,487	$475,001	$182,314

The receipts based payments will vary by alternative and support different levels of jobs and income (see table 69). Alternatives producing more revenue generating outputs and uses will in turn provide larger payments to counties. Differences in payments are primarily related to the amount and value of commercial wood products available by alternative. Although PILT payments are inversely related to revenue sharing payments such that a decrease in revenue sharing payments would be offset by slightly higher PILT dollars, the data to estimate the change in PILT payments are not available. PILT payment data for 2009 are used as a proxy. Alternative C supports the least jobs and income based on lower payments to counties due to decreased timber harvest and alternative D the most.

Table 69. Estimated jobs and income supported by revenue sharing and payments to counties by alternative

National Forest	Estimated Related Employment Contribution					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	13	13	11	19	16	14
UMA	20	21	18	32	27	23
WAW	25	25	24	29	27	26
National Forest	**Estimated Related Wage Income Contribution ($1,000)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
MAL	$454	$457	$404	$658	$547	$479
UMA	$830	$849	$726	$1,294	$1,104	$915
WAW	$932	$939	$908	$1,076	$999	$957

Social Values

People and their values are complex. Individual or group values are affected in a multitude of ways by an alternative overall and by specific parts of an alternative. A person may like the general intent of an alternative and dislike a particular activity at a particular place. Given the strategic nature of the forest plans, an evaluation about how alternatives affect social values is focused on a forestwide perspective across all three national forests. At this scale, it is not possible to identify unique places or how individuals value those places. However, an evaluation of the overall intent of the alternatives can be made.

The discussion centers on those values that show the highest levels of interest with generally 200 or more comments. These high interest values are presented in figure 10. The identification of alternative effects on each value is accomplished using resource and socioeconomic indicators described in preceding sections. For ease of reading, tables of the indicators are used again in this section (James Kent and Associates 2006). For a more complete explanation of the value typology, see the section titled “Nonuse and Non-monetary Human Values” above.

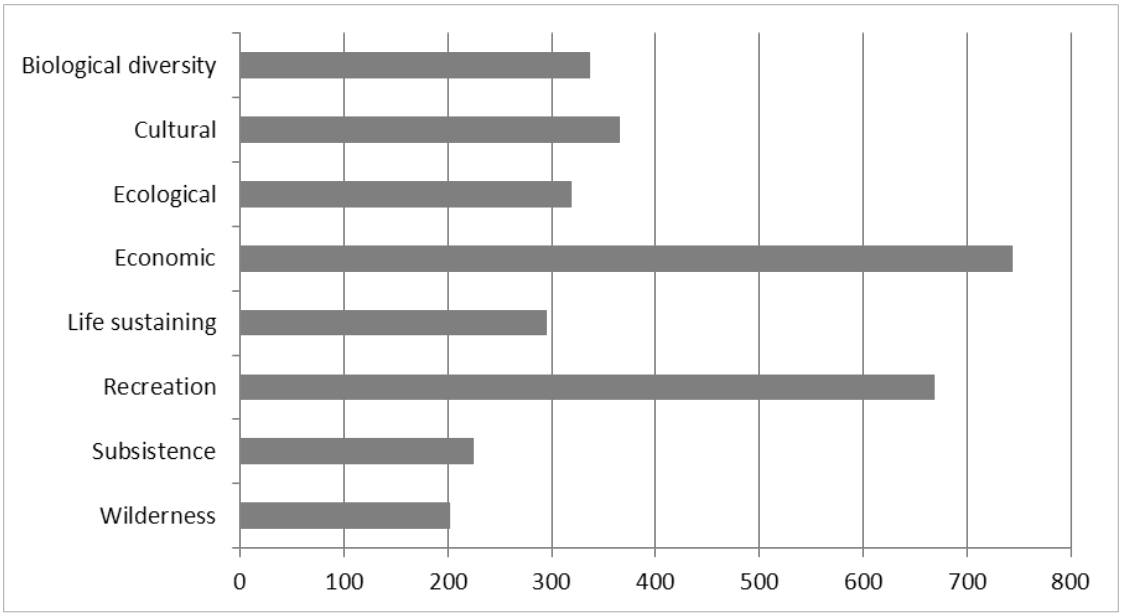

Figure 10. High interest sense of place values

Biological diversity is described as valuing places because they provide a variety of fish, wildlife, and/or plants. Ecological values are described as valuing places because they are ecologically functional and healthy. Life sustaining values are identified as valuing places because they help produce, preserve, and renew air, soil, and water. Alternative impacts on all three of these values are measured using the condition class score. The condition class indicator shows the movement toward historic conditions, and larger changes results in the greatest movement toward historic conditions. Historic conditions are expected to provide high levels of naturally occurring biological diversity, and to provide the highest levels of functional and healthy ecosystems. Alternative D would have the most movement towards the historic conditions for dry and moist forests, and alternative B for cold forest (see table 70).

Table 70. Condition class score by vegetation type for all three national forests

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Cold forest	61%	54%	63%	61%	61%	63%
Dry forest	11%	14%	10%	24%	19%	14%
Moist forest	36%	39%	33%	53%	44%	36%

In addition to condition class score, alternative impacts to ecological values are also indicated by restoration activities including acres of fuel treatments, miles of stream restoration, and acres of riparian and wetlands enhancement.

Cultural values are described as valuing places because they are important to maintain and are used to pass down the wisdom, knowledge, traditions, and cultural ways of life. Subsistence values are described as valuing places because they provide important food, firewood, and other supplies that sustain life. These two values are combined because they both reveal that the people in the Blue Mountains area "are outdoor oriented in work and play, linked to the core with grazing, agriculture and timber management" (James Kent and Associates 2006).

Alternative impacts on these values are described using the percent of the national forest available for summer motor vehicle use (see table 71) and acres of vegetation management activities for fuel treatments and timber harvest (see table 72). Motor vehicle access is used because gathering food, firewood and other supplies and reaching important places are facilitated by access. Acres of vegetation management are used because firewood gathering is often a side product of vegetation management activities. Vegetation management also often enhances habitat for large vertebrate species, such as deer and elk.

Table 71. Percent of national forest suitable for summer motor vehicle use

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	83%	85%	51%	93%	90%	90%
UMA	66%	71%	36%	73%	63%	63%
WAW	75%	74%	35%	75%	68%	68%

Table 72. Acres of timber harvest annually by national forest

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	7,100	7,100	3,400	20,500	12,500	8,300
UMA	5,200	5,100	2,300	15,600	10,600	6,400
WAW	4,500	4,550	2,050	16,250	9,350	6,050

Economic values are described as valuing places for the economic benefits they provide, such as timber, fisheries, minerals, or tourism opportunities. The indicator to show the alternative impacts on economic values is employment supported by the national forest programs (see table 73). Alternative D would support the most jobs and alternative C the least.

Table 73. Total direct, indirect, and induced employment contribution by national forest (jobs)

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	1,257	1,274	956	1,657	1,412	1,287
UMA	1,044	1,041	762	1,629	1,368	1,114
WAW	1,395	1,422	1,104	2,126	1,718	1,502

Recreation values are described as the valuing of places because they provide outdoor recreation opportunities. Developed recreation opportunities are not expected to change across alternatives so the indicator for alternative effects on recreation values is the mix of motor vehicle and nonmotorized access, which is indicated by the amount of area suitable for each use. Table 71 displays the percent of each national forest available for summer motor vehicle use. The rest of the national forest is suitable only for nonmotorized use (summer). Shifts between these two categories by alternative would both positively and negatively affect recreation values depending on a person's preferred experiences. The impact is not the same for motor vehicle users and nonmotorized users. A five percent increase or decrease in area suitable for motor vehicle use can result in a much larger change in area available only for nonmotorized use. For example, for the Malheur National Forest, alternatives D, E, and F would provide about 10 percent more area for summer motor vehicle use than alternative A. The corresponding decrease in area for only summer nonmotorized use is greater than 50 percent. For alternative C within the Malheur National Forest, the area available for summer motor vehicle use would decrease almost 40 percent compared to alternative A. This would result in a corresponding increase in area available only for nonmotorized use of 190 percent. Evaluating the alternative effects on recreation values is complex and presents conflicting results.

People often value most the recreation experiences currently available to them. The alternatives that result in the greatest change from current motor vehicle and nonmotorized availability are likely to generate the most negative effects on recreation values. For all three national forests, alternative C would generate the greatest declines in the availability of area for motor vehicle use, and alternative D would have the greatest increase in area suitable for motor vehicle use with the Malheur and Umatilla National Forests.

Wilderness values are describes as the valuing of places because they provide unmanaged, pristine, unroaded areas. Alternative impacts on these values are described using the acres allocated to preliminary administratively recommended wilderness areas (see table 74) and acres allocated to MA 3A Backcountry (nonmotorized use) (see table 75). These two indicators show the same relative alternative effects on wilderness values with alternative C providing the most acres to management emphasis that provide generally unmanaged pristine areas. Alternatives E and F rank second for positive impact on wilderness values.

Table 74. Preliminary administratively recommended wilderness areas (acres)

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	0	1,200	83,800	0	30,400	30,400
UMA	0	1,400	248,500	0	40,100	40,100
WAW	0	10,800	172,700	0	20,300	20,300

Table 75. Backcountry nonmotorized use (acres)

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	0	59,300	270,400	0	53,600	53,600
UMA	0	19,300	105,800	0	105,500	105,500
WAW	0	0	210,100	0	104,400	104,400

Resilience and Social and Economic Well-being Summary

Changes in forest management can affect traditions, lifestyles, and the economic livelihood of residents and communities. Those who depend on the national forests for their livelihoods and recreation opportunities are concerned that their relationship with the national forests may be compromised by other uses and restrictions. Forest Service managers depend on their relationships with local communities, people and their institutions to help administer the national forests by providing a skilled workforce, labor, manufacturing infrastructure, business support, and other services cost effectively. All of these relationships are important to sustaining and restoring the ecological integrity of the national forests as well as the social and economic conditions of the communities.

The following sections describe how alternative levels of Forest Service contributed employment may cumulatively affect each of the three socio-economic impact zones.

Cumulative Effects on the Malheur Socio-economic Impact Zone

The jobs and income supported through national forest management activities are very important components of the Malheur socio-economic impact zone's socio-economic well-being. The Forest Service currently contributes over 15 percent of the total employment and labor income in the impact zone. Compared to alternative A, the overall jobs contribution would decrease by about 25 percent under alternative C and would increase by about 30 percent for alternative D. Alternative E would be the second highest with an increase close to 10 percent. These changes are driven by the differences in Forest Service expenditures on contractors and supplies associated with ecosystem restoration management activities, timber harvest, and livestock grazing (table 76).

Given the relatively low socio-economic resiliency of the Malheur socio-economic impact zone, the declines in employment and income projected for alternative C may have a measurable negative effect on community well-being. The declines in timber harvest may make it difficult to maintain wood products manufacturing infrastructure in the Malheur socio-economic impact zone. Projections of timber harvest on other ownerships in eastern Oregon do not indicate the potential to replace national forest timber harvest given current costs and stumpage prices (Adams and Latta 2007). The higher levels of timber harvest and resulting employment under alternative D and E may be enough to support existing and possibly expand wood manufacturing infrastructure.

Table 76. Total jobs and income supported by national forest activities and programs by alternative for the Malheur socio-economic impact zone

Activity	Estimated Employment Contribution (direct, indirect, and induced)					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
Recreation	233	233	233	233	233	233
Range	389	398	187	439	395	389
Timber	133	142	67	418	263	170
Expenditures	362	362	331	428	382	355
County payments	139	139	139	139	139	139
Totals	**1,257**	**1,274**	**956**	**1,657**	**1,412**	**1,287**
Activity	**Estimated Wage Income Contribution (direct, indirect, and induced)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
Recreation	$4,589	$4,589	$4,589	$4,589	$4,589	$4,589
Range	$5,195	$5,316	$2,550	$5,881	$5,276	$5,195
Timber	$7,214	$7,674	$3,625	$22,660	$14,224	$9,238
Expenditures	$17,179	$17,179	$15,915	$19,852	$17,967	$16,869
County payments	$4,479	$4,479	$4,479	$4,479	$4,479	$4,479
Totals	**$38,655**	**$39,237**	**$31,158**	**$57,462**	**$46,534**	**$40,370**

Cumulative Effects on the Umatilla Socio-economic Impact Zone

The Forest Service contributes about one percent of the total employment and labor income in the Umatilla socio-economic impact zone. The employment contribution would decrease by about 25 percent for alternative C and would increase by about 55 percent for alternative D. Alternative E would be the second highest with an increase of close to 30 percent. These changes are primarily driven by the differences in Forest Service expenditures on contractors and supplies associated with ecosystem restoration management activities, livestock grazing, and timber harvest (table 77).

The large area encompassed by the Umatilla socio-economic impact zone along with the high population centers and a diversified economy provides the area with a relatively high socio-economic resiliency. The declines in jobs projected for alternative C would have a much smaller impact on the economy overall. However, individual businesses and workers will be affected. The projected increase in jobs associated with the increased timber harvest and Forest Service employment for alternatives D and E would expand the Forest Service contribution to the total employment to about one percent. The increase in timber harvest can contribute to the maintenance and expansion of wood products manufacturing infrastructure.

Table 77. Total jobs and income supported by national forest activities and programs by alternative for the Umatilla socio-economic impact zone

Activity	Estimated Employment Contribution (direct, indirect, and induced)					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
Recreation	187	187	187	187	187	187
Range	153	130	19	127	127	127
Timber	243	263	117	777	561	339
Expenditures	393	393	370	470	424	392
County payments	68	68	68	68	68	68
Totals	**1,044**	**1,041**	**762**	**1,629**	**1,368**	**1,114**
Activity	**Estimated Wage Income Contribution (direct, indirect, and induced)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
Recreation	$4,527	$4,527	$4,527	$4,527	$4,527	$4,527
Range	$1,874	$1,674	$219	$1,631	$1,631	$1,631
Timber	$13,882	$15,006	$6,707	$44,365	$32,058	$19,388
Expenditures	$19,215	$19,215	$18,217	$22,706	$20,607	$19,190
County payments	$2,574	$2,574	$2,574	$2,574	$2,574	$2,574
Totals	**$42,072**	**$42,996**	**$32,244**	**$75,802**	**$61,397**	**$47,310**

Cumulative Effects on the Wallowa-Whitman Socio-economic Impact Zone

The Forest Service has moderate economic ties to the Wallowa-Whitman socio-economic impact zone with about five percent contributions to total employment and labor income. The jobs and income supported through Forest Service activities are moderately important components of the Wallowa-Whitman socio-economic impact zone's socio-economic well-being. This job contribution would decrease by 20 percent for alternative C, and would increase by close to 50 percent for alternative D. Alternative E would be the second highest with a projected increase of about 20 percent. These changes are primarily driven by the differences in Forest Service contractors and supplies for ecosystem restoration management activities, livestock grazing, and timber harvest (table 78).

The Wallowa-Whitman socio-economic impact zone resilience ranks in between the Malheur and Umatilla socio-economic impact zones. The projected decline in jobs for alternative C would have a moderate impact on the economy overall and especially in the timber related components. Projections of timber harvests on other ownerships in eastern Oregon do not indicate the potential to replace national forest timber harvest given current costs and stumpage prices (Adams and Latta 2007). The projected increase in jobs associated with the increased timber harvest and Forest Service expenditure related employment is largest for alternatives D. The increase in timber harvest can contribute to the maintenance and expansion of wood products manufacturing infrastructure.

Table 78. Total jobs and income supported by national forest activities and programs by alternative for the Wallowa-Whitman socio-economic impact zone

Activity	Estimated Employment Contribution (direct, indirect, and induced)					
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Recreation	397	397	397	397	397	397
Range	258	242	102	267	258	258
Timber	201	245	104	845	506	320
Expenditures	466	466	429	545	484	454
County payments	72	72	72	72	72	72
Totals	**1,395**	**1,422**	**1,104**	**2,126**	**1,718**	**1,502**
Activity	**Estimated Wage Income Contribution (direct, indirect, and induced)**					
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**	**Alt. E**	**Alt. F**
Recreation	$7,678	$7,678	$7,678	$7,678	$7,678	$7,678
Range	$3,435	$3,241	$1,304	$3,556	$3,435	$3,435
Timber	$11,112	$13,526	$5,723	$46,722	$28,000	$17,716
Expenditures	$22,766	$22,766	$21,166	$26,181	$23,558	$22,245
County payments	$2,389	$2,389	$2,389	$2,389	$2,389	$2,389
Totals	**$47,379**	**$49,600**	**$38,259**	**$86,526**	**$65,060**	**$53,463**

Civil Rights and Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, directs federal agencies to integrate environmental justice considerations into federal programs and activities. Environmental justice means that, to the greatest extent practical and permitted by law, all populations are provided the opportunity to comment before decisions are rendered or are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment.

In order to identify and address environmental justice concerns, the executive order states that each agency shall analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and American Indians as part of the NEPA process.

It is the policy of the Forest Service that the responsible Forest Service official (FSM 1704) review proposed actions for civil rights impacts and take either of the following actions in compliance with DR 4300-4 and 1010-1 (FSM 1730.1): prepare a civil rights impact analysis and statement of its findings for any proposed policy or organizational action which may have a major civil rights impact, or document the determination that a civil rights impact analysis and a statement of findings are not needed.

Effects and Findings

In the socio-economic impact zones for the Blue Mountains national forests, the population is generally less diverse than that of Oregon. However, the Umatilla socio-economic impact zone has a larger proportion of Hispanic or Latino population and a larger proportion of American Indians and Alaska Natives than statewide (see table 30). The American Indian population is also

proportionately larger than the state in the Malheur socio-economic impact zone. There are proportionately more people living in poverty in the three socio-economic impact zones than throughout the state (see table 31). There are two exceptions in the Malheur socio-economic impact zone: Hispanic or Latino and minorities (excluding Native Americans) have proportionately lower amounts of poverty than statewide.

The Forest Service has provided notice of comment opportunities and has considered all public input from people or groups regardless of age, race, income status, or other social/economic characteristics. There would be no adverse effects to human health and no alternative has been determined to disproportionately affect minority or low income populations.

Potentially affected American Indian tribes have been consulted. Avoidance of cultural resources, consideration of traditional values, and reasonable access through agreements, permits, and recognition of their sovereignty and legal rights are all part of the development and evaluation of the alternatives. As a result, American Indian populations would not be disproportionately impacted by any alternative.

A review of the alternatives shows the social and economic effects are generally small across the entire population. Using the alternative employment and income effects as an indicator of potential impacts to the minority, low income and the overall population, the Malheur zone with about 15 percent of the zone's employment and income contributed by Forest Service activities, would be most impacted. Alternative C would negatively affect the overall employment contribution by about 25 percent. This means about four percent of the current employment base would be affected. Alternative D would result in close to a 30 percent increase in the Forest Service contribution to the Malheur zone. This could represent a 5 percent increase in total employment opportunities in the zone.

The contribution to employment and income by the Forest Service in the Umatilla zone is less than one percent. The measureable impacts to the population for any of the alternatives are proportionately small. In the Wallowa-Whitman zone, the employment income contribution is about five percent. Alternative D has the greatest potential impact with the Forest Service contribution increasing by 50 percent.

No adverse civil rights or environmental justice impacts are anticipated at the national forest level for any under-represented population or to other populations or communities. While forestwide level impacts are not expected to be disproportionate, adverse impacts may be possible at the project planning level. Differences in forestwide effects and project-level effects are the result of uneven distributions of minorities and low-income populations geographically. Civil rights and environmental justice impacts will be examined at the local level with NEPA analysis for site-specific projects.

Issue 3: Livestock Grazing and Grazing Land Vegetation

As with many actions that involve the removal of natural resources from public land; livestock grazing, or the removal of forage by domestic animals (primarily cattle and sheep), is a an increasingly debated and highly controversial issue. This issue is shaped by opinions and scientific papers ranging from complete elimination of livestock's use of public lands, to increases in the use of public land by livestock. In dealing with this issue, the Forest Service strives to sustain the health, diversity, and productivity of the land to meet the needs of present

and future generations by using the best available science and an ecological approach to multiple use management.

In this section, the interdependency of social and economic factors and how they relate to national forest management designed to maintain or restore the composition and structure of vegetation will be addressed. These factors include the conditions of and desired condition of grazing land vegetation especially in riparian areas, the potential for disease transmission from domestic sheep to bighorn sheep, and the concern that further restrictions on grazing allotment management would adversely affect livestock operations and the livelihoods of those who graze the forest.

Livestock grazing and grazing land vegetation is discussed in several sections of this chapter including but not limited to: Economic and Social Well-Being, Aquatics, Terrestrial Wildlife, Watershed, and Plants.

Grazing land vegetation and livestock grazing will be discussed as separate topics. Cumulative effects will be discussed together at the end of this section. The economic contributions of livestock grazing and grazing land vegetation are discussed in the Economic and Social Well-Being section of this document.

History of Grazing in the Blue Mountains

Although Marcus Whitman brought several head of cattle to the Walla Walla River valley in 1836, more substantial numbers of cattle and sheep were initially brought into northeastern Oregon and southeastern Washington during the 1840s via the Oregon Trail. Native American horse herds were already large and well established by then, having arrived in the Blue Mountains around 1730 after migrating northward from the Santa Fe, New Mexico area.

Livestock grazing on Forest Service land has been essential in meeting the needs of the areas inhabitants, beginning even before the Forest Service was formed in 1905. In the early 1900's, when permits were first issued for livestock grazing, settlers living near Forest Service boundaries could obtain a free use permit to graze up to ten domestic animals on government land during the specified season. In addition, ranchers could graze larger numbers of animals on Forest Service lands, providing they purchased a permit, confined their animals to the allotted area, and salted them according to established guidelines.

The general picture of Forest Service livestock management, beginning in the first decade of the 1900s, is one of initially working to control livestock numbers (e.g., institution of permit systems, assignment of allotments, allocation of permitted livestock numbers, and seasons). This was followed by a period of working to fence national forest and allotment boundaries and to develop water sources to keep permitted livestock where they belonged and to curtail trespass livestock and to keep trespass livestock outside National Forest System lands. This in turn was followed in the mid-1900s by an emphasis on rangeland restoration (e.g., seeding and erosion control) and the beginning of development of cross fencing to increase livestock control and implement intensive grazing management systems.

Throughout this period from the very early 1900s through the mid- to late-1900s, there were very large reductions in permitted livestock. Forest Service records indicate a dramatic reduction in permitted numbers and seasons, as well as actual numbers and animal unit months (AUMs) during the first decade or so of Forest Service management. In some cases, numbers permitted were allowed to increase during both World War I and II with permitted use again declining following the war years. Since the World War II, reductions have been relatively steady and slow

as management was adjusted on an allotment specific basis to bring stocking rates in line with both land and management capability. Current permitted numbers, seasons, and AUMs are estimated to be a small fraction of what occurred prior to Forest Service management. Irwin (1994) estimated that AUMs for the Wallowa-Whitman National Forest decreased from 700,000 in 1915 to about 200,000 in 1985. In 1905, just prior to the establishment of the Wenaha Forest Reserve, the northern half of the Umatilla supported somewhere in excess of 275,000 head of grown sheep plus their increase, 40,000 head of cattle, and 15,000 head of horses. By the late 1930s, however, permitted livestock numbers for the entire Umatilla National Forest had been reduced to 88,102 head of sheep and 8,528 head of cattle (Powell 2008). The Wallowa-Whitman closed numerous sheep allotments in the mid 1990's to reduce the potential for disease transmission between the domestic sheep and bighorn sheep.

During the latter 1900s, the emphasis shifted to more intense livestock management and to the application of the best available scientific information. Allotments were cross-fenced into a greater number of pastures and rotation systems were established to ensure rest or deferment (e.g., no grazing until after the key forage plants had passed the most critical periods of growth). Permitted livestock numbers continued to trend downward but at a relatively slow pace. Throughout this period, permitted seasons were reduced to conform to standard range readiness criteria. These criteria focused on ensuring that livestock did not enter National Forest System rangelands until soils were dry enough and plants had passed the most critical periods of growth to ensure that impacts from livestock were minimal. End of season criteria were also set and adjusted based on certain factors, such as minimizing conflicts with recreation, moving before snow accumulation, and ensuring that adequate forage resources remained for large wild ungulate winter range needs. In addition, with the development of allotment cross-fencing, management was able to more actively manage use periods so as to better provide for plant growth, regrowth, and reproduction. In general, these principles are still followed, although improved understanding of plant and soil needs has allowed for adaptive management principles to be followed with regard to seasons of use, as well as authorized numbers, age classes, and types of livestock.

Finally, during the past 20 to 30 years, an awareness of the importance of riparian areas and wetlands and aquatic resources, supported by an increased emphasis on Endangered Species Act listed fish species and habitats, has resulted in implementing intensive grazing management practices. These practices are primarily focused on restoring riparian and stream conditions and on minimizing or avoiding conflict between permitted livestock and the listed fish species and their habitats. During this time period, additional monitoring has occurred to assist in the application of adaptive management principles focused on sustaining permitted livestock use while improving aquatic habitats. With localized exceptions, riparian areas in the project area are in improved condition and are trending toward continued recovery (Archer 2009). Much of the recovery to date has occurred in terms of riparian vegetation with recovery in stream morphology tending to be slower and more localized. In part, this is due to the nature of the processes involved (e.g., vegetation can grow and reproduce relatively quickly given the opportunity while hydrologic process recovery takes more time). It is also due to the multiple impacts affecting stream hydrology (e.g., roads, livestock, Forest Service management, fire management, recreation, etc.). In most cases, the recovery noted to date has been accomplished in the presence of permitted livestock along with more intense management. Some areas of concern remain but, for the most part, these are relatively localized and can be dealt with through improved management. However, there may be situations where livestock exclusion is the most appropriate or logical treatment.

In addition to the management changes, decreased AUMs, and increased focus on restoring riparian health that has occurred over the last century, the National Forest System uses the administrative acts, bills, and plans listed in appendix F as the legal framework for managing livestock.

Analysis Assumptions

Grazing by livestock or native herbivores can affect grazing land health, including removing plant material, trampling soils (compaction, displacement, and structural damage), and trailing (alteration of water flow patterns). With proper management these impacts are insignificant compared with the natural resilience of the grazing land ecosystem. However, excessive grazing can cause impacts that move a system beyond its short-term ability to maintain functionality. Excessive impacts for an extended period can cause the system to cross thresholds that permanently alter it beyond its ability to recover (Laycock 1994, Miller et al. 1994). It is assumed in this document that, in general utilization of 40 percent or less of the forage on the landscape would result in proper management (see discussion of utilization below).

Grazing land, especially riparian and wetland areas are subject to impacts from a wide variety of other uses and activities. The most critical of impacts come from roads (impacts to riparian/aquatic water relationships), large wild ungulates (impacts primarily to spring and fall rangelands), and fire (impacts from fire exclusion, wildfire/prescribed fire, and natural drought cycles).

All alternatives include management standards or guidelines that provide for the sustainability of the grazing lands of the planning area. Grazing land health and sustainability is defined by the degree to which the integrity of soils and the ecological processes of grazing land ecosystems are maintained in a healthy functional status over time in response to various disturbance processes. The determination of whether or not grazing lands are healthy depends on the levels of soil stability and watershed function, the integrity of nutrient cycles, plant species composition, and the level of disturbance resiliency relative to site potential.

State and Transition Models are tools that can demonstrate visually the changes to plant communities as a result of natural and/or human caused disturbances. State and Transition models utilize the same combination the ecological concepts used to support PNC (Potential Natural Community) and HRV (Historic Range of Variability), paired with additional relevant site data and knowledge of plant responses to management activities. These models are becoming more important resource in order to assist managers and help determine what the potential of a rangeland ecological site is in order to work towards a desired condition, identify the causal factors for improvement or degradation of an ecological site, or identify if the site has been too severely altered to be able to work towards PNC without active restoration. In a basic sense the ‘states’ in a State and Transition model is shows the range of plant communities possible given the physical rangeland site characteristics, and the ‘transition’ demonstrates the natural or human caused disturbances that can or have occurred, and what the resulting plant community could be post disturbance. Work by Stringham et al. in 2003 is a more technical reference to explain State and Transition models, and is within the list of sources cited.

The other important component to a State and Transition model is when the ecological site has been so severely disturbed that it has crossed a threshold, in which it will not improve without an active restoration strategy. In situations where ecological sites have crossed a threshold, restoration through modification of livestock management is not possible. These areas must be

managed for modified goals and objectives recognizing a new potential condition and rate of recovery for the new transitioned state.

The desired conditions are defined by layers of management direction. A desired condition is identified where HRV objectives with the *Public LURs* definitions of satisfactory condition (i.e., fair range forage condition with an upward trend or better) are met by attaining a mid-seral ecological status with an upward trend or higher condition based on the PNC, and recognizes that some communities have been altered, changing the PNC. Where ecological sites in state A are managed to maintain their current state, and ecological sites in states B and C are managed to transition toward state A (Stringham et al. 2003, Swanson and Johnson 2008, and Bestelmeyer et al. 2009). In situations where ecological sites have crossed a threshold (state D), restoration through livestock management is not possible. These lands are considered to be in unsatisfactory condition, and may have continued livestock use along as the rate of recovery of these sites is within 70 percent of the natural rate of recovery (HCNRA CMP FEIS 2003 pp C-38). Because of the time and expense to restore the condition of sites that have crossed a threshold, there are not any plans to do active restoration in the near future.

The basic measures of grazing land health are tied to the state and transition models with phases A and B presumed to be capable of ensuring long-term sustainability and resiliency. Phase C is assumed to be of concern but is still likely to allow grazing land to operate within the range of natural variability. Phase D is assumed to have resulted from some impact that may have crossed a threshold. Although there is no direct measure of grazing land health parameters associated with these phases, impacts to grazing land vegetation are often directly related and correlated to impacts to the soil resource. Therefore, the use of the phases model is believed to be a good representation of soil stability, nutrient cycles, disturbance resilience, plant species composition and health, and watershed function.

In order to provide context, especially for the economic and well-being section of this document, the total animal unit months (AUMs) available for each alternative must be estimated. For a variety of reasons, AUMs can vary on an annual basis, as well as by forest. For this reason, the number of livestock permitted between 2007 and 2009 was averaged for each forest and then divided by the number of suitable acres within active allotments in 2010 to obtain an average AUM per suitable acre. This was then used to estimate the number of livestock AUMs for each alternative, including alternative A to allow unbiased comparison between alternatives.

Design of the Alternatives

All alternatives are designed to maintain the health, sustainability, and resilience of grazing land as part of the broader landscape. How standards and guidelines would be applied and management direction for ensuring the separation of bighorn and domestic sheep make up the key differences between the alternatives. In addition, suitability for livestock grazing by alternative varies where there is more intensive management required for riparian management areas, botanical areas, Research Natural Areas, federally listed or species at risk plants, federally listed fish or critical habitat, occupied sage grouse habitat, grazing after wild fire, or wild and scenic river corridors.

For all alternatives, permitting of domestic livestock and stocking of allotments would remain a project-level decision based on guidance provided by the forest plans. This could potentially include stocking of vacant allotments.

All of the action alternatives vary in the percent utilization of woody and herbaceous vegetation within riparian management areas, but they have the same minimum residual stubble height (at the greenline) of 4-6 inches and the maximum bank alteration of 20 percent.

Alternative A would continue current forest plan direction as amended by PACFISH/INFISH requirements. Grazing permit authorizations have diminished since 1990 due to the Federal listing of fish species per the Endangered Species Act and the PACFISH and INFISH amendments to the 1990 forest plans. These changes resulted in stricter management direction for livestock grazing in riparian areas (table A-9, appendix A). Upland grazing has continued to be managed according to direction provided by Region 6 of the Forest Service (table A-8, appendix A) during the development of the current plans. Within the three national forests, 219,000 acres would be generally suitable for sheep grazing, and 3,020,000 acres would be generally suitable for cattle grazing. Alternative A does not include specific plan components to reduce the potential for or prevent disease transmission from domestic sheep to bighorn sheep on the Umatilla National Forest, although, the Forest has closed several allotments to minimize the effects to bighorn sheep from disease transmission from domestic sheep. The forest plan for the Malheur National Forest contains management direction not to stock livestock pastures within bighorn sheep ranges with domestic sheep. The Wallowa-Whitman forest plan states that management of bighorn sheep will be in accordance with a 1982 document “Wild Bighorn Sheep Conflicts with Domestic Livestock and other Wildlife Ungulates on the Wallowa-Whitman Forest -A Summary Status Report and Interim Program Direction” [Wildlife S&G #5, page 4-45]. Similar to the Umatilla, the Wallowa-Whitman has closed several sheep allotments.

Table 79. Management direction for the maximum percent utilization of livestock grazing in uplands

National Forest	Management Level	Forested		Grasslands		Shrubland	
		Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory
MAL*	Stewardship B	40%	0-30%	50%	0-30%	40%	0-25%
	Extensive C	45%	0-35%	55%	0-35%	50%	0-30%
UMA	Stewardship B	40%	0-30%	50%	0-30%	40%	0-25%
	Extensive C	45%	0-35%	55%	0-35%	45%	0-30%
	Intensive D	50%	0-40%	60%	0-40%	50%	0-35%
WAW	Stewardship B	40%	0-30%	50%	0-30%	40%	0-25%
	Extensive C	45%	0-35%	55%	0-35%	45%	0-30%
	Intensive D	50%	0-40%	60%	0-40%	50%	0-35%
OCH	Stewardship B	40%	0-30%	50%	0-30%	40%	0-25%
	Extensive C	45%	0-35%	55%	0-35%	45%	0-30%
	Intensive D	50%	0-40%	55%	0-40%	50%	0-35%

* Does not mention level D.

For the Umatilla National Forest, utilization of transitory range (where timber harvest has occurred during the last 30 years) shall not exceed 60 percent for domestic livestock.

Alternative B utilizes the status of allotments as of 2010. The estimated numbers of permitted cattle are fewer than alternative A, and acres suitable for grazing would also be fewer. Permit authorizations for grazing sheep would be slightly reduced to lessen the risk of disease transmission from domestic sheep to bighorn sheep. This alternative identified areas as unsuitable for domestic sheep/goat grazing that were estimated to have a 95 percent probability of contact

with wild sheep. It also anticipated the reestablishment of the Canyon Mountain wild sheep herd. Alternative B and the other action alternatives all include measures (standards and guidelines) to reduce the potential for or prevent disease transmission from domestic sheep to bighorn sheep. Management actions would be in cooperation with state wildlife agencies.

Table 80. Management direction for maximum percent utilization of livestock grazing in riparian areas

National Forest	Management Level	Grass and Grass-like		Shrubs	
		Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory
MAL*	Stewardship B	40%	0-30%	30%	0-25%
	Extensive C	45%	0-35%	40%	0-30%
UMA	Stewardship B	40%	0-30%	30%	0-25%
	Extensive C	45%	0-35%	40%	0-30%
	Intensive D	50%	0-40%	50%	0-35%
WAW	Stewardship B	40%	0-30%	30%	0-25%
	Extensive C	45%	0-35%	40%	0-30%
	Intensive D	50%	0-40%	50%	0-35%
OCH	Stewardship B	40%	0-30%	30%	0-25%
	Extensive C	45%	0-35%	40%	0-30%
	Intensive D	50%	0-40%	50%	0-35%

* Does not mention level D.

In general, livestock management in riparian areas under all action alternatives incorporates the Aquatic and Riparian Conservation Strategy developed by Region 6 of the Forest Service. Alternative B incorporates a utilization guideline within riparian management areas of 40 percent on both herbaceous and woody vegetation. The guideline for upland utilization of herbaceous vegetation is 50 percent or less in areas of season long use and of low departure from the desired condition. Where a management system is in place (e.g., deferred rotation, rest rotation) utilization may reach 55 percent in areas of low departure from the desired condition. Where there is moderate or greater departure from desired condition utilization is expected to be 30 percent or less under season long and 35 percent or less with a management system in place. Upland shrub utilization is not expected to exceed 45 percent.

In alternative C the area that would be generally suitable for cattle grazing would be reduced to approximately 786,000 acres, the smallest projection among alternatives. This decrease would result from the classification of riparian areas and subwatersheds with habitat for listed fish species as generally unsuitable for cattle grazing. Riparian management areas in alternative C would have a width of 300 feet on either side of all streams, regardless of stream class. The area that would be generally suitable for sheep grazing would be reduced to approximately 98,000 acres, also the lowest projection among alternatives. This decrease would result from the classification of subwatersheds within the maximum foray distance for bighorn sheep rams as generally unsuitable for sheep grazing. Any area that was not previously determined to be unsuitable as a result of site factors (slope, vegetation, canopy cover), or was outside of a listed fish subwatershed, or not within 300 feet of a stream was identified as suitable.

In general, livestock management under alternative C incorporates a utilization guideline within riparian management areas of 10 percent on herbaceous vegetation and 25 percent on woody

vegetation. Upland utilization of herbaceous vegetation is a standard of 30 percent under all management systems regardless of departure from the desired condition. Upland shrub utilization is a standard not to exceed 25 percent.

In alternative D, grazing permit authorizations for cattle would be greater than the current condition. The assumption is that portions or all of some vacant allotments would be stocked and as a result, suitable acres in active allotments would increase. Permit authorizations for grazing sheep would be slightly reduced to reduce the risk of disease transmission from domestic sheep to bighorn sheep. This alternative identified areas unsuitable for domestic sheep/goat grazing that would provide a moderate level of confidence (greater than 50 percent) of no contact with wild sheep by incorporating the 95 percent confidence area with existing EIS or preferred alternative DEIS decisions. It does not consider the reestablishment of the Canyon Mountain wild sheep herd.

Management of livestock in riparian areas is the same as proposed in alternative B, except that the riparian management areas are between 50 and 100 feet in width. Upland grazing would have a desired utilization of herbaceous vegetation of 40 percent or less in areas of season long use and of low departure from desired condition. Where a management system is in place (e.g., deferred rotation, rest rotation) utilization may reach 50 percent in areas of low departure. Where there is moderate or greater departure from desired condition utilization is expected to be 40 percent or less under season long and 45 percent or less with a management system in place. Alternative D has no utilization guideline for upland shrubs. Most other grazing management under alternative D would use desired conditions to address livestock grazing and rangeland vegetation rather than the standards and guidelines proposed for all other alternatives.

Alternatives E and F would be the same as alternative A regarding permitted numbers for cattle and acres suitable for grazing. Permit authorizations for grazing sheep to reduce the risk of disease transmission from domestic sheep to bighorn sheep for both alternatives would be the same as in alternative D.

The desired upland utilization for both E and F for herbaceous vegetation is 35 percent or less in areas of season long use and of low departure from desired condition. Where a management system is in place (e.g., deferred rotation, rest rotation) utilization may reach 40 percent in areas of low departure. Where there is moderate or greater departure from desired condition utilization is expected to be 30 percent or less under season long and 35 percent or less with a management system in place. Upland shrub utilization is not expected to exceed 40 percent.

Although both E and F follow the guidelines of the Aquatic and Riparian Conservation Strategy alternative E incorporates a utilization guideline within riparian management areas of 25 percent on both herbaceous and woody vegetation within bull trout watersheds and 40 percent in all other watersheds. Alternative F, on the other hand, incorporates an additional utilization guideline for watersheds containing anadromous fish of 35 percent for the Umatilla and Wallowa-Whitman National Forests.

Additionally, both alternatives include an objective designed to improve a portion of rangeland in phase C or D to phase A or B for all three National Forests. These two alternatives also incorporate the Oregon Department of Fish and Wildlife greater sage-grouse conservation strategy. There are guidelines surrounding fence building with in greater sage grouse habitat, livestock turnout and utilization guidelines.

Table 81. Maximum percent utilization of key grass and forbs species within upland sites*

Management System	Alt. B Departure from Desired Condition (guideline)		Alt. C Departure from Desired Condition (standard)		Alt. D Departure from Desired Condition (guideline)		Alt. E and F Departure from Desired Condition (guideline)	
	Low	Moderate or Greater	Low	Moderate or Greater	Low	Moderate or Greater	Low	Moderate or Greater
Season long	50	30	30	30	45	40	35	30
Management systems that incorporate deferment, rest, rotation	55	35	30	30	50	45	40	35

* Utilization should be based on a point in time measurement. It includes all use by permitted livestock, wildlife, insects, wildfire, or recreational use. Utilization will be based on height-weight curves and/or ocular estimates or other approved measures. Utilization is based on key species.

Low-moderate departure: phase A or B.

Moderate or greater departure: phase C or D.

Table 82. Allowable shrub utilization

Alternative B	Alternative C	Alternative D	Alternatives E & F
Guideline Upland shrub utilization should not exceed 45 percent as determined by any science-based method.	Standard Upland shrub utilization shall not exceed 25 percent as determined by any science-based method.	This alternative has no corresponding management direction.	Guideline Upland shrub utilization should not exceed 40 percent as determined by any science-based method.

Table 83. Maximum utilization within riparian management areas*

Measure	Alt. B	Alt. C**	Alt. D	Alt. E	Alt. F
Maximum percent utilization of woody vegetation (percent of mean annual vegetative production)	40%	25%	40%	25% within bull trout spawning and rearing reaches 40% for all other watercourses including anadromous fish reaches	30% in bull trout spawning and rearing habitat (all three national forests) 35% in anadromous fish reaches (UMA and WAW) 40% outside bull trout spawning and rearing habitat (MAL) 40% outside anadromous fish reaches (UMA and WAW)
Maximum percent utilization of herbaceous vegetation(percent of mean annual vegetative production)	40%	10%	40%	25% within bull trout spawning and rearing reaches 40% for all other watercourses including anadromous fish reaches	30% in bull trout spawning and rearing habitat (all three national forests) 35% in anadromous fish reaches (UMA and WAW) 40% outside bull trout spawning and rearing habitat (MAL) 40% outside anadromous fish reaches (UMA and WAW)

* In addition, the minimum residual stubble height (applies at the greenline) for all alternatives is 4 to 6 inches. ** For alternative C, this is a standard for maximum utilization within riparian management areas.

Affected Environment – Grazing Land Vegetation

Grazing lands have been affected by a wide variety of natural and human influences. The human influences have often been concurrent throughout the Forest Service and a result of an increase in multiple use of the land, as well as the application of the emerging and developing science of land management.

Rangeland Vegetation

Indicators for rangeland vegetation within the three national forests include:

- Rangeland and riparian vegetative composition and condition
- Grazing land phases and progress towards achievement of desired conditions
- Fire exclusion and extinguishment

Rangeland and Riparian Vegetative Composition and Condition

Grazing lands provide forage for wildlife, permitted livestock, and wild horses, as well as habitat for a wide variety of animal and plant species, including rare or unique plant species and communities. Grazing lands and associated plant communities also provide important watershed values, including soil protection and maintenance, high quality water storage and slow release, and biodiversity. Other intrinsic values associated with rangelands include maintenance of open space, visual beauty, and areas for recreational activities.

Rangelands are a key component of the plan area and account for approximately 765,000 acres, or about 16 percent, of National Forest System (NFS) lands of the 4.9 million acres within the three national forests, excluding the HCNRA. Including the additional grazable forest lands, the total grazing land within the plan area is approximately 3,395,000 acres, or approximately 69 percent of the national forests. The distribution of these lands is displayed in table 84.

Table 84. Grazing land for each national forest

National Forest	Rangeland (acres)	Grazable Forestland (acres)	NFS Lands Classified as Grazing Land (percent)*
MAL	230,000	1,270,000	88%
UMA	240,000	570,000	58%
WAW	295,000	790,000	60%

* total of rangeland and grazable forestland

Measures more restrictive than those of the 1990 forest plans were implemented in 1995 with the intent of protecting, conserving, and managing riparian habitats for protected resident and anadromous fish species. Monitoring of the effectiveness of these measures began in 2001 as required by the PACFISH/INFISH biological opinion (PIBO). To date, repeat PIBO sampling has been completed on more than 200 monitoring reaches in the Blue Mountains (Archer et al. 2009). In the case of riparian areas and wetlands, this monitoring information, combined with long-term camera point monitoring and professional observation, indicates that there has been recovery in many areas for many of the parameters most closely associated with livestock grazing effects (managed sites). However, this has not occurred to the extent that all sites most associated with livestock grazing effects, as well as road or recreation effects, have recovered to the point that they fully meet desired conditions. At the scale of the Blue Mountains, favorable trends have been observed in 18 of 24 aquatic and riparian habitat variables measured at managed sites and

observed differences in seven of the variables are statistically significant (PIBO data). In addition, large differences remain in several variables between managed and reference sites. Vegetative variables are improving at a faster rate than physical habitat (channel) variables. While PIBO monitoring points within areas managed for permitted livestock tend to be at a lower current condition relative to specific parameters than are reference sites (not grazed by permitted livestock), the difference may or may not be significant, depending on the specific parameter. For example, while there are differences in bank angle (favoring the reference sites), there is no apparent difference in bank stability between reference and managed areas, although there were apparent improvements in the reference sites based on repeat sampling. Further, repeat monitoring findings show little difference in effective ground cover between reference and managed sites, although green-line cover was greater at the reference sites than at the managed sites. This trend was also borne out by sampling of cross-section vegetation. One key finding was that at the managed sites, nonnative plant cover was consistently greater than on the reference sites.

Overall, PIBO monitoring tends to show a more stable riparian condition at the reference sites. While certain parameters recorded lower values at the managed sites relative to the reference sites, the raw data shows that, in general, the sites open to livestock grazing were recovering in the presence of managed livestock grazing.

These findings are supported by information, such as long-term camera points, dating, in some cases, to the late 1920s (Reid et al. 1991). These older photos, with periodic retakes, initially show extremely degraded riparian/aquatic systems with a virtual lack of woody or herbaceous vegetation, raw and down cut stream banks, and a significantly lowered water table. Following the camera points through time shows a dramatic increases in herbaceous vegetation (often beginning with Kentucky bluegrass followed by sedges and rushes) followed by increases in riparian hardwoods where adapted to the soils and the site. This is all accompanied by raising of the streambed, stabilization of the stream banks, and a significant raising of the water table. In some areas, this has occurred at a much faster rate than in others. And, in general, certain parameters respond more quickly than others. For example, effective ground cover tends to respond relatively quickly to improved management while recovery of shrubby vegetation is slower, and recovery of stream bank stability, bank angle, and general stream morphology occurs only within an extended timeframe. There are relatively localized areas where grazing continues to impact recovery (primarily by livestock but includes large wild ungulates in some areas, and wild horses in the Murderers Creek Wild Horse Territory), but it can also include the effects of roads and recreation (e.g., riparian dispersed camping and all-terrain vehicles).

With specific areas of concern remaining, many riparian areas and wetlands have improved relative to reference conditions (and relative to the early 1900s). It is believed that recovery is continuing at a relatively slow but steady rate. In some instances, this recovery may be accomplished through improved management of the impacting activities while in other cases exclusion of specific uses or activities or active restoration activities may be needed. Efforts have been ongoing to reduce the amount of time livestock have access to streams and the potential for trampling causing streambank alteration or stepping on redds. In some cases, the most effective method of protection which set stream habitat improvement on an accelerated trajectory was construction of livestock exclusion fences in critical areas on all three Forests.

Grazing Land Phases

The occurrence and persistence of a specific plant community on a site is dependent on site specific factors ranging from disturbance factors such as wildfire, drought, livestock grazing, and browsing to more natural factors such as soil structure, soil moisture, shade, plant dominance or life cycle, competition from other plants and topography. Grazing lands are dynamic systems where, at any point, the interaction of physical and biological factors shapes the plant community and the occurrence of specific species. In response to disturbance, the vegetation of a given site may change in composition, dominant species, and vegetation structure. In resilient ecosystems, these changes are readily reversible by successional processes. However, large or ongoing disturbances may modify ecosystem processes and feedbacks beyond the limit of ecological resilience and result in the transition to an alternate state with limited potential for recovery (Westoby et al. 1989, Stringham et al. 2003, Briske et al. 2008). These are the primary assumptions of state and transition models, which describe known and anticipated pathways of vegetation dynamics in relationship to disturbance factors (Stringham et al. 2003, Briske et al. 2008).

State and transition models are useful tools to evaluate the condition of rangelands. A number of state and transition models for bunchgrass plant communities have been developed for the Blue Mountains (Johnson and Swanson 2005). Others have been derived from reference conditions of ecological site descriptions. These models are based on local vegetation data and expert opinions. Transitions between states are generally described by biotic thresholds based on vegetation composition.

Johnson and Swanson (2005) classify vegetation along a gradient of increasing departure from pristine, native vegetation (reference conditions). Phases A, and B are used to describe the distinctive plant communities in a state close to reference, which represents the historic range of vegetation dynamics of a site. Phase A is the most resilient plant community within that state and depicts reference conditions. Phase B shows moderate departure from reference conditions. Phase C is strongly departed from reference conditions. This is the at-risk phase, which is the least resilient and most vulnerable to transition to an alternate state.

Sites with vegetation conditions completely departed from the reference condition are classified as phase D. This phase represents various alternate states possible for a site. Examples for phase D include potential green fescue meadows now dominated by forbs and annuals, riparian meadows seeded with nonnative species like orchard grass and meadow foxtail, rangelands invaded by nonnative species like star thistle and ventenata, and conifer encroachment of grass and shrublands that are now void of bunchgrasses. Transitions to less desirable or more desirable phases can be caused by grazing, alteration of water tables through mining or irrigation, cultivation, fire suppression, and other large disturbances. It is important to note that sites in phase D may still fulfill many ecosystem functions, such as forage production and erosion control, and with additional disturbance, may transition to a different, either less or more, desirable state.

For forest plan analysis, current vegetation survey (CVS) plots were assigned to phases and states using vegetation attributes and surface cover. Soil erosion, compaction, or other alterations were not directly measured. Plant composition thresholds can be inadequate indicators of ecosystem resilience and future ecosystem behavior (Bestelmeyer 2006). Transitions across such biotic thresholds may be reversible given enough time and changes in management activities. Transitions across abiotic thresholds (such as loss of topsoil) are typically nonreversible without extensive restoration activities. Due to uncertainty regarding thresholds and sparse data for state

and transition model validation, rangeland was classified into two categories: phases A and B include sites with little to moderate departure from reference, and phases C and D include sites that are strongly to completely departed from reference conditions and are either at risk to transition or have transitioned to an alternate state. Recovery to a previous state would require active restoration. Table 85 displays the percent of plots by national forest and phase type.

Table 85. Summary (acres) of current vegetation survey plot phases for the existing condition (alternative A) for each national forest

Phases	MAL	UMA	WAW
A or B grazable forestland	1,028,700 (81%)	535,800 (94%)	718,900 (91%)
C or D grazable forestland	241,000 (19%)	34,200 (6%)	71,100 (9%)
Total grazable forestland	**1,270,000**	**570,000**	**790,000**
A or B rangeland	59,800 (28%)	98,400 (43%)	118,000 (42%)
C or D rangeland	170,200 (72%)	141,600 (57%)	177,000 (58%)
Total rangeland	**230,000**	**240,000**	**295,000**

Desired conditions for National Forest System lands are best represented by phases A and B (little to moderate departure from reference conditions). However, a variety of past activities, such as livestock grazing, mining, and logging, have significantly altered rangelands and forestlands. Many of these activities predate the establishment of these national forests and have lasting effects on the structure and composition of vegetation cover.

In the Blue Mountains, grazable forestland sites represent the majority of the forage production. Within the Umatilla and Wallowa-Whitman National Forests, distribution among grazable forestland phase groupings are similar, with 91 to 94 percent in phases A and B (see table GR4). Within the Malheur National Forest, 81 percent of the grazable forestland is in phases A and B. Much of the phases C and D grazable forestlands within the Malheur National Forest is in the hot, dry upland forest type (ponderosa pine and fescue/mahogany/bitterbrush) and has probably been influenced by a variety of impacts, including wildfire followed by grazing, leading to the elimination of species, such as fescue or mountain mahogany.

True rangelands make up a relatively small component of the Blue Mountains national forests. The general condition of rangelands appears more departed from reference conditions than forestlands. Within the Umatilla and Wallowa-Whitman National Forests, phases A and B rangelands account for 42 or 43 percent of rangeland (see table GR4). For the Malheur National Forest, about 30 percent of rangeland is categorized in phases A and B. As with the grazable forestlands, most of the phases C and D rangelands may be the result of activities that pre-date the establishment of the Blue Mountains national forests. Whether or not these sites have indeed crossed a threshold and transitioned to an alternate state has to be analyzed on a case-by-case basis.

Forage conditions on grazable rangelands and forestlands have been evaluated during the last 50 years using condition and trend monitoring (i.e., the Parker Three-step method). Data from monitoring transects can serve as indicators of general rangeland conditions in the planning area. During the 1950s, average forage conditions were very poor; with average Parker scores of 15 out of a possible 100 (more information is available from the project record). These forage condition ratings have been steadily improving to an average of 56 in the 1990s. From 2000 to 2004, scores have decreased to an average of 47. In the 1950s, a large majority of plots had poor to very poor

forage conditions (98 percent of plots scoring less than 40). Conditions have improved significantly, and only 39 percent of sites were in poor to very poor condition from 2000 to 2004. The rate of improvement has slowed so that the trend for the last 20 years appears static. However, very few plots exhibit an obvious declining trend.

Johnson (2003) and Reid et al. (1991) published findings from 50 years of photographic and vegetation sampling within subalpine grassland ecosystems in the Blue Mountains. The study followed the ecological recovery of sites that had been degraded by early 20th century unregulated grazing. They found that in general there had been substantial improvement in ecological status with increases in native grass species and ground cover that should prevent accelerated soil erosion. While substantial improvement has occurred, they still found room for more improvement.

Skovlin and Thomas (1995) used repeat photography to document long-term changes that had occurred on a variety of Blue Mountains vegetation types between the original series of photos taken prior to 1925 and the repeat photos taken in 1992. They found shifts from grassland to shrub steppe-juniper woodland. Canyon lands were in fair condition and appeared stable. The valley grasslands had improved in general and appeared stable. Surrounding foothills were found to be in poor to good condition with an upward trend in forage values and watershed stability. Mountain grasslands showed increases in conifer encroachment but were in fair condition and stable. Mountain meadows in general showed improvements in species composition, but there were some that had not improved in 75 years. Subalpine grasslands showed increases in conifer encroachment. In another repeat photography publication, Skovlin et al. (2001) also found increases in conifer encroachment onto grasslands.

In general, with proper management as prescribed through the standards and guidelines of all alternatives, it is possible to ensure that across the landscape of an allotment, most sites will be in phases A or B with some in phase C. In some cases, there will be residual phase D sites that remain from historic impacts but it is highly unlikely that additional phase D sites will be created relative to and under proper livestock management. Overall, all alternatives are expected to result in a mosaic of phases A or B and phase C sites scattered across the allotment landscape.

The large majority of these sites would be operating within the upper levels of their state and transition models such that they retain their long-term sustainability, are capable of responding to disturbance (to include disturbance by the permitted livestock), and to cycle through various transitions with the potential to ultimately return to their potential natural community. Given grazing patterns that are common to livestock, it is possible that that certain sites e.g., those preferred by the permitted livestock, could remain at the lower levels of the state and transition model and would not return to their potential plant community in the presence of livestock. However, there are innumerable factors that affect the distribution, stocking rates, grazing systems, season of use, and grazing intensity for each specific site; therefore it we can only assume that phases at specific sites may remain unchanged in a less than potential community. These factors are constantly variable and dependent on each individual manager’s method of livestock management which all have a consistent goal of meeting the standards and guidelines within this plan and the term and conditions their grazing permit. It is assumed that if permitted livestock have the effect of maintaining certain plant communities in specific locales in a lower status, across the landscape the mosaic of plant communities should be within their natural roles.

There are phase D sites within some allotments that have occurred as a result of many different types of impacts. For example, on some sites, conifer or shrub encroachment or canopy cover may be resulting in alteration of the rangeland plant community due to the lack of appropriate

disturbance on overstory vegetation. In many instances, this would be due to a lack of periodic fire. Active restoration in the form of prescribed fire or forested revegetation management could result in the movement of these specific sites back into their near natural cycle, which could then allow them to return to their potential natural plant community. However, other sites have experienced severe enough impacts that they would be expected to remain in a phase D status for the foreseeable future. Phase D sites may have been impacted by many activities including; historic heavy and improper livestock grazing, road construction, recreation, logging, or mining impacts such that the topsoil is essentially absent and the site is no longer capable of restoration without a very significant effort.

The ability of a grazing land ecosystem to adjust to change depends upon the system's capacity to positively respond to disturbance events (or at least to respond in a minimally negative manner with the ability to recover in a reasonable timeframe). Response indicators include moving native vegetative cover and species composition toward potential natural communities; age class distribution that indicates adequate reproduction is occurring; and other plant community attributes that indicate the maintenance or improvement of soil stability, nutrient storage, and cycling.

Fire Exclusion and Extinguishment

Throughout the Forest Service and the planning area, the exclusion of fire or rapid extinguishment of fire has been a common practice. This action has many unintentional effects to grazing land vegetation such as:

- It increases coniferous tree cover, which decreases forage production.
- It increases the height, cover, and density of sagebrush, primarily for mountain big sagebrush, which decreases native herbaceous cover. (Quigley et al. 1997) Where sagebrush density and size has progressed to a major extent, it has made it more difficult to reintroduce fire into the disturbance process.
- It increases the population, abundance, and range of Western Juniper (*Juniperus occidentalis*), a species known for its ability to capture precipitation while creating monocultures of trees with very little forage production at the ground level.

The impacts of grazing management before and after a fire have a dramatic effect on the response of vegetation to the fire and to what can be expected in the long term. The need for increased intensity of grazing management on burned areas can be understood by realizing the potential change in the plant community and associated animal response that can result from a burn (Clark and Miller 2001).

The response of individual plant species to fire varies significantly between and within species. Moreover, this response is influenced by a variety of fire parameters, including intensity, severity (e.g., amount of organic matter consumed), residence time, soil heating, season of burn, and time since last fire. These parameters can vary significantly among fires and within a fire. These variations can and will cause differences in the response of individual species and the community as a whole. In addition, numerous physical and climatic factors (e.g., fuel condition, weather, slope, and aspect), as well as biological factors (plant morphology and physiology) will influence post-fire effects on plant communities. This includes direct effects, such as the ability of individual species to recover from the effects of fire.

Expected recovery potential is a function of fire severity. Johnson (1998) reported that in lightly burned areas (low severity fires) the expected recovery is fairly quick and a natural recovery of

one to two years would be expected. Moderately burned areas (medium severity fires) have a modest recovery rate of two to five years. Heavily burned (high severity fires) have a slow natural recovery and may require five or more years to recover.

Affected Environment – Livestock Grazing

Indicators for livestock grazing within the three national forests include:

- Active allotments include acres and percent of National Forest System land in active grazing allotments and acres in active allotments suitable and capable for grazing
- Forage suitability and utilization includes AUMs for cattle and sheep
- Grazing after wildfire

Active Allotments

Table 86 displays the total acres within each national forest in active cattle and sheep allotments, the acres suitable for grazing in those allotments, the percentage of those allotments suitable for grazing, and the percentage by national forest in active allotments. Suitability and capability for grazing within allotments is determined by factors that include canopy cover, steepness of slopes, plant production level, and soil condition (land type associations). Active allotments make up about 70 percent of the total land base within the plan area. This varies from 55 percent within the Wallowa-Whitman National Forest to 92 percent within the Malheur National Forest. Suitable acres in active allotments as a proportion of the plan area range from 28 percent within the Wallowa-Whitman National Forest to 81 percent within the Malheur National Forest.

Table 86. Active allotments and allotments suitable for grazing for each national forest (existing condition 2013)

Measure	MAL	UMA	WAW
Active livestock grazing allotments (all land types)	1,551,000 acres	826,000 acres	978,000 acres
Percent of national forest in active allotments	91%	59%	54%
Suitable acres in active cattle and sheep grazing allotments (currently active only)	1,299,000 acres	344,000 acres	433,000 acres
Percent of active allotment suitable for livestock grazing	81%	42%	44%
Percent of national forest suitable for grazing (percent suitable within active allotments relative to all NFS lands)	74%	25%	24%

Table 87 displays the existing permitted AUMs by national forest. This number reflects how many head of livestock are permitted on the combined allotments.

Table 87. Cattle and sheep animal unit months (AUMs) for each national forest

National Forest	Cattle and Sheep Permitted AUMs (2013)
MAL	144,100
UMA	48,600
WAW	95,423

Forage Suitability

In forest planning, the suitability and potential capability of National Forest System lands for producing forage for grazing animals and for providing habitat for management indicator species shall be determined as part of the 1982 Planning Rule, Section 219.20. Lands suitable for grazing and browsing shall be identified and their condition and trend shall be determined. The supply of forage for livestock grazing as well as wildlife species is required to be estimated. An evaluation was conducted in 2010 regarding forage availability and use, in part to determine if there is competition between wild and permitted forage users such that wild ungulate viability is being detrimentally impacted.

In general, the assessment (Countryman 2010) shows that at the landscape scale, forage availability is not a concern. In fact, forage resources are more than adequate to provide for existing and projected future needs of permitted livestock and large wild ungulates while ensuring landscape scale sustainability of rangeland ecosystems.

The 2010 assessment calculated pounds per acre of forage for each plant association group. The basic data for this was derived from the plant association guides completed for the Blue Mountains (Johnson 1987 and 1992). These estimates are at the national forest scale and are influenced by a number of variables, including variation in production on individual sites versus the broader averages, and variations in yearly climate that increase or decrease production. The permitted AUMs are generally 10 to 20 percent higher than the levels that are actually grazed in the allotment (yearly authorized number) each year. The utilization estimates displayed in table 88 represent the level that could be grazed on allotments each year.

Table 88. Total forage production (in millions of pounds) and percent utilization by permitted livestock (current use levels) for each national forest

National Forest	Utilization per Year (cattle and sheep)	Production per Year on All NFS Lands	Production on Suitable Acres in Active Allotments	Percent Utilization on Suitable Acres in Active Allotments Used by Cattle and Sheep
MAL	103	614	558	18%
UMA	37	329	169	22%
WAW	72	389	216	33%

In addition to the percent utilization by sheep and cattle displayed in table 88, elk and deer are estimated to consume an additional 1.8 to 4.8 percent. At the scale of each national forest, the available information indicates a large excess of forage production that is capable of meeting the current and projected needs for permitted livestock, as well as for large wild ungulate populations in addition to providing for the basic needs of plants, soils, and other rangeland resources. There may be site specific conflicts, although they are believed to be generally small in scope and extent.

There are a number of factors involved in this assessment. First, a portion of National Forest System lands are not within allotments (either active or vacant). All of the forage produced on these lands is therefore available for basic plant, soil, and wildlife needs, as well as other resource needs.

Second, within any given allotment, not all of the acreage is actually capable and suitable for livestock. Unsuitable areas have high canopy cover (greater than 60 percent), steep slopes

(greater than 45 percent for cattle and greater than 60 percent for sheep), or limited forage production potential (based on soil type). These unsuitable areas receive only incidental, if any, livestock grazing. The forage resources on this unsuitable portion are fully available for wildlife and other rangeland related resource needs.

Third, within the areas that are suitable for grazing, current allowable use criteria (utilization standards) are applied to the grazing resource. This means that in most cases 50 percent or less of the forage produced on these acres is available for grazing. The remaining forage production is fully available for other resource and basic plant/soil needs.

Fourth, within any given land area, livestock tend to be very selective grazers. GPS mapping of use by cattle on rangeland shows that they tend to concentrate in or near riparian areas or on lower, more gentle slopes with actual utilization tapering off as distance from water increases and as slope increases (Bailey 2001). Sheep are more able to utilize steeper slopes, but even with permitted sheep grazing, there are use preference patterns across the landscape. By operating under science-based allowable use criteria, the average, actual use of the rangelands tends to be much less than the allowable use levels across the suitable range.

Finally, livestock are only permitted for a limited season of use. In general, this period occurs from about mid-May or early June to late September or mid-October. This means that for the majority of the year there is no competition for space or forage between permitted livestock and wildlife.

In summary, not all of the grazing lands within the planning area are both suitable for livestock grazing and are within an allotment. On suitable grazing lands within allotments, annual allowable use criteria restrict the total forage harvested. As a result of livestock grazing preferences and habits, only a portion of the allowable forage is harvested by livestock, with the remaining forage available for wildlife and basic soil/plant and other resource needs.

While much of the impact from introduced plants has come from noxious weeds that are commonly treated to the extent possible, there are infestations that have limited management options and therefore are not commonly treated. Annual invasive grasses, including cheatgrass (*Bromus tectorum*), are aggressive or harmful nonindigenous plant species. Cheatgrass has invaded the planning area and can be found in many grassland and shrubland habitats. It normally has minimal influence except where significant disturbances, such as fire and excessive or improper grazing or vegetation management practices, have allowed the species to spread and become common (Quigley et al. 1997).

With changes in the historic disturbance regimes, the long-term resilience of some grazing land plant communities has changed. For example: many dry meadows within the planning area have been occupied by Kentucky bluegrass (*Poa pratensis*) (Quigley et al. 1997). This is believed to have occurred as a result of multiple and severe historic impacts to the water-soil relationships of riparian areas. Heavy livestock grazing from the late 1800s through perhaps the mid-1900s impacted palatable (and grazing sensitive) native plants and favored the spread of bluegrass. In addition, bluegrass and several other nonnative species were often planted in over-grazed areas as they are more tolerant of grazing than native bunchgrasses and are better competitors against cheatgrass.

Construction of roads and railroads to support logging and recreational activities very often dramatically altered hydrologic regimes and resulted in drier riparian and wetland soil conditions. This impacted the native herbaceous species composition to favor more drought tolerant (often

upland) species, including favoring the more drought and impact tolerant bluegrass. In summary, disturbances from wild ungulate populations, wild horses, increased recreational activities, roads, altered fire regimes, and forested vegetation management practices have altered hydrologic processes and caused some riparian areas to transition from moist or wet meadows to dry meadow or even upland conditions. While the vegetation composition of these sites is strongly to completely departed from historic reference conditions, sites may remain productive for forage.

Similar processes can be observed across upland portions within the planning area, such as where increased densities and canopy cover of conifers has negatively impacted understory herbaceous and shrubby plant composition and cover, or where a lack of fire disturbance has resulted in a loss of aspen plant communities (and its herbaceous understory) due to a replacement by conifers. In other areas, upland woody species and communities, such as bitterbrush (*Purshia tridentata*) and mountain mahogany (*Cercocarpus* spp.), have been dramatically impacted as historic alteration in natural fire frequency and intensity resulted in invasion of the sites by conifers to the extent that when fire occurs, the intensity is much more severe, and the upland shrub species are unable to successfully reestablish (Quigley et al. 1997). When regeneration does occur, excessive and/or improperly timed browsing by ungulates can suppress regeneration and growth.

Road development and the associated increase in recreational driving have increased during the past few decades. The increase in off-road vehicle use has resulted in a corresponding increase in the spread of invasive plants, disturbance of soils (erosion, loss of soil vegetation cover), and disruption of livestock or other rangeland management activities (e.g., gates left open, water sources damaged, grazing systems disrupted).

Avoiding Domestic Sheep Potential for Disease Transmission to Bighorn Sheep

Grazing by domestic sheep can increase the risk of disease transmission to bighorn sheep (George et al. 2008). Bighorn sheep are highly susceptible to some strains of Pasteurella that are carried by domestic sheep (Foreyt et al. 1994). The disease, which does not affect domestic sheep, is usually fatal to bighorn sheep. Transmission of the disease can occur when bighorn sheep and domestic sheep occupy the same area and come in physical contact with each other (Coggins 2002, Clifford et al. 2009).

As a result of die-offs and suppressed reproduction during the last century, the genetic diversity in bighorn sheep herds has been lost (Schommer and Woolever 2001). At the present time there are no vaccines to protect bighorn sheep from developing pneumonia (Clifford et al. 2009, Schommer and Woolever 2001, Srikumaran et al. 2007, Weiser et al. 2003). The only way to prevent a pneumonia outbreak in bighorn sheep herds is to keep bighorn sheep separated spatially from domestic sheep and goats (Clifford et al. 2009, Dassanayake et al. 2008, Onderka et al. 1988, Schommer and Woolever 2001).

The separation, either spatially, temporally, or both, of bighorn sheep from domestic sheep has been recommended by leading bighorn sheep disease experts (Garde 2005, Schommer and Woolever 2001, Singer 2001). The Western Association of Fish and Wildlife Agencies defines effective separation as spatial and/or temporal separation between wild sheep and domestic sheep or goats resulting in, at most, minimal risk of potential association and subsequent transmission of respiratory disease between animal groups (WAFWA 2010). It is recommended that site-specific solutions for each bighorn sheep population and domestic sheep allotment be developed based on a management strategy appropriate for the complexity of the situation (Schommer and Woolever 2001). Each of the alternatives would take this approach; however, given the complexity of the

issue in the Blue Mountains, each alternative would have pros and cons for minimizing the risk of contact between domestic and bighorn sheep.

Alternatives were evaluated on their merits for providing separation and minimizing likelihood of contact between domestic sheep and the 16 bighorn sheep populations within and adjacent to the Blue Mountains national forests.

Those alternatives that would provide the most summer source habitat in areas identified as unsuitable for domestic sheep grazing and the fewest acres of rangelands considered suited for domestic sheep grazing are considered the best options for bighorn sheep population persistence. The Wallowa-Whitman and the Umatilla National Forests would have a large portion of habitat in areas identified as unsuitable for domestic sheep grazing for all alternatives. Although the table displays acres of rangelands suitable for domestic sheep grazing, not all of those acres are currently being or would be grazed by domestic sheep. Many of the acres that could be grazed by domestic sheep are currently in cattle allotments, and, although technically they could be grazed by sheep, it would require a change in the type of livestock permitted on the allotment. For more information please refer to the "Terrestrial Wildlife Species Diversity and Viability" section of chapter 3.

Forage Utilization by Livestock

Some authors have criticized using utilization data to make grazing land management decisions. Burkhardt (1997) claims that both utilization and stubble height methods are "likely the least effective management tool" and notes that these were developed to manage season-long grazing. Burkhardt also believes proper season of use and rest are far more effective for addressing most riparian grazing problems. McKinney (1997) notes the problems associated with measuring utilization when averages are calculated based on plant-by-plant observations. McKinney also maintains that overgrazing does not occur until after the grazing animal makes more than one visit to the plant.

Despite these criticisms there is no denying that estimating levels of utilization in order to achieve proper stocking rates has a long history in range management. Early authors investigated the effects of different stocking rates and utilization levels on above-ground biomass, forage production, cover, and other vegetation attributes, as well as livestock performance. Examples include Beetle et al. (1961), Cook (1977), Cooper (1953), Houston and Woodward (1966), Hyder (1951), Johnson (1953), Klipple and Costello (1961), Lang et al. (1956), Launchbaugh (1967), Lewis et al. (1956), Paulsen and Ares (1962), Pearson (1973), Pechanec and Stewart (1949), Pickford and Reid (1948), Skovlin et al. (1976), Smith (1967), Smoliak (1974), Valentine (1970), and Woolfolk (1949). These authors support using proper utilization levels to maintain and improve forage production and key species (Holechek 1988, Holechek 1998). For example, Cook (1977), working in sagebrush-grass range, concluded that 25 percent utilization on key forage plant species was reasonable for late spring and summer use and that 50 percent utilization was the maximum use that should occur in the winter. Skovlin et al. (1976) also reported that light stocking (34 percent for bluebunch wheatgrass and less for Sandberg bluegrass) provided a substantial increase in grazing capacity and better cattle gains per head than moderate or heavy stocking. It also provided the highest game density under dual use. Regarding sagebrush-bunchgrass range in southeastern Oregon, Hyder (1951) concluded, "… although 50 percent utilization is generally considered to be moderate, it probably represents excessive cropping on the range under consideration because of the large proportion of poor and fair range condition."

Clary (1995) examined vegetation and soil responses to grazing simulation on riparian meadows and found that 10 cm or greater stubble height appears to be required to ensure full biomass production in mountain meadow sedge communities. He concluded, “If utilization guidelines are used, those rates that do not exceed 30 percent of the annual biomass production will likely maintain production the following year,” and that grazing these communities “once [growing] annually to a 5 cm stubble height in the spring, or to a 10 cm stubble height in late summer, or at a utilization rate exceeding 30 percent of the total annual biomass production can reduce herbage production significantly.” These recommendations apply only to maintaining or enhancing production and do not address the issues of stream bank stability and channel maintenance.

Holechek (1992) found that the most effective management strategy on Chihuahuan Desert rangelands was to use a conservative stocking rate (30 to 35 percent use of forage) and that this was a critical factor in the superior vegetation, livestock, and economic performance on the College Ranch at New Mexico State University compared to surrounding rangelands. Holechek (1993) summarized the importance of stocking rate and residues and concluded (Holechek et al. 1994) that conservative stocking (about 30 percent average use) can improve the herbaceous understory even on mesquite-infested range.

Hart et al. (1989 and 1993) found that proper stocking rates and grazing intensities were more important than grazing systems in improving rangeland vegetation in Wyoming. Hughes (1990) reported that on the Beaver Dam Slope Allotment (Arizona Strip District, BLM), downward trends were recorded between 1970 and 1982 at average utilization levels of 36 percent (ranging from 10 to 70 percent), while this same allotment showed an upward trend between 1981 and 1989 after utilization levels were adjusted to an average of 22 percent (ranging from 11 to 34 percent).

Holechek (2000) described conservative utilization as 31 to 40 percent and moderate as 41 to 50 percent and believed that managers should avoid heavy grazing (exceeding 50 percent). Holechek (2006) more recently concluded that in arid and semiarid areas, grazing can have positive impacts on forage plants compared to exclusion if average long-term use levels do not exceed 40 percent.

The lessons from these and other studies are that utilization levels that maintain long term health, recovery, and resilience to disturbance are highly variable and depend on site specific conditions; and the that stocking rates and grazing systems are important for improving rangeland conditions. The Blue Mountain Forests use forage utilization as a trigger for livestock management pasture moves for maintenance or improvement of resource conditions.

Grazing after Wildfire

The impacts of grazing management before and after a fire have a dramatic effect on the response of vegetation to the fire and to what can be expected in the long term. The need for increased intensity of grazing management on burned areas can be understood by realizing the potential change in the plant community and associated animal response that can result from a burn (Clark and Miller 2001).

The response of individual plant species to fire varies significantly between and within species. Moreover, this response is influenced by a variety of fire parameters, including intensity, severity (e.g., amount of organic matter consumed), residence time, soil heating, season of burn, and time since last fire. These parameters can vary significantly among fires and within a fire. These variations can and will cause differences in the response of individual species and the community as a whole. In addition, numerous physical and climatic factors (e.g., fuel condition, weather,

slope, and aspect), as well as biological factors (plant morphology and physiology) will influence post-fire effects on plant communities. This includes direct effects, such as the ability of individual species to recover from the effects of fire.

Expected recovery potential is a function of fire severity. Johnson (1998) reported that in lightly burned areas (low severity fires) the expected recovery is fairly quick and a natural recovery of one to two years would be expected. Moderately burned areas (medium severity fires) have a modest recovery rate of two to five years. Heavily burned (high severity fires) have a slow natural recovery and may require five or more years to recover.

Environmental Consequences – Grazing Land Vegetation

The following discussion describes the environmental consequences to grazing land and its relation to the significant issue of livestock grazing. The analysis considers the effects to grazing land in a landscape context and evaluates the alternatives in terms of the ability of the alternatives to contribute to grazing land health (e.g., sustainability, resilience, response to disturbance regimes, ability to maintain rangelands functionality relative to state and transition models).

Indirect Effects

Rangeland Vegetation Effects Common to all Three Forests

Alternative A

The vegetation composition would be expected to maintain the current desired condition and trend.

Current data tends to indicate that recovery trends have slowed, although the exact reasons for this are not known. Some sites, primarily foothills (especially where impacted by nonnative plant species) and certain high elevation sites where historic impacts have exceeded a threshold, would continue to remain in poor to fair range condition (approximately corresponds to the early to low mid-seral status and/or phase D). In any case, assuming that approximate current permitted livestock levels and management would remain the same for alternative A, it is likely that upland rangeland conditions would continue their improvement on most sites. In some instances this improving trend would be impacted, and could even be reversed by invasive species, or in the longer term, by climate change. Conifer or other woody vegetation encroachment and over-story canopy cover would be expected to continue at a relatively unchanged pace. This will continue to impact grazing land health on those sites in or adjacent to the woody vegetation.

For alternative A the amount of rangeland in phases A through D is expected to remain unchanged, since recovery of native species on rangeland appears to have stabilized during the last 10 years (Countryman and Swanson, project record). Rangelands that are currently in phase C as a result of livestock grazing could show passive recovery if permitted livestock numbers are reduced. Rangelands that are currently in phase D are not expected to change as a result of decreased livestock numbers.

The description of the PACFISH and INFISH riparian management objectives (RMOs) as described in appendix A would be considered to be the desired conditions. These riparian conditions would remain similar to the existing conditions due to the goal statement (desired condition) from the 1990 forest plans that states that range ecosystems should be managed to ensure that the basic needs of the forage and soil resource are met. Forage production, above that needed for maintenance or improvement of the basic resources, would be made available to wildlife and permitted domestic livestock.

Effects to rangeland vegetation from wildfire may require rest from livestock grazing for a period of time to allow regrowth, depending on the severity of the fire.

Alternative B

The vegetation composition would be expected to maintain the desired condition and trend while meeting standards and guidelines.

Current rangeland condition (health and sustainability) would continue to improve across the landscape as it has in the recent past, but possibly at a slower rate. Recovery would be due in part to using the best available science for continued management of lands where livestock grazing is permitted. Some sites, primarily foothills (especially where impacted by nonnative plant species) and certain high elevation sites where historic impacts exceeded a threshold, would continue to remain in phases C and D. Due to budget constraints, as well as feasibility, restoration efforts would continue to be limited.

Implementation of alternative B would continue the trend towards improved rangeland vegetation conditions at about the same rate as alternative A. As with all alternatives, some areas would remain in phase D.

Riparian condition is in an upward trend across the Blue Mountains (Archer 2009, 2011). The maximum allowable utilization for riparian vegetation would be 40 percent, slightly lower than the 40 to 50 percent that alternative A would allow. The riparian vegetation upward trend would continue for all national forests.

Alternative B proposes that grazing after wildland fire should be managed so as not to cause a trend away from the key species desired condition. This may include growing season deferment for one or more years following wildland fire.

Alternative C

The vegetative composition would be expected to improve the desired condition in the riparian areas without permitted grazing.

Currently the allowable utilization of available forage on suitable grasslands is 50 to 55 percent. Alternative C would reduce this utilization to 30 percent. This would be a moderate to high change substantially decreasing the utilization in both riparian and uplands.

The effect of this alternative on rangelands would generally be minimal to moderate, given that the available information (range transect data, CVS plots, PIBO monitoring) indicates that current grazing management at the scale of the Blue Mountains has led to an improvement of both upland and riparian conditions. Some of these areas may show a fairly rapid recovery initially that would slow over time.

Implementation of alternative C would continue the trend towards improved rangeland vegetation conditions. Sites where livestock grazing is controlling the transition to an alternate phase would likely transition as a result of the decrease in suitable grazing land in this alternative. As with all alternatives, some areas would remain in phase D.

Riparian areas and subwatersheds with habitat for listed fish species would be unsuitable for permitted livestock grazing. This loss of area for permitted livestock and the change to riparian vegetation utilization to 10 percent would be expected to result in the most rapid short-term recovery of riparian areas and wetlands. Total livestock removal would be likely to benefit very

specific riparian areas that may not be recovering as fast due to livestock grazing. Management Area 4B, Riparian Management Areas, is considered unsuitable for livestock grazing and would remove riparian acres from the suitable land base.

Alternative C proposes that grazing after wildland fire should be deferred until vegetation recovers to a condition where grazing will not cause the percent composition of native species to be reduced (cause a likely downward trend in key species). This generally will be a minimum of 5 years, but could be up to 10 years depending on the extent and severity of the fire and other factors.

Alternative D

The vegetative composition would be expected to maintain the desired condition while meeting standards and guidelines.

Currently the allowable utilization of available forage on suitable grasslands is 50 to 55 percent. Alternative D would reduce this utilization to 40 to 50 percent. This would be a modest change with a limited effect since utilization in the uplands does not exceed 35 to 40 percent in most active allotments.

Implementation of alternative D would continue the trend towards improved rangeland vegetation conditions. Additional AUMs for cattle and narrower riparian management areas may slow recovery at a site specific scale. Areas where off-road use impacted rangeland vegetation would start to recover and as with all alternatives, some areas would remain in phase D.

There could be an increase in riparian acres affected by livestock grazing, but the allowable riparian vegetation utilization would be the same as for alternative B. However, riparian management areas (MA 4B) would be narrower than for the other alternatives (100 feet on either side of a fish-bearing stream compared to 300 feet for all other alternatives; see details in appendix A). While the standards and guidelines that apply to MA 4B for all other alternatives apply to this alternative as well, the number of acres in this management area would be applied to a smaller area, which could lead to some impacts in the riparian zone (such as locating new livestock handling facilities, which should be placed outside of MA 4B (RMA-RNG-1)).

Effects to rangeland vegetation from wildfire may require rest from livestock grazing for a period of time to allow regrowth, depending on the severity of the fire.

Alternative E and F

The vegetative composition would be expected to maintain the desired condition and trend while meeting standards and guidelines.

Currently the allowable utilization of available forage on suitable grasslands is 50 to 55 percent. Alternatives E and F would reduce this utilization to 35 to 45 percent. This would be a modest change with a limited effect since utilization in the uplands does not exceed 35 to 40 percent in most active allotments.

Improvement and maintenance of rangeland health, sustainability, and resilience would also remain approximately the same.

Implementation of alternatives E and F would continue the trend towards improved rangeland vegetation conditions. Slightly more restrictive utilization guidelines in alternatives E and F may

result in slightly fewer numbers of permitted livestock than alternatives A. As with all alternatives, some areas would remain in phase D.

Riparian vegetation is in an upward trend across the Blue Mountains (Archer 2009, 2011). The maximum allowable utilization for riparian vegetation for these alternatives would be 40 percent, slightly less than the 40 to 50 percent that would be allowed for alternative A. The riparian vegetation upward trend would continue for all national forests.

Alternatives E and F propose that grazing after wildland fire should be managed so as not to cause a trend away from the key species desired condition. This may include growing season deferment for one or more years following wildland fire.

Environmental Consequences – Livestock Grazing

The alternatives vary in regard to several parameters affecting livestock grazing including acres suitable for grazing, AUMs, riparian management, suitability, proximity of domestic sheep to bighorn sheep, and post-fire guidance.

Indirect Effects

Suitability and AUMs

Malheur National Forest

Alternative B would have the most acres suitable for permitted cattle grazing in active allotments and the most cattle AUMs. Alternative A would have the most acres suitable for permitted sheep grazing in active allotments, although it is not significantly greater than the acres that would be suitable for alternatives B, D, E, and F. With the exception of alternative C, the alternatives would have the same number of permitted sheep AUMs. Alternative C would have approximately 81 percent less AUMs.

Table 89 displays the comparison of the key indicators used to evaluate the livestock grazing and grazing land vegetation issue by alternative for the Malheur National Forest.

Table 89. Malheur National Forest livestock grazing indicators for each alternative

Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Acres suitable for permitted cattle grazing in active allotments	1,197,000	1,225,000	620,000	1,216,000	1,197,000	1,197,000
Acres suitable for permitted sheep grazing in active allotments	102,000	101,000	55,000	101,000	101,000	101,000
Permitted animal unit months (cattle)	117,000	120,000	61,000	119,000	117,000	117,000
Permitted animal unit months (sheep)	6,500	6,500	1,200	6,500	6,500	6,500

Umatilla National Forest

Alternative B would have the most acres suitable for permitted cattle grazing in active allotments and the most cattle AUMS. Alternatives A, D, E, and F would have an equal number of acres suitable for cattle grazing, or about 96 percent of the acres that would be suitable for alternative B. Alternatives A, D, E, and F would have an equal number of cattle AUMS, or about 97 percent

of the cattle AUMs that would be available for alternative B. Alternative C would have approximately half as many suitable acres and approximately 10 percent of the cattle AUMS as alternative B would have.

Alternative A would have the most acres suitable for permitted sheep grazing and the most sheep AUMs. Of the remaining alternatives, alternatives D, E and F would have the most acres suitable for sheep grazing along with the most sheep AUMs. Alternative B would have about half as many suitable acres as alternative A and about 59 percent of the sheep AUMs that would be available for alternative A. Alternative C would have about 22 percent of the suitable acres and about 15 percent of the sheep AUMs that alternative A would have.

Table 90 displays the comparison of the key indicators used to evaluate the livestock grazing and grazing land vegetation issue by alternative for the Umatilla National Forest.

Table 90. Umatilla National Forest livestock grazing indicators for each alternative

Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Acres suitable for permitted cattle grazing in active allotments	284,000	298,000	30,000	284,000	284,000	284,000
Acres suitable for permitted sheep grazing in active allotments	60,000	28,000	13,000	42,000	42,000	42,000
Permitted animal unit months (cattle)	30,000	31,000	3,000	30,000	30,000	30,000
Permitted animal unit months (sheep)	7,800	4,600	1,200	5,800	5,800	5,800

Wallowa-Whitman National Forest

Alternative D would have the most acres suitable for permitted cattle grazing in active allotments and the most cattle AUMs. Alternative A would have the most acres suitable for permitted sheep grazing, and alternatives A and D (equal amounts) would have the most sheep AUMs. The remaining alternatives would have equal sheep AUMs.

Table 91 displays the comparison of the key indicators used to evaluate the livestock grazing and grazing land vegetation issue by alternative for the Wallowa-Whitman National Forest.

Table 91. Wallowa-Whitman National Forest livestock grazing indicators for each alternative

Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Acres suitable for permitted cattle grazing in active allotments	408,000	393,000	135,000	422,000	408,000	408,000
Acres suitable for permitted sheep grazing in active allotments	25,000	22,000	22,000	25,000	25,000	25,000
Permitted animal unit months (cattle)	77,000	74,000	26,000	80,000	77,000	77,000
Permitted animal unit months (sheep)	4,500	3,500	3,500	4,500	3,500	3,500

Amount and Percent of National Forest System land in Active Grazing Allotments

Alternative A

No change would be expected in the amount and percentage of National Forest System land in active grazing allotments.

Alternative B

Completing the Rescission Act schedule for range AMP NEPA would potentially increase acres and percent of suitable grazing land if vacant allotments become active. This analysis and subsequent decision to convert a vacant allotment to active would be done at the project level.

Alternative C

Completing the Rescission Act schedule for range AMP NEPA would potentially increase acres and percent of suitable grazing land if vacant allotments become active. This analysis and subsequent decision to convert a vacant allotment to active would be done at the project level.

Alternative D

This alternative includes the vacant allotments in the suitable land base. Completing the Rescission Act schedule for range AMP NEPA would potentially alter acres and percent of suitable grazing land if vacant allotments or portions of the vacant allotments are determined to be unsuitable. This analysis and subsequent decision regarding actual suitable acres of the vacant allotments would be done at the project level.

Alternative E and F

Completing the Rescission Act schedule for range AMP NEPA would potentially increase acres and percent of suitable grazing land if vacant allotments become active. This analysis and subsequent decision to convert a vacant allotment to active would be done at the project level.

Acres in Active Allotments Suitable and Capable For Grazing

Alternative A

No change would be expected in the acres of rangeland and grazable forestland suitable for cattle and sheep grazing.

This alternative would have a single standard:

- Do not stock livestock allotments in bighorn sheep range with domestic sheep (Malheur National Forest)
- Manage the conflict between bighorn sheep and domestic sheep in coordination with state wildlife agencies (Umatilla and Wallowa Whitman National Forests)

Alternative B

Suitable acres for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep. Suitable acres for cattle would not be expected to change. Suitable acres for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep. RNG 13 would be a Guideline of trailing of domestic sheep or goats should not be authorized or allowed within 7 miles of bighorn sheep home ranges.

Alternative C

Suitable acres for cattle and sheep would be expected to decrease due to the riparian buffers being designated as unsuitable for livestock grazing. Suitable acres for sheep would decrease more than the other alternatives due to the institution of the bighorn sheep ram maximum foray distance buffer designation for unsuitable domestic sheep grazing.

RNG 13 would be a Standard of trailing of domestic sheep or goats should not be authorized or allowed within 7 miles of bighorn sheep home ranges.

Approximately 60 percent of currently active cattle grazing allotments would be unsuitable for livestock grazing. This suitability determination would be implemented through project level analysis and decisions. This would eventually result in a corresponding decrease in permitted AUMs as displayed in table 89 through table 91.

Alternative D

This alternative would designate more acres as suitable for cattle because the riparian management areas would be the smallest. However, suitable acres for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep.

RNG 13 would be a Standard of trailing of domestic sheep or goats should not be authorized or allowed within 7 miles of bighorn sheep home ranges.

Small increases in acres in active allotment status with a corresponding slight to moderate increase in permitted livestock numbers and AUMs could occur. Actual modifications to management and stocking would be dependent on the outcome of project-level planning and decisions and would be based in part on budget levels that would allow for more intense management in specific situations, as well as for stocking of some vacant allotments. Overall, projected increases are relatively small and would not be expected to result in major effects.

Alternative E and F

Suitable acres would not change for cattle; however, suitable acres for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep.

Suitable acres for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep. RNG 13 would be a Standard of trailing of domestic sheep or goats should not be authorized or allowed within 7 miles of bighorn sheep home ranges.

Overall, the permitted cattle AUMs would remain approximately the same and any actual modifications to management and stocking would be dependent on the outcome of project-level planning and decisions.

AUMs for Cattle and Sheep

Alternative A

No change is expected in cattle and sheep AUMs.

Alternative B

AUMs for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep. AUMs for cattle would not be expected to change.

Alternative C

AUMs for cattle and sheep would be expected to decrease due to the riparian buffers being designated as unsuitable for livestock grazing. Sheep AUMs would decrease more than the other alternatives due to the institution of the bighorn sheep ram maximum foray distance buffer designation for unsuitable domestic sheep grazing.

Alternative D

This alternative would designate more AUMs for cattle because the riparian management areas would be the smallest. However, AUMs for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep.

This alternative would designate more acres as suitable for cattle because the riparian management areas would be the smallest. However, suitable acres for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep.

Alternative E and F

AUMs would not change for cattle; however, AUMs for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep.

Suitable acres for sheep would be slightly reduced to minimize the risk of potential disease transmission from domestic sheep to bighorn sheep.

Grazing after Wildfire

Alternative A

Alternative A would not include post-fire guidance for livestock grazing. Depending on fire intensity, grazing may be modified. Desired conditions for rangeland vegetation would guide management activities.

Alternative B

Alternative B would create a Guideline that grazing after wildland fire should be managed so as not to cause a trend away from the key species desired condition. This may include growing season deferment for one or more years following wildland fire. Depending on the size and severity of the wildfire, this could affect one or more pastures, or the entire allotment in the short term. In the long term, forage vigor and quality may be improved.

Alternative C

Alternative C would create a Standard that grazing after wildland fire shall be deferred until vegetation recovers to a condition where livestock grazing will not cause the percent composition of native species to be reduced (cause a likely downward trend in key species). This generally will be a minimum of 5 years, but could be up to 10 years depending on the extent and severity of the fire and other factors. This alternative would provide rangeland vegetation with the greatest opportunity to recover from wildland fire. Depending on the size and severity of the wildfire, this could affect one or more pastures, or the entire allotment. This may be a very negative impact or

hardship on the permittee(s) if there are no available vacant allotments they could occupy during this extended rest period.

Alternative D

Alternative D would not include post-fire guidance for livestock grazing. Rangeland vegetation desired conditions would guide management activities.

Alternative E and F

Alternatives E and F would create a Guideline that grazing after wildland fire should be managed so as not to cause a trend away from the key species desired condition. This may include growing season deferment for one or more years following wildland fire. Depending on the size and severity of the wildfire, this could affect one or more pastures, or the entire allotment in the short term. In the long term, forage vigor and quality may be improved.

Cumulative Effects

The analysis area for cumulative effects includes all 14 counties of the Blue Mountains, including lands administered by other federal agencies (BLM, BIA) tribal lands, state lands, and private lands. Grazing lands throughout the project area have been and continue to be subject to a wide variety of impacts. Many ranchers depend on allotments administered by the Forest Service and Bureau of Land Management to provide a portion of their year-round grazing operations. As private land continues to be developed and property values continue to increase, the desirability and feasibility of some allotments used for livestock production could decline. The project area includes an accumulation of diverse and highly dynamic land with extensive site specific characteristics that respond to each impact in a distinctive manner and within a unique and often unknown timeframe. It is essential to understand the legacy of historical impacts in order to make informed decisions on changes to rangeland management direction (as reflected within the alternatives). Additionally, understanding the historical impacts is important to consider in the context of attempting to maintain or achieve desired conditions. These impacts, taken together as past, present, and reasonably foreseeable future effects, are cumulative effects.

Wildland Fire

Fire is an intrinsic disturbance process in many rangeland ecosystems. Examples include:

- Aspen communities where fire is a key disturbance factor in regeneration and removal of conifer competition.
- Mountain big sagebrush communities where fire is a key disturbance factor in maintaining a mosaic of seral stages and age classes and in ensuring sustainability of an understory that can be overshadowed by sagebrush.

Other grazing lands are not necessarily dependent on fire as a key disturbance but have adapted to thrive in the presence of periodic fire or other disturbance, such as drought or insect infestations. Most grazing land grass/forb communities are adapted to periodic vegetative material removal and regeneration and tend to be most healthy in the presence of periodic fire and disturbance. Until about the mid-1900s, natural fire played its natural role. In general, this periodic natural fire maintained canopy covers within natural ranges; allowed for mosaics of plant communities, seral stages, and age classes; and helped to stimulate new growth of grasses and to keep them healthy and thriving. Since the mid-1900s, humans restricted the occurrence and spread of natural fire. This has had the effect of allowing an increase in conifer canopy and the encroachment of conifers, juniper, or sagebrush into open grasslands or shrublands thereby decreasing herbaceous

cover and impacting those species which required open sunny conditions. As canopies closed, the understory herbaceous and shrubby vegetation was reduced or lost. This impacted forage quantity, quality, and availability for native ungulates, as well as for permitted livestock. With this loss, forage harvest was concentrated even more on the open grasslands, shrublands or on riparian areas and wetlands.

Fire exclusion has had a significant effect on grazing land vegetation and this effect is expected to continue into the future in areas where increased urbanization has made the use of fire and the potential for natural fire more difficult.

Conversely, the use of prescribed fire has also had effects on grazing lands. In some instances, fire was used to control shrub vegetation (e.g., sagebrush or juniper) without a clear understanding of how natural fire would have affected plant communities. In other instances, fire was overused and impacted plant community health and sustainability. Additionally, fire use inadvertently favored the spread of invasive species, such as cheatgrass. For the most part, prescribed fire has had minimal and mostly short-term effects to rangeland resources, such as soils, vegetation, wildlife, and recreational or visual quality.

It is critical to allow rest from livestock grazing for recovery of the vegetation following any high intensity wild fire or prescribed fire. Lower intensity or mosaic prescribed fire tends to stimulate vegetative growth and is normally considered to have a positive effect on rangeland vegetation.

Large Wild Ungulates

During the past century-and-a-half or so, there have been significant changes in both the species and the population of large wild ungulates, such as deer, elk, and wild horses. Some changes have been a result of human decisions designed to increase populations of deer and elk. At times these actions worked too well with the effect that the population exceeded grazing capacity with negative and lasting impacts to the vegetation (and sometimes to the soils) in certain geographic areas. This has been demonstrated through the use of upland exclosures.

In some cases, wild ungulate populations increased to occupy available habitat niches. Elk are a prime example in the Blue Mountains with few if any elk present in the early 1900s and increased populations currently. The effect of this could increase the grazing pressure on forage and browse plants, especially when the increased wild ungulate population is added to permitted livestock. In general, the initially rapid reduction in permitted livestock (early 1900s) followed by a slower but continuing reduction in both permitted numbers, seasons of use, and areas open to livestock grazing has offset the increased effects of large wild ungulate use. However, this is not the case everywhere and the dual use results in both historic and current impacts to soils and forage resources in some areas. It is expected that this situation will continue with relatively stable large wild ungulate populations (with natural fluctuations) and a slow decline in permitted livestock (or in the case of some of the alternatives, a rapid and significant decrease in permitted livestock).

Roads

Most road construction occurred during the past 40 to 50 years. The construction of roads in the uplands was done to access management areas for timber harvest and forested vegetation activities. For the most part, these roads have few direct effects on grazing lands, but there can be a number of indirect and cumulative effects. Specifically, roads tend to act as significant vectors for the invasion or spread of invasive species. This is discussed in more detail in the access section but for the grazing lands vegetation assessment purposes, invasive species tend to have a very long lasting impact on grazing lands health (especially on disturbance regimes and

resilience/sustainability). The effect of invasive species dates to the early to mid-1900s. Effects include competition with native grasses and forbs for space, water, and nutrients. In the most extreme examples, certain invasive species can replace native plant communities and result in a transition to phase D that may not respond to reasonable restoration efforts. Invasive species can and have also impacted fire regimes with the greatest impacts occurring to upland shrub communities (e.g., a cheatgrass infestation). However, upland roads have also altered water regimes to the extent that natural runoff is diverted or subsurface water flow is intercepted and then diverted. This can change local plant communities. In addition, it was common practice at one time to seed roads with nonnative species, such as smooth brome (*Bromus inermis*) or yellow blossom sweet clover (*Melilotus officialis*). These species have had an effect on native grazing lands vegetation, at times replacing native grasses and forbs on specific sites.

Recreation

Increases in wildland recreation use have often paralleled the development of roads with four-wheel or backcountry driving becoming a significant impact in some areas. For the most part, early to mid-1900s recreation was limited to hunting and camping mostly along riparian areas. More recently recreation has increased with very significant increases in backcountry driving. As recreation uses of all kinds have increased, so too have the conflicts between uses and activities, such as permitted livestock grazing, as well as with desired vegetative conditions. Increases in recreation activity tend to be associated with increases in soil erosion, importation and spread of invasive plants or animals, and damage to rangeland vegetation, as well as an increase in livestock management gates left open, water developments damaged, and livestock harassed with a resultant loss in management control and effectiveness. With increasing urbanization and a desire for recreation on national forests, it would be expected that conflicts and impacts would continue and possibly increase.

Private Lands and Open Space

Private lands within and associated with the plan area have historically been used for activities in conjunction with uses and activities on National Forest System lands. For example, all livestock grazing permits for the national forests are linked with private ranch lands through requirements for ownership of base property. In addition, most permit holders are dependent on national forest grazing permits to round out and make their overall operations economically viable. For a variety of reasons, public lands have seen a decline in the amount of forage authorized for use. This trend is anticipated to continue, although at a slower rate. Livestock operation costs are expected to continue rising and market prices will continue to fluctuate. This will result in economies of scale and some smaller operators may dispose of base properties due to financial reasons. In such cases allotments may be released and may or may not be incorporated into other allotments.

In general, National Forest System lands within the plan area can and are affected by management of the private lands. As ranches are sold and subdivided, there will continue to be a net loss of open space. Development of the private lands for home sites tends to increase impacts to the national forests for recreation, but there are also effects associated with loss of wildlife habitat and increases in invasive species infestation and spread. This has led to the relatively recent recognition of the importance of maintaining open space as an important component of wildlife habitat, maintenance of native biodiversity, and for social values offered by solitude. The open space offered by National Forest System lands becomes increasingly important, especially as private lands are developed for home sites.

Water Development and Uses

Scattered through the project area are various kinds of water developments, including reservoirs for irrigation water and recreation; diversions, normally for irrigation but also for urban uses; and developments for livestock, recreation, and so forth. The impacts of these developments are difficult to describe and quantify relative to grazing lands, but, in general, diversion of water from one place to another tends to affect native vegetation and soils. Loss of water in one place can result in changes of vegetation to more xeric species while addition of water to other sites, such as along conveyance ditches, often results in increases in mesic vegetation and often in invasive species. The contrary also exists where water developments that were constructed for livestock use are now readily used and relied upon by wildlife, even to a greater extent than by livestock. Some of these developments have been in place for decades to a century or more, so the effects are well established. It is likely that there will be additional developments in the future, especially with the increased need to keep livestock off streams with federally listed fish.

Forested Vegetation Management

Management of conifer vegetation over time has had important effects to grazing land vegetation. Historically, forested vegetation was manipulated by Native Americans through the use of fire to maintain a relatively open canopy. This often was based on maintaining ease of travel, as well as habitat for wildlife species used by the Native Americans for food and other needs. When Euro-Americans settled in the area, the most significant impacts would have been as a result of control of fire (e.g., increases in canopy cover with loss of understory herbaceous and shrubby vegetation or encroachment of conifers into rangelands). The early livestock management practices associated with heavy utilization and improper management resulted in a loss of fine fuels to carry fire and an increase in forested vegetation regeneration with no means of maintaining it at levels representative of the historic ranges. With early logging practices that tended to hi-grade mature timber (especially ponderosa pine and Douglas-fir), little thought was given to managing the residual forested vegetation or to reproduction for future forest health. The result again was a dramatic increase in canopy cover, encroachment into rangelands, and a general dramatic loss of herbaceous and woody understory species and forage production for both wildlife and livestock. More recently, forested vegetation management has moved to a longer-term focus of healthy forestlands, but there is a huge backlog of overstocked stands with little or highly altered understory herbaceous and shrubby vegetation. At the same time, a continuation of fire suppression practices has exacerbated this situation. In the future, it is likely that political restrictions on forested vegetation management, combined with restrictions on the use of wildland fire, are likely to result in a continuation of overstocked and/or closed canopy stands. The exceptions will probably be limited to those areas where there is active forested vegetation management, including practices, such as periodic thinning. The long-term effect of this is a reduction in understory vegetation relative to what likely occurred prior to the 1900s with a continuing loss of forage production and wildlife habitat. In part this means that the true rangelands (e.g., grasslands, shrublands, etc.) carry more of the wildlife and permitted livestock forage harvest than should occur.

Climate Change

Climate change, primarily through increases in temperatures and CO_2, and changes in precipitation, likely will result in shifts in species composition and distributions of rangeland communities and thus also in forage production. Climate changes have resulted and will continue to result in earlier initiation of the growing season, longer growing season length, earlier plant senescence, mismatches between climate characteristics and plant phenology, and increased risk of drought and fire disturbance. In fact, rangeland systems in general may be an early indicator of

climate change due to the dominance of grasses and forbs and, hence, their relatively higher sensitivity to annual climate variability compared to forestlands.

General increases in precipitation could result in expansion of woody species and shifts from grasslands to shrublands, or from grasslands and shrublands to woodlands and forests. Conversely, decreases in effective precipitation could cause declines in vegetation productivity and shifts from forests, woodlands, and shrublands to grasslands and deserts. Given enough water for growth, elevated CO_2 has the potential to increase rangeland plant productivity through increases in water-use efficiency. Native cool season species are positively affected by higher CO_2 levels, but so are some nonnative invasive plant species, such as cheatgrass, red brome, and others (Chambers and Pellant 2008).

Some species have the potential to migrate upslope with increases in temperature. However, habitat fragmentation and barriers to migration may impede many species from migrating to more suitable habitats in the north. Some native rangeland species may be displaced where climate change favors invasive species.

Rangelands will likely be affected by increasing amounts of wildfire but may still have fewer disturbances than occurred either historically (e.g., natural fire, Native American fire, wild ungulate grazing) or through Euro-American activities. Ecosystem disturbances can accelerate both loss of native species and invasion of exotics (Sala et al. 2000).

Changes in rangeland composition, structure, seasonality and productivity could have consequences for livestock grazing, including changes to the annual timing of grazing (e.g., earlier on- and/or off-dates), and reduced overall AUMs where forage production declines.

Effects from the Alternatives – The alternatives differ in their relative contributions to climate change adaptation primarily in the degrees they would restore ecosystem resilience, reduce uncharacteristic disturbance, and reduce barriers to species movement. Alternative D would have the most forest thinning and thus potentially the greatest reduction in uncharacteristic disturbance, followed by alternatives E and F. Alternative D would have the most invasive species eradication, thus reducing the risk of displacement of native species by nonnative invaders. Alternative C would have the greatest area allocated to designated wildlife corridors (MA 3C), followed by alternatives E and F, and would likely provide more favorable conditions for species migration than other alternatives.

Issue 4: Old Forest

This section describes the affected environment and possible environmental consequences of the alternatives related to the old forest significant issue. Many commenters suggested an active approach to reducing the risk of loss of old forest from insects, disease, and wildfire, and to accelerate the development of old forest structure. Other people prefer the use of nonmechanical (non-timber harvest) means to restore old forests and the designation of old forest reserves where no significant timber harvest is allowed.

Affected Environment

Old forest key indicators include:

- Acres of old forest within management area allocations with limited management activity
- Acres of vegetation treatments within old forest

- Change in old forest structure over time
  - Percent of each upland forest potential vegetation group (PVG) in the old forest single-story (OFSS) and old forest multi-story (OFMS) structural stages at year 50

While various definitions of old forest exist, it is important to note that old forest does not refer to an individual, old tree or even a scattering of old trees. Old forest is a late stage of stand development that develops over a relatively long period of time. The age at which old forest develops and the specific structural attributes that characterize old forest will vary widely according to forest type, climate, site conditions, and disturbance regime (USDA Forest Service 1993). While old forest is mainly distinguished from younger growth by having an abundance of physiologically old trees (for the species and site conditions) that are dominant in the overstory and are usually larger in diameter, other characteristics include variation in tree sizes and spacing, accumulations of large-size dead standing and fallen trees that are high relative to earlier structural stages, decadence in the form of broken or deformed tops or boles and root decay, canopy gaps, and understory patchiness (USDA Forest Service 1993).

Compositionally, old forest encompasses both older forests dominated by shade-intolerant species, which are fire-dependent, and forests near climax stages dominated by shade-tolerant species. Old forest may be single-story (typically shade-intolerant) or multi-story (typically shade tolerant). Rates of change in composition and structure are slow, relative to younger forests. Different stages or classes of old forest are recognizable in many forest types. Old forest is not necessarily virgin or primeval. Old forests have developed following human disturbances, including timber harvest (Kolb 2007). The structure and function of an old forest ecosystem is influenced by its stand size, structure, disturbance regime, species composition, and its position on the landscape.

The Blue Mountains were historically well known for vast expanses of old forest single-story ponderosa pine that dominated the landscape, as well as old moist and cold upland forest. Frequent, low severity and mixed severity wildfire was one of the dominant forces that historically created and maintained these stands. Infrequent, high severity fire was a dominant force influencing old forest in the high elevation cold upland forest environments. Insect and disease disturbances were also important in creating small scale, as well as larger scale, contributions to the downed wood and standing dead tree component of old forest. The variation in size, intensity, and frequency of these disturbances contributed to a pattern of old forest that was probably not stable on the landscape (Hessburg et al. 2005). Old forest positioning on the landscape was not static historically. Rather, old forest probably shifted spatially over time. As some old forest stands succumbed to high severity disturbances, other areas were progressing from mid-aged and mature forest into old forest.

Due to past harvest and wildfire (see the Forested Vegetation, Timber Resources, and Wildland Fire section for historic overview), the percent of the dry upland forest potential vegetation group in the old forest single-story open canopy structural stage is far less than levels that occurred prior to 1900. The percent of the moist and cold upland forest potential vegetation groups in old forest structural stages is closer to the pre-1900 levels, in comparison to the dry upland forest potential vegetation group (Countryman and Justice 2008).

Public forests are facing new challenges caused, in part, by expectations that forests provide a myriad of services along with products, while maintaining old forests. In the 1990s, people were recognizing that historic forest structure and patterns were fluid across the landscape due to natural disturbances (Rogers 1996). As management emphasis of public lands moved towards restoration and historical range of variability (HRV), managers recognized the need to mimic

natural disturbances (Ontario Ministry of Natural Resources Forest Management Branch 2001, Mitchell et al. 2002, Sarr et al. 2004). Reliance on designated old growth management areas (OGMA) has now been determined to be ineffective to meet the needs of wildlife species dependent on old forest because the concept ignores the role of historic disturbance regimes and the shifting of old forest across the landscape. Additionally, as pointed out by Simberloff (1987) and displayed in table 92, not all of the areas identified as OGMAs actually contain old growth. Klenner et al. (2000) demonstrated that when natural disturbance is taken into account, the loss of old growth from designated OGMAs due to wildfire indicates that maintaining old growth solely on the limited OGMA landbase is a risk-prone strategy. They state: “maintaining a specific feature may at best be highly uncertain, or at worst, detrimental to planning for long-term objectives as it creates a false sense of security about the future landscape condition.”

A wide spectrum of social values is associated with old forests. Various groups of people find old forests aesthetically pleasing, ecologically important, intrinsically and economically valuable, and necessary for a resilient and sustainable landscape. Additionally, public forests are facing new challenges caused, in part, by expectations that forests provide a myriad of services along with products, while maintaining old forests.

The Forested Vegetation, Timber Resources, and Wildland Fire section of this document also discusses the existing condition of old forest in the Blue Mountains and the effects of the alternatives on the amount of old forest over time. This section summarizes that information and describes the management approaches for old forest by alternative. The Terrestrial Wildlife Species Diversity and Viability section discusses the importance of old forest as habitat and the effects of the alternatives on wildlife species that depend on old forest.

Existing Condition

Table 97, table 98, and table 99 display the existing amounts of old forest structural stages within each national forest. Within the Malheur National Forest, approximately 25 percent of all upland forest potential vegetation groups (cold, moist, and dry) are currently in old forest structural stages (OFSS and OFMS). Approximately 1 percent of the cold upland forest potential vegetation group, 3 percent of the dry upland forest, and 5 percent of the moist upland forest are in the old forest single story (OFSS) structural stage. Approximately 20 percent of the cold upland forest potential vegetation group, approximately 20 percent of the dry upland forest potential vegetation group, and 47 percent of the moist upland forest potential vegetation group are in the old forest multi-story (OFMS) structural stage.

Within the Umatilla National Forest, approximately 30 percent of all upland forest potential vegetation groups (cold, moist, and dry) are currently in old forest structural stages (OFSS and OFMS). Little or no (approximately 0 percent) of the cold upland forest potential vegetation group, approximately 4 percent of the dry upland forest potential vegetation group, and approximately 23 percent of the moist upland forest potential vegetation group are in the OFSS structural stage. Approximately 30 percent of the cold upland forest potential vegetation group, approximately 8 percent of the dry upland forest potential vegetation group, and approximately 32 percent of the moist upland forest are in the OFMS structural stage.

Within the Wallowa-Whitman National Forest, approximately 32 percent of all upland forest potential vegetation groups (cold, moist, and dry) are currently in old forest structural stages (OFSS and OFMS). Approximately 1 percent of the cold upland forest potential vegetation group, 1 percent of the dry upland forest potential vegetation group, and 1 percent of the moist upland forest potential vegetation group are in the OFSS structural stage. Approximately 34 percent of

the cold upland forest potential vegetation group, approximately 14 percent of the dry upland forest potential vegetation group, and approximately 25 percent of the moist upland forest potential vegetation group are in the OFMS structural stage.

Of the approximately one million acres of old forest located within the Blue Mountains, less than 400,000 acres are located within a management allocation that has a significant potential to be treated using active timber management (areas with developed road systems and suitable for timber production). All acres of old forest would be potentially available to be managed using fire, depending on the potential of that activity to be compatible with moving the landscape toward the desired conditions.

Historic Estimates of Old Forest Abundance Compared to the Existing Condition

Within all three national forests, the percent of the moist and cold upland forest potential vegetation groups in old forest structural stages is less departed from the HRV, in comparison to the dry upland forest potential vegetation group (Countryman and Justice 2008). The percent of the dry upland forest potential vegetation group in the old forest single-story (OFSS) structural stage is far less than levels that occurred historically due to interruption of the historical fire regime, past timber harvest, and uncharacteristically severe wildfire (see the Forested Vegetation, Timber Resources, and Wildland Fire section for historic overview).

Table 231 and table 232 display the existing forested structural stages (percent of potential vegetation group) and the HRV/desired conditions by national forest within each upland forest potential vegetation group. Within the Malheur cold upland forest potential vegetation group, the percent of the landscape in the OFSS stage is below the HRV, while the percent of the landscape in the OFMS stage is within the HRV. Within the Malheur dry upland forest potential vegetation group, the percent of the landscape in the OFSS stage is below the HRV, while the percent of the landscape in the OFMS stage is above the HRV. Within the Malheur moist upland forest potential vegetation group, the percent of the landscape in OFSS stage is below the HRV, while the percent of the landscape in the OFMS stage is above the HRV.

Within the Umatilla cold upland forest potential vegetation group, the percent of the landscape in the OFSS stage is below the HRV, while the percent of the landscape in the OFMS stage is above the HRV. Within the Umatilla dry upland forest potential vegetation group, the percent of the landscape in the OFSS stage is below the HRV, while the percent of the landscape in the OFMS stage is within the HRV. Within the Umatilla moist upland forest potential vegetation group, the percent of the landscape in the OFSS and OFMS stages are above the HRV.

Within the Wallowa-Whitman cold upland forest potential vegetation group, the percent of the landscape in the OFSS stage is below the HRV, while the percent of the landscape in the OFMS stage is above the HRV. Within the Wallowa-Whitman dry upland forest potential vegetation group, the percent of the landscape in the OFSS stage is below the HRV, while the percent of the landscape in the OFMS stage is above the HRV. Within the Wallowa-Whitman moist upland forest potential vegetation group, the percent of the landscape in the OFSS stage is below the HRV, while the percent of the landscape in the OFMS stage is above the HRV.

Current Old Forest Management Direction Specific to Each National Forest

Current management direction for timber sales within all three national forests is partly derived from the Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (Eastside Screens), which was added to the 1990 forest plans by amendment in 1995. The Eastside Screens provides management direction for late and old

structure (LOS; see appendix A). In the forest plan revision analysis, late and old structure is referred to as old forest. The Eastside Screens requires national forests to manage old forest within the HRV that occurred pre-1850. Harvest is allowed within old forest stands when the amount of old forest is within or above the HRV, but not when it is below the HRV. Besides direction to manage old forest within HRV, the Eastside Screens includes the following management direction related to the individual large diameter trees: "When LOS is below HRV, maintain all remnant late- and old-seral (LOS) and/or structural live trees greater than 21 inches d.b.h. that currently exist within stands proposed for harvest activities." See the Forested Vegetation, Timber Resources, and Wildland Fire section for further discussion of HRV.

The current amount of old forest (inside and outside of old forest management areas) is much greater than the amount that was predicted when the 1990 forest plans were approved. At that time, significant amounts of old forest were expected to be harvested during the next two decades. The implementation of the 1993 Eastside Screens caused the harvest of large trees to effectively cease within the three national forests, virtually halting the conversion of old forest to young forest. In some cases, the Eastside Screens also prevented the conversion of OFMS to OFSS.

The Eastside Screens management direction does not include designation of management areas for old forest, but applies wherever old forest occurs on the landscape.

Old Growth Management Areas

All three national forests currently have management allocations for old forest as displayed in table 92.

Table 92. Old forest structure within 1990 forest plans designated old forest management areas

National Forest	Acres in Old Forest Management Areas	Actual Old Forest Structure within Old Forest Management Areas*
MAL	84,232	33,000 acres (39%)
UMA	44,277	13,000 acres (22%)
WAW	60,285	21,000 acres (35%)

* Based on GIS current old forest management areas and existing vegetation layer.

Table 92 displays actual acres of old forest structure with current old forest management areas. Actual acres of old forest structure were determined by forest plan monitoring surveys (1995 to 2003 walk-through survey data), as well as data on existing vegetation conditions. The table shows that many dedicated old forest management areas are not currently meeting the intent of the forest plans for old forest. For example, within the Wallowa-Whitman National Forest, only 35 percent of dedicated old forest management areas currently exhibit old forest structure and meet the forest plan old forest definitions. Additionally, the size of current dedicated old forest areas may be inadequate to meet the habitat requirements for which they were established.

Many areas allocated to old forest in the 1990 forest plans did not meet the definition initially and were chosen to meet patch size and distribution requirements or expected to grow into old forest. These areas were not necessarily chosen because they were the best old forest available in the area. Over the past 20 years, old forest allocations have been affected by disturbances, such as fire, windthrow, insects, and diseases. In some instances, acres dedicated to old forest management areas have experienced vegetation species composition or forest structure changes due to disturbances; however, these acres are still allocated to old forest management areas.

Existing Management Direction for the Malheur National Forest

The Malheur forest plan (1990) describes old growth (management area 13) as composed of mature/over mature sawtimber (150 years old or older), which provides habitat for wildlife species dependent on mature/over mature forest conditions, provides for ecosystem diversity, and provides for the preservation of aesthetic qualities.

Existing Goal: Provide "suitable" habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities.

Current activity restrictions within Management Area 13:

- Identified as unsuitable for timber management
- Motor vehicle use is restricted to open roads and trails
- New road construction should avoid old growth stands

Existing Management Direction for the Umatilla National Forest

Under current management direction, old forest is allocated to two management areas: Dedicated Old Growth and Managed Old Growth. The goal of dedicated old growth is to provide and protect sufficient suitable habitat for wildlife species dependent upon mature and/or over-mature forest stands and to promote a diversity of vegetative conditions for such species. The goal of managed old growth is to provide and protect sufficient suitable habitat for wildlife species dependent upon mature and over mature lodgepole pine forest stands and to promote a diversity of vegetative conditions for such species. Fuels treatments are permitted to maintain or enhance old growth habitat characteristics or reduce the potential for a large number of acres burned or high severity burns.

Current activity restrictions include:

- Motor vehicle use is restricted to open roads and trails
- New road construction should avoid old growth stands where feasible and practical
- Dedicated old growth: Timber management and harvest activities are not permitted
- Managed old growth: Timber harvest activities are permitted for the purpose of enhancing wildlife habitat

Existing Management Direction for the Wallowa-Whitman National Forest

Under current management direction, this management area was allocated for the preservation of old forest (old growth in the current forest plan). It is intended to maintain habitat diversity, preserve aesthetic values, and to provide old-growth habitat for wildlife. Although the forest plan allocates 36,750 acres to this management area, maps of the allocations were not finalized at the time the plan was signed and later mapping of this allocation showed that it includes 60,285 acres.

Current activity restrictions:

- Unsuitable for timber management
- Timber harvest, including salvage, may occur
- New road construction should avoid old growth

Design Elements for the Action Alternatives

The intent of all burning and timber harvesting treatments would be to improve ecological resiliency by:

- favoring shade intolerant species, such as ponderosa pine and western larch, (according to the desired conditions for species composition),
- reducing stand densities within the dry upland forest potential vegetation group (according to the desired conditions for stand densities),
- reducing the abundance of multi-storied stands on the landscape (according to the desired conditions for forested structural stages),
- increasing the percent of the landscape in old forest structural stages (according to the desired conditions for forested structural stages), and
- decreasing the potential for uncharacteristically severe insect and fire effects.

The majority of treatments would occur in the dry upland forest potential vegetation group, with fewer treatments being applied in the moist and cold upland forest potential vegetation groups (see aapendix B, table B-11).

Under all of the action alternatives, management of old forest would be guided by the desired conditions for forested structural stages. The desired conditions for the percent of each upland forest potential vegetation group in the OFSS and OFMS stages are displayed in table 93. Management of old forest would also be guided by the desired conditions for other structural and functional attributes, such as stand density, species composition, fire regime condition class (FRCC), fire severity, insect and disease risk hazard, and landscape patterns.

Table 93. Desired conditions for old forest (percent of landscape)

Potential Vegetation Group	Old Forest Single Story	Old Forest Multi-story
Cold upland forest	5-20%	10-25%
Moist upland forest	10-20%	15-20%
Dry upland forest	40-65%	1-15%
Dry upland woodland	20-40%	30-50%

See the “Forested Vegetation, Timber Resources, and Wildland Fire” section for more discussion of forested structural stages desired conditions.

Design Elements Specific to Alternative B

Alternative B would not include a specific land management area allocation for old forest. Like the Eastside Screens direction in alternative A, alternative B would manage old forest where it exists on the landscape. Many older forest stands that do not yet meet the definition of old forest (as defined in the Forest Service Region 6 Interim Old Growth Definition green-book) would become old forest over time. Some old forest stands would be affected by disturbances and would no longer meet the definition of old forest or provide old forest habitat requirements. The management direction in this alternative would contain flexibility which would allow forest stands to be managed for their structural stage, regardless of their management allocation.

Old forest would not be included in lands suitable for timber production and would not contribute to the allowable sale quantity. Because of a deficit of old forest structure within the Blue

Mountains and viability concerns for species that depend on that resource, even-aged management regeneration harvests would not be scheduled within current old forest stands. Under alternative B, timber harvest in old forest stands could utilize uneven-aged management single tree selection and small group selection harvests or various thinning methods. Alternative B would contain a guideline that would prohibit new road and trail construction in old forest.

Design Elements Specific to Alternative C

Under alternative C, old forest stands outside of wilderness and backcountry areas would be designated and placed into an old forest land management allocation (MA 4C Old Forest). Table 94 displays the acres of old forest that would be allocated to MA 4C Old Forest Management Areas under alternative C. These acres would be allocated in areas that would otherwise be allocated to MA 4A General Forest. As forest stands change over time, some acres in MA 4C would no longer be old forest, while other acres outside of MA 4C would become old forest. Under alternative C, old forest stands would be considered unsuitable for timber production and timber harvest. No commercial harvest would occur within these old forest management areas, but prescribed fire and harvesting of smaller diameter trees would be allowed. Treatments within MA 4C would consist mostly of thinning trees less than 8 inches d.b.h. Alternative C would contain a standard that would prohibit new road and trail construction in old forest.

Table 94. MA 4C old forest acres for alternative C for each national forest

National Forest	MA 4C Acres
MAL	205,391
UMA	95,177
WAW	106,263

Design Elements Specific to Alternative D

Alternative D would not include a specific land management area allocation for old forest. Alternative D would manage old forest where it exists on the landscape. Many old forest stands that do not currently meet the definition of old forest (as defined in the Forest Service Region 6 Interim Old Growth Definition green-book) would become old forest over time. Some old forest stands would be affected by disturbances and would no longer meet the definition of old forest or provide old forest habitat requirements. The management direction in this alternative would contain flexibility which would allow forest stands to be managed for their structural stage regardless of their management allocation.

Under alternative D, old forest would be included in lands suitable for timber production and would contribute to the allowable sale quantity, where old forest stands within general forest (MA 4A) may be suitable for timber production. However, timber harvest under alternative D would not convert old forest to non-old forest because of a deficit of old forest structure within the Blue Mountains and viability concerns for species that depend on that resource. Even-aged management regeneration harvests would not be scheduled within current old forest stands. Under alternative D, timber harvest in old forest stands could utilize uneven-aged management single tree selection and small group selection harvests or various thinning methods. Management activities would be expected to move the landscape towards the desired conditions for the percent of the upland forest potential vegetation group in the OFSS and OFMS structural stages.

Alternative D would contain a guideline that would prohibit new road and trail construction in old forest.

Design Elements Specific to Alternatives E and F

Alternatives E and F would not include a specific land management area allocation for old forest. Alternatives E and F would manage old forest where it exists on the landscape. Many old forest stands that do not currently meet the definition of old forest (as defined in the Forest Service Region 6 Interim Old Growth Definition green-book) would become old forest over time. Some old forest stands would be affected by disturbances and would no longer meet the definition of old forest or provide old forest habitat requirements. The management direction in this alternative would contain flexibility that would allow forest stands to be managed for their structural stage regardless of their management allocation.

Old forest would not be included in lands suitable for timber production and would not contribute to the allowable sale quantity. Because of a deficit of old forest structure within the Blue Mountains and viability concerns for species that depend on that resource, even-aged management regeneration harvests would not be scheduled within current old forest stands. Under alternatives E and F, timber harvest in old forest stands could utilize uneven-aged management single-tree selection and small group selection harvests or various thinning methods. These alternatives would contain a guideline that would prohibit new road and trail construction in old forest.

Management of Individual Large Diameter and/or Old Trees

In addition to the guidance pertaining to the management of old forest stands, the alternatives would differ in their management direction regarding individual large diameter and/or old trees. While this is discussed in the old forest section, the guidance pertaining to the management of individual large diameter and/or old trees would not be limited to old forest stands, but would apply both within and outside of old forest stands under all of the alternatives. The desired conditions, objectives, and standards and guidelines are discussed in detail in appendix A.

Alternative A

Alternative A would continue to follow direction from Eastside Screens. Where late and old structure falls below the HRV, the following guideline would apply: maintain all remnant late and old structure and/or structural live trees greater than 21 inches d.b.h. that currently exist within stands proposed for harvest activities. If the single-story late and old structure stage is within or exceeds HRV within a watershed, or if both late and old structure single and multi-story are within or exceed HRV, then harvest can occur within these structural stages as long as late and old structure conditions do not fall below HRV.

Alternative B

Alternative B would include a guideline related to the management of individual large diameter trees. This guideline includes the retention of live trees 21 inches d.b.h. and greater, with exceptions that allow the removal of trees 21 inches d.b.h. and greater under specific circumstances to achieve other desired conditions, such as species composition or special habitats, or due to safety concerns.

Alternative C

Alternative C would include a standard that would prohibit harvesting live trees 21 inches d.b.h. and greater (no exceptions). This standard would be applied to areas outside of designated old forest management areas that grew into an old forest structural stage during the life of the plan.

Alternative D

Alternative D would not include a standard or guideline that would specifically address the management of individual large diameter and/or old trees. However, only minimal harvest of trees greater than 21 inches d.b.h. would be expected to occur under alternative D because of a deficit of old forest structure within the Blue Mountains and viability concerns for species that depend on that resource. This alternative would allow for more site-specific flexibility both within and outside of old forest stands to achieve other desired conditions for forested vegetation, for example, species composition.

Alternative E

Rather than using a guideline based on diameter, alternative E would contain a guideline that emphasizes retaining live trees with certain old tree characteristics. Using physical tree characteristics to infer old age would be an easier approach to managing individual old trees, would ease project implementation, and would be less expensive and time-consuming, in comparison to an alternative that utilized a more strict age guideline. For most tree species, certain tree characteristics can be used as a fairly reliable indicator of older age (generally greater than 150 years old, but varies by species and site). Van Pelt (2008) describes these characteristics in terms of the appearance of bark, branches, knots, and tree crown. Under alternative E, a guideline would be applied to areas both within and outside of old forest stands specifying that management activities should generally emphasize retaining live trees with certain old tree characteristics. For most species, old trees are generally considered to be greater than 150 years in age and may exhibit certain old tree characteristics. However, these old tree characteristics and old age may vary by species and site and should be further developed on a project-specific basis.

Alternative F

Rather than using a guideline based on diameter, alternative F would contain a guideline based on age. An age-based guideline could result in increased difficulty during project implementation. Determining tree age can be a time-consuming task that involves coring individual trees with an increment borer. This process could make project implementation labor-intensive and expensive if a cut unit contained an abundance of trees that are larger in diameter and/or appear to be in the general age range of 150 years old.

Under this alternative, management activities both within and outside of old forest stands should retain live old trees greater than 150 years old, except in lodgepole pine cover types (retain trees greater than 120 years old).

Environmental Consequences – Old Forest

Projections of future effects are uncertain because they are influenced by a complex interaction of factors, such as climate change, fire, insects, and diseases. Using past events as a basis for constructing models of future projections may cause additional uncertainty. The past is not always a good predictor of what will happen in the future, which is why the effects of management activities would be monitored.

Key Indicator: Acres of old forest within management area allocations with limited management activity

Table 95 displays the acres of old forest within management areas where limited management activity would occur. Under alternative C, a substantial number of additional acres would be allocated to MA 4C Old Forest Management Areas in areas that would otherwise be allocated to MA 4A General Forest. As forest stands change over time, some acres in MA 4C would no longer be old forest, while other acres outside of MA 4C would become old forest. Under alternative C, old forest stands would be considered unsuitable for timber production and timber harvest. No commercial harvest would occur within these old forest management areas, but prescribed fire and harvesting of smaller diameter trees would be allowed. Treatments within MA 4C would consist mostly of thinning trees less than 8 inches d.b.h. Alternative C would also contain the greatest number of acres of preliminary administratively recommended wilderness areas. As a result of these management area allocations, alternative C would result in the highest number of acres of old forest located within land allocations with limited management activity, in comparison to the other alternatives.

Table 95. Acres of existing old forest within wilderness areas, old forest management areas, and backcountry areas for each alternative for each national forest

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	78,000	81,000	350,000	73,000	85,000	85,000
UMA	142,000	188,000	322,000	176,000	191,000	191,000
WAW	144,000	152,000	290,000	143,000	153,000	153,000

Alternatives B, D, E, and F would not include a specific land management area allocation for old forest. These alternatives would manage old forest where it exists on the landscape. Many old forest stands that do not currently meet the definition of old forest (as defined in the Forest Service Region 6 Interim Old Growth Definition green-book) would become old forest over time. Some old forest stands would be affected by disturbances and would no longer meet the definition of old forest or provide old forest habitat requirements. The management direction in these alternatives would contain flexibility that would allow forest stands to be managed for their structural stage regardless of their management allocation.

Alternatives A and D would have the lowest number of acres in wilderness areas, backcountry areas, and old forest management areas, resulting in the fewest acres of old forest in areas with little or no timber harvest.

Key Indicator: Acres of vegetation treatments within old forest

Table 96 displays the estimated annual levels of timber harvest within old forest by alternative within each national forest. The majority of timber harvest activities (approximately 60 to 90 percent) would occur within the dry upland forest potential vegetation group. The intent of all vegetation treatments within old forest (harvest, precommercial thinning, and prescribed fire), regardless of the alternative, would be to sustain and increase the amount of old forest structure, improve tree species composition, reduce stand density, and reduce the probability of severe levels of wildfire or insect related mortality outside of the desired condition. All of the alternatives provide management direction that would emphasize retaining current amounts of old forest and increasing these amounts over time. All of the alternatives contain the same desired

conditions for the percent of each upland forest potential vegetation group in old forest structural stages. One of the differences between the alternatives would be the number of acres treated annually, which would influence the rate at which the desired conditions would be achieved over varying percentages of the landscape.

Table 96. Acres of predicted timber harvest (per year) within old forest for each alternative for each national forest

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	500	800	0	4,800	1,600	1,000
UMA	300	500	0	2,900	1,000	500
WAW	200	300	0	2,900	700	500
Total	1,000	1,600	0	10,600	3,300	2,000

Alternative A would continue annual timber harvest within old forest at the current rate of approximately 1,000 acres per year.

Under alternative B, annual timber harvest in old forest would increase to 1,600 acres, resulting in an increase of approximately 60 percent, when compared to alternative A.

Under alternative C, timber harvest would not occur in old forest because old forest would be allocated to MA 4C Old Forest Management Areas, which would emphasize limited management. Treatments within old forest would consist mostly of thinning trees less than 8 inches d.b.h. Under alternative C, vegetation treatments within old forest would rely heavily on the use of prescribed fire (planned ignitions) and wildfire (unplanned ignitions) managed for resource benefits.

Alternative D would result in the greatest increase in timber harvest within old forest. Under alternative D, annual timber harvest in old forest would increase to 10,600 acres, resulting in an increase of approximately 960 percent, when compared to alternative A. Timber harvest under alternative D would not convert old forest to non-old forest because of a deficit of old forest structure within the Blue Mountains and viability concerns for species that depend on that resource. Even-aged management regeneration harvests would not be scheduled within current old forest stands. Under alternative D, timber harvest in old forest stands could utilize uneven-aged management single tree selection and small group selection harvests or various thinning methods. Management activities would be expected to move the landscape towards the desired conditions for the percent of the upland forest potential vegetation group in the OFSS and OFMS structural stages.

Under alternative E, annual timber harvest in old forest would increase to approximately 3,300 acres, resulting in an increase of approximately 230 percent, when compared to alternative A.

Under alternative F, annual timber harvest in old forest would increase to approximately 2,000 acres, resulting in an increase of approximately 100 percent, when compared to alternative A.

Key Indicator: Change in old forest structure through time

Malheur National Forest

Table 97 displays old forest structural stages as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Malheur National Forest.

Table 97. Old forest structural stages (percent of upland forest potential vegetation group) under each alternative within the Malheur National Forest

Potential Vegetation Group and Structure	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold OFSS	5-20	1	3	6	4	6	4	7	3	5	4	5	4	5
Cold OFMS	10-25	20	26	17	26	17	24	16	22	12	23	13	24	14
Dry OFSS	40-65	3	7	13	6	11	6	10	10	16	8	16	7	12
Dry OFMS	1-15	20	22	20	22	20	22	22	18	16	19	15	21	19
Moist OFSS	10-20	5	6	7	6	5	6	6	6	6	6	6	6	6
Moist OFMS	15-20	47	47	34	47	35	47	35	44	30	46	31	47	33
All PVGs OFSS and OFMS (percent)	NA	25	30	33	30	31	30	31	29	30	29	30	29	30
All PVGs OFSS and OFMS (thousands of acres)	NA	365	445	484	439	461	439	462	426	452	427	439	435	451

OFSS = old forest-single story; OFMS = old forest- multi-story; DC = desired condition; EC = existing condition; PVG=potential vegetation group

Cold Upland Forest Potential Vegetation Group – Within the Malheur cold upland forest potential vegetation group, all of the alternatives would result in achievement of the desired conditions for the percent of the cold upland forest potential vegetation group in the OFSS stage at year 50. The percent of the cold upland forest potential vegetation group in the OFSS stage would increase from existing conditions to year 50 under all of the alternatives. All of the alternatives would also achieve the desired conditions for the OFMS stage at year 50. The percent of the cold upland forest potential vegetation group in the OFMS stage would increase from existing conditions to year 20 under all of the alternatives, but would then decrease by year 50 due to mortality caused by wildfire and insects. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group. Additionally, the cold upland forest potential vegetation group in general exhibits the least amount of departure from the HRV because the historical fire regime was characterized by higher severity fire that burned infrequently; therefore this forest type has experienced the fewest number of missed fires. However, this structural stage may be difficult to maintain within the desired conditions range, especially with climate change potentially increasing the level of stand-replacing wildfire.

Dry Upland Forest Potential Vegetation Group – Within the Malheur dry upland forest potential vegetation group, none of the alternatives would achieve the desired conditions for the percent of the landscape in the OFSS stage by year 50 due to the large amount of variation between the existing and desired conditions and the amount of time required to develop old forest structural attributes. However, alternatives D and E would result in the greatest increase in the OFSS stage in the dry upland forest potential vegetation group at year 50, exceeding other alternatives by approximately 3 to 6 percent.

Alternatives D and E would also result in the greatest decrease in the OFMS stage in the dry upland forest at year 50, exceeding other alternatives by approximately 3 to 5 percent. This would be the result of increased timber harvest activities associated with these alternatives. Timber harvest activities would focus on the conversion of the OFMS stage to the OFSS stage by decreasing stand densities and by removing smaller size classes in the understory, while favoring larger diameter trees of more fire tolerant species. Although alternative D would not include a standard or guideline that would specifically address the management or retention of individual large diameter and/or old trees, only minimal harvest of trees greater than 21 inches d.b.h. would be expected to occur inside and outside of old forest stands under alternative D because of a deficit of old forest structure within the Blue Mountains and viability concerns for species that depend on that resource. Alternative D would allow for more site specific flexibility both within and outside of old forest stands to achieve other desired conditions for forested vegetation, for example, species composition.

Alternative E would include a guideline that would emphasize retaining live trees with certain old tree characteristics. Using physical tree characteristics to infer old age would be an easier approach to managing individual old trees, would ease project implementation, and would be less expensive and time-consuming, in comparison to an alternative that utilized a more strict age guideline. Only alternative E would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the OFMS stage at year 50. However, alternative D would only vary from the desired condition range by approximately 1 percent at year 50. Under alternatives D and E, a greater percent of the dry upland forest potential vegetation group would more closely resemble the historical open, single-story old forest structure that existed prior to interruption of the historical fire regime characterized by frequent fire. These old forest stands would be expected to be more ecologically resilient due to increased health and vigor and decreased risk of insect, disease, and fire-related mortality.

Alternative C would result in the highest percent of the dry upland forest potential vegetation group in the OFMS stage and the lowest percent in the OFSS stage at year 50. Although alternative C would contain a standard that would strictly prohibit the harvesting of all live trees 21 inches d.b.h. and greater, this standard would not result in closer achievement of the desired conditions for the percent of the dry upland forest potential vegetation group in old forest structural stages. Alternative C would result in forest structures that are more departed from the historical structures that evolved with the historical frequent fire regime. These stands would be at an increased risk of attack from bark beetles and other insects and would be more susceptible to uncharacteristically severe wildfire due to the greater amount of departure from the HRV.

Moist Upland Forest Potential Vegetation Group – Within the Malheur National Forest moist upland forest potential vegetation group, none of the alternatives would achieve the desired conditions for the percent of the landscape in the OFSS or OFMS stages at year 50. All of the alternatives would result in approximately 5 to 7 percent of the moist upland forest potential vegetation group in the OFSS stage.

Under all of the alternatives, the percent of the moist upland forest potential vegetation group in the OFMS stage would be lower at year 50, in comparison to existing conditions, due to mortality caused by fire, insects, and disease. Alternatives D and E would come closest to achieving the desired conditions for the percent of the moist upland forest potential vegetation group in the OFMS stage. Alternatives D and E would result in approximately 30 to 31 percent of the moist upland forest potential vegetation group in the OFMS stage at year 50.

Umatilla National Forest

Table 98 displays old forest structural stages as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Umatilla National Forest.

Table 98. Old forest structural stages (percent of upland forest potential vegetation group) under each alternative within the Umatilla National Forest

Potential Vegetation Group and Structure	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold OFSS	5-20	0	2	7	2	7	2	8	2	7	2	7	2	7
Cold OFMS	10-25	30	20	11	19	11	19	10	18	9	18	9	19	10
Dry OFSS	40-65	4	7	15	7	12	6	11	9	14	8	15	7	13
Dry OFMS	1-15	8	11	10	11	10	12	12	9	8	10	7	10	9
Moist OFSS	10-20	23	15	9	14	8	16	10	15	28	16	9	15	9
Moist OFMS	15-20	32	37	29	37	29	37	29	36	28	35	28	36	28
All PVGs OFSS and OFMS (percent)	NA	30	31	29	31	28	32	28	30	26	30	27	31	27
All PVGs OFSS and OFMS (thousands of acres)	NA	345	358	329	353	314	361	324	344	301	347	307	352	312

OFSS = old forest-single story; OFMS = old forest- multi-story; DC = desired condition; EC = existing condition; PVG = potential vegetation group

Cold Upland Forest Potential Vegetation Group – Within the Umatilla cold upland forest potential vegetation group, all of the alternatives would achieve the desired conditions for the percent of the cold upland forest potential vegetation group in the OFSS stage at year 50. All of the alternatives would also achieve the desired conditions for the percent of the cold upland forest potential vegetation group in the OFMS stage at year 20. However, the percent of the cold upland forest potential vegetation group in the OFMS stage would decrease by year 50 under all of the alternatives due to mortality caused by wildfire and insects. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group. This potential vegetation group, in general, exhibits the least amount of departure from the HRV because the historical fire regime was characterized by higher severity fires that burned infrequently; therefore this forest type has experienced the fewest number of missed fires. However, this structural stage may be difficult to maintain within the desired condition range, especially with climate change potentially increasing the level of stand-replacing wildfire.

Dry Upland Forest Potential Vegetation Group – Within the Umatilla dry upland forest potential vegetation group, none of the alternatives would achieve the desired conditions for the percent of the landscape in the OFSS stage by year 50 due to the large amount of variation between existing and desired conditions and the amount of time required to develop old forest structural attributes. However, alternatives A, D, and E would result in the greatest increase in the OFSS stage in the dry upland forest potential vegetation group at year 50, exceeding other alternatives by approximately 1 to 4 percent. Under alternatives D and E, timber harvest activities

in old forest would focus on the conversion of the OFMS stage to the OFSS stage by decreasing stand densities and by removing smaller size classes in the understory, while favoring larger diameter trees of more fire tolerant species.

Although alternative D would not include a standard or guideline that would specifically address the management or retention of individual large diameter and/or old trees, only minimal harvest of trees 21 inches d.b.h. and greater would be expected to occur inside and outside of old forest stands because of a deficit of old forest structure within the Blue Mountains and viability concerns for species that depend on that resource. Alternative D would allow for more site specific flexibility both within and outside of old forest stands to achieve other desired conditions for forested vegetation, for example, species composition.

Alternative E would include a guideline that would emphasize retaining live trees with certain old tree characteristics. Using physical tree characteristics to infer old age would be an easier approach to managing individual old trees, would ease project implementation, and would be less expensive and time-consuming in comparison to an alternative that utilized a more strict age guideline.

Under all of the alternatives, the OFMS stage would remain within the desired condition range at years 20 and 50. Alternative C would result in the lowest percent of the dry upland forest potential vegetation group in the OFSS stage at year 50. Although alternative C would contain a standard that would strictly prohibit the harvesting of all live trees 21 inches d.b.h. and greater, this standard would not result in closer achievement of the desired conditions for the percent of the dry upland forest potential vegetation group in old forest structural stages. Alternative C would result in forest structures which are more departed from the structures that evolved under the historical fire regime. These stands would be at an increased risk of attack from bark beetles and other insects and would be more susceptible to uncharacteristically severe wildfire due to the greater amount of departure from the HRV.

Moist Upland Forest Potential Vegetation Group – Within the Umatilla moist upland forest potential vegetation group, all of the alternatives would achieve the desired conditions for the percent of the landscape in the OFSS stage at year 20. However, the percent of the moist upland forest potential vegetation group in the OFSS stage would continue to decrease under all of the alternatives, except alternative D, between years 20 and 50 due to mortality caused by insects and fire. Under alternative D, the percent of the moist upland forest potential vegetation group in the OFSS stage would increase to approximately 28 percent at year 50 and exceed the desired condition range. This would be the result of increased timber harvest activities associated with this alternative, which would result in decreased stand densities, increased tree health and vigor, decreased fire hazard, and decreased insect-related mortality.

The alternatives would not result in a substantial difference in the percent of the moist upland forest potential vegetation group in the OFMS stage. Under all of the alternatives, the percent of the moist upland forest potential vegetation group in the OFMS stage would be lower at year 50, in comparison to existing conditions, due to mortality caused by fire, insects, and disease. However, all of the alternatives would exceed the desired condition range for the percent of the moist upland forest in the OFMS stage at year 50.

Wallowa-Whitman National Forest

Table 99 displays old forest structural stages as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Wallowa-Whitman National Forest.

Table 99. Wallowa-Whitman National Forest old forest structure stages (percent of landscape) for each alternative

Potential Vegetation Group and Structure	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold OFSS	5-20	1%	3	5	3	5	3	5	3	5	3	5	3	5
Cold OFMS	10-25	34%	27	20	28	20	27	20	27	20	27	20	27	20
Dry OFSS	40-65	1%	4	9	4	8	4	7	6	11	5	11	4	9
Dry OFMS	1-15	14%	13	11	13	11	14	12	11	8	11	8	13	9
Moist OFSS	10-20	1%	4	6	3	5	4	6	3	5	5	7	4	6
Moist OFMS	15-20	25%	23	17	23	17	23	17	22	15	21	16	22	17
All PVGs OFSS and OFMS (percent)	NA	32%	23	22	23	21	23	21	22	20	23	21	23	21
All PVGs OFSS and OFMS (thousands of acres)	NA	444	322	303	321	291	322	294	310	287	319	296	319	295

OFSS = old forest-single story; OFMS = old forest- multi-story; DC = desired condition; EC = existing condition; PVG = potential vegetation group

Cold Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman cold upland forest potential vegetation group, the alternatives would not result in a substantial difference in the percent of landscape in the OFSS or OFMS stages because very little active management would occur. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within this potential vegetation group. Additionally, the cold upland forest potential vegetation group, in general, exhibits the least amount of departure from the HRV because the historical fire regime was characterized by fires that burned infrequently; therefore, this forest type has experienced the fewest number of missed fires.

All of the alternatives would achieve the desired conditions for the percent of the cold upland forest potential vegetation group in the OFSS and OFMS stages at year 50, though the percent in the OFMS stage would decrease from existing conditions under all of the alternatives due to mortality caused by wildfire and insects. This structural stage may be difficult to maintain within the desired condition range, especially with climate change potentially increasing the level of stand-replacing wildfire.

Dry Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman dry upland forest potential vegetation group, all of the alternatives would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the OFMS stage at years 20 and 50. None of the alternatives would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the OFSS stage by year 50 due to the large amount of

variation between existing and desired conditions and the amount of time required to develop old forest structural attributes. However, alternatives D and E would result in the greatest increase in the OFSS stage in the dry upland forest potential vegetation group at year 50, exceeding other alternatives by approximately 2 to 4 percent. This would be the result of the increased levels of timber harvest activities associated with these alternatives. Timber harvest activities would focus on the conversion of the OFMS stage to the OFSS stage by decreasing stand densities and by removing smaller size classes in the understory, while favoring larger diameter trees of more fire tolerant species.

Although alternative D would not include a standard or guideline that would specifically address the management or retention of individual large diameter and/or old trees, only minimal harvest of trees 21 inches d.b.h. and greater would be expected to occur inside and outside of old forest stands because of a deficit of old forest structure within the Blue Mountains and viability concerns for species that depend on that resource. Alternative D would allow for more site-specific flexibility both within and outside of old forest stands to achieve other desired conditions for forested vegetation, for example, species composition. Alternative E would include a guideline that would emphasize retaining trees with certain old tree characteristics. Using physical tree characteristics to infer old age would be an easier approach to managing individual old trees, would ease project implementation, and would be less expensive and time-consuming, in comparison to an alternative that utilized a more strict age guideline.

Alternative C would result in the lowest percent of the dry upland forest potential vegetation group in the OFSS stage at year 50. Although alternative C would contain a standard that would strictly prohibit the harvesting of all live trees 21 inches d.b.h. and greater, this standard would not result in closer achievement of the desired conditions for old forest within this potential vegetation group. Alternative C would result in forest structures which are more departed from the historical structures that evolved with the historical frequent fire regime. These stands would be at an increased risk of attack from bark beetles and other insects and would be more susceptible to uncharacteristically severe wildfire due to the greater amount of departure from the HRV.

Moist Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman moist upland forest potential vegetation group, none of the alternatives would achieve the desired conditions for the percent of the landscape in the OFSS stage at year 50. Alternative E would result in the greatest percent of the landscape in the OFSS stage at year 50, but would be slightly below the desired condition range. All of the alternatives would achieve the desired condition for the percent of the moist upland forest potential vegetation group in the OFMS stage at year 50. Under all of the alternatives, the percent of the moist upland forest potential vegetation group in the OFMS stage would be lower at year 50, in comparison to the existing conditions, due to mortality caused by fire, insects, and disease.

Key Indicator Summary

Table 100 displays a summary of the key indicators for old forest by alternative within each national forest. Although old forest is described using two structural stages (OFSS and OFMS) within three different potential vegetation groups, only OFSS within the dry upland forest potential vegetation group was used in the summary of key indicators. The dry upland forest potential vegetation group is the best reflection of the differences between the alternatives because approximately 60 to 90 percent of harvesting treatments would occur within the dry upland forest potential vegetation group. Additionally, OFSS within the dry upland forest potential vegetation group tends to exhibit the greatest amount of departure from the HRV.

Historically, fires burned with relatively high frequency in the dry upland forest potential vegetation group. After over a century of fire suppression, the dry upland forest potential vegetation group has experienced a greater number of missed fires than the moist and cold upland forest potential vegetation groups. In general, old forest in the cold and moist upland forest potential vegetation groups tend to be less departed from the HRV than the dry upland forest potential vegetation group.

Table 100. Key indicators summary for old forest for each alternative for each national forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Malheur						
Acres of old forest within management area allocations with limited management activity	78,000	81,000	350,000	73,000	85,000	85,000
Acres of vegetation treatments per year in old forest	500	800	0	4,800	1,600	1,000
Percent old forest at year 50 (all potential vegetation groups)	33%	31%	31%	30%	30%	30%
Percent dry upland forest in OFSS stage at year 50	13%	11%	10%	16%	16%	12%
Umatilla						
Acres of old forest within management area allocations with limited management activity	142,000	188,000	322,000	176,000	191,000	191,000
Acres of vegetation treatments per year in old forest	300	500	0	2,900	1,000	500
Percent old forest at year 50 (all potential vegetation groups)	29%	28%	28%	26%	27%	27%
Percent dry upland forest in OFSS stage at year 50	15%	12%	11%	14%	15%	13%
Wallowa-Whitman						
Acres of old forest within management area allocations with limited management activity	144,000	152,000	290,000	143,000	153,000	153,000
Acres of vegetation treatments per year in old forest	200	300	0	2,900	700	500
Percent old forest at year 50 (all potential vegetation groups)	22%	21%	21%	20%	21%	21%
Percent dry upland forest in OFSS stage at year 50	9%	8%	7%	11%	11%	9%

Table 100 displays the percent of all upland forest potential vegetation groups combined in old forest structural stages (OFMS and OFSS) by alternative within each national forest. When all upland forest potential vegetation groups within a national forest are combined and old forest is analyzed at a broader scale, the differences in the percent of the landscape in old forest (OFSS and OFMS combined) would vary by approximately 1 to 3 percent between alternatives at year 50. Within the Malheur National Forest, all of the alternatives would result in approximately 30 to 33 percent of all upland forest potential vegetation groups in old forest structural stages at year 50. Within the Umatilla National Forest, all of the alternatives would result in approximately 26 to 29 percent of all upland forest potential vegetation groups in old forest structural stages at year

50. Within the Wallowa-Whitman National Forest, all of the alternatives would result in approximately 20 to 22 percent of all upland forest potential vegetation groups in old forest structural stages at year 50.

When the total land area is separated into areas that are more actively managed (timber harvest) versus those with limited management activity (wilderness and backcountry), several different trends begin to emerge. Under all of the alternatives, the actively managed areas would exhibit a positive trend through time, with an increasing percent of the landscape in old forest. For example, the percent of the dry upland forest potential vegetation group in the OFSS stage would increase at year 50, compared to the existing conditions, under all of the alternatives. Those areas with limited management activity would exhibit a negative trend through time, with a decreasing percent of the landscape in old forest (see analysis file). There are several possible reasons for these trends. The combination of existing age class distribution (even within the old forest), stand density, species composition, and mix of potential vegetation groups can influence the level of wildfire and insect related mortality. Especially in the dry upland forest potential vegetation group, those stands with the highest density, highest proportion of fir, and the oldest age are those most susceptible to wildfire and insect mortality (Campbell 1996). Those old forest stands that would have some level of prescribed fire and/or timber harvest would have a lower probability of high levels of mortality of the older trees within the stand, and consequently slightly increasing amounts of old forest through time.

Within all three national forests, alternative C would result in the greatest number of acres of old forest in management area allocations with limited or no timber harvest. While alternative C would allocate the greatest number of acres to old forest, this does not necessarily mean that alternative C would result in the greatest number of acres of actual old forest structure on the landscape. The trend data mentioned in the preceding paragraph displays a decreasing percent of the landscape in old forest for areas less actively managed. Additionally, history has shown that allocations to old forest areas with limited or no management activity has not been an effective method of increasing the percent of the landscape in old forest. Over the past 20 years, old forest allocations have been affected by disturbances, such as fire, windthrow, insects, and diseases. In some instances, acres of dedicated old forest areas where vegetation species or structural composition have changed due to disturbances are still allocated to old forest management areas. Reliance on designated old growth management areas (OGMA) has now been recognized to be ineffective to meet the needs of old growth dependent wildlife species because the concept ignores the role of historic disturbance regimes and the resulting movement of old forest across the landscape. Klenner et al. (2000) demonstrated that when natural disturbance is taken into account, the loss of old growth from designated OGMAs due to wildfire indicates that maintaining old growth solely on the limited OGMA landbase is a risk-prone strategy. Additionally, as pointed out by Simberloff (1987) and displayed in table 92, not all of the areas identified as OGMAs actually contain old growth. The majority of the areas currently designated as old growth management areas do not meet the forest plan definition of old forest or the size may be inadequate to meet habitat requirements.

The most actively managed areas under each of the alternatives would be the dry upland forest potential vegetation group, where approximately 60 to 90 percent of the timber harvest activities would occur. Table 99 displays the percent of the dry upland forest potential vegetation group in the OFSS stage by alternative within each national forest.

Alternatives D and E would result in the greatest number of acres of vegetation treatments per year in old forest for the purpose of maintaining old forest or converting OFMS to OFSS and

would result in the greatest percent of the dry upland forest potential vegetation group in the OFSS stage at year 50. Within the Malheur National Forest, alternatives D and E would result in approximately 16 percent of the dry upland forest potential vegetation group in the OFSS stage at year 50. Within the Umatilla National Forest, alternatives D and E would result in approximately 14 percent and 15 percent, respectively, of the dry upland forest potential vegetation group in the OFSS stage at year 50. Within the Wallowa-Whitman National Forest, alternatives D and E would result in approximately 11 percent of the dry upland forest potential vegetation group in the OFSS stage at year 50. Under alternatives D and E, annual vegetation treatments in old forest would total approximately 10,600 acres and 3,300 acres, respectively, within all three national forests. Timber harvest under alternatives D and E would not be expected to convert old forest to non-old forest. Because of a deficit of old forest structure within the Blue Mountains and viability concerns for species that depend on that resource, even-aged regeneration harvests would not be scheduled within current old forest stands, though single tree selection and small group selection harvests could occur in old forest under alternatives D and E.

Management activities would be expected to move the landscape towards the desired conditions for the percent of the dry upland forest potential vegetation group in the OFSS stage. Under alternatives D and E, timber harvest activities within old forest would focus on the conversion of OFMS to OFSS by removing smaller size classes in the understory, while favoring more fire tolerant tree species and larger diameter trees and by decreasing stand densities. As a result, these stands would more closely resemble the historical open canopy, single-story forest structure that existed prior to interruption of the historical fire regime. A more open, single-story forest structure would result in decreased competition between trees for moisture, nutrients, and sunlight, increased tree health, growth, and vigor, increased old tree longevity, increased spatial heterogeneity, decreased crown continuity, decreased ladder fuels, decreased fuel loadings, increased wind speeds required to initiate and sustain a crown fire, decreased fire severity and decreased risk of mortality from insects, disease, and fire. Decreased stand densities could also result in increased regeneration of more shade intolerant tree species and closer achievement of the desired conditions for species composition. Shade intolerant tree species such as ponderosa pine are better adapted to a frequent fire regime, better able to withstand low severity fire, and result in a lower fire hazard. Ponderosa pine also tend to be less prone to moisture stress and better adapted to drier conditions than more shade tolerant tree species. Due to more open stand densities and a more favorable species composition adapted to frequent fire, conditions would be more conducive to the reintroduction of low severity surface fire. There would be more opportunities to manage wildfire (unplanned ignitions) for resource benefits, in comparison to alternative C.

One of the disadvantages related to alternative D would be the lack of prescribed fire (planned ignitions) associated with this alternative. Alternative D would not include prescribed burning outside of harvest units and would include very limited amounts of prescribed burning within harvest units. The majority of fuels treatments within harvest units would be accomplished by removal or crushing instead of burning. The lack of fire under alternative D could inhibit other ecological processes such as nutrient cycling, resulting in decreased understory productivity, diversity, and seedling establishment.

Fire is essential to nutrient cycling in fire adapted ecosystems. Fire has a fertilizer effect on the soil by increasing ammonium levels and microbial nitrogen mineralization, resulting in increased nutrient levels in both understory and overstory vegetation. Fire rejuvenates desirable grasses, depending on the species response to disturbance (i.e., sprouters, prolific seeders, and species with strong rhizome extension respond favorably to fire). Especially when combined with

reduced stand densities, fire results in changes in the microclimate on the forest floor, specifically increased sunlight penetration, increased soil temperatures, and increased understory productivity. Fire has been shown to result in significant increases in herbaceous biomass, species richness, and understory productivity and diversity. Depending on timing, fire may also increase seedling establishment by aiding in seedbed and site preparation. Fire can also aid in the creation of openings for regeneration.

Alternative C would result in the lowest percent of the dry upland forest potential vegetation group in the OFSS stage at year 50 within each national forest. Alternative C would allocate old forest to a land management area resulting in minimal amounts of active management within old forest. Treatments within old forest would consist mostly of thinning trees less than 8 inches d.b.h. While these treatments may help to reduce stand densities and ladder fuels in some stands, it would be difficult to achieve the desired conditions for stand densities in the majority of old forest stands. Additionally, it would be difficult to achieve other desired conditions, such as species composition, with so few acres treated annually and with such limitations on thinning and harvesting treatments.

Under alternative C, the decreased levels of timber harvest would result in increased stand densities within old forest stands. Increased stand densities would result in increased crown continuity, increased fuel loading, decreased wind speeds required to initiate and sustain a crown fire, and increased fire severity. Increased stand densities would also result in decreased regeneration of shade intolerant/fire tolerant tree species. Additionally, increased stand densities would result in increased competition between trees for moisture, nutrients, and sunlight, and decreased tree health, growth, and vigor.

Under alternative C, vegetation treatments within old forest would rely heavily on the use of prescribed fire (planned ignitions) and wildfire (unplanned ignitions) managed for resource benefits to reduce stand densities, rather than harvesting trees. Relying solely on the effects of fire in highly departed landscapes could result in substantially higher levels of mortality across all tree age and size classes, including the large and/or old tree component, depending upon burning conditions. Due to the high percent of the dry upland forest potential vegetation group in closed stand densities and the potential for very high levels of mortality, the window or time frame under which fire could and would be managed to achieve the desired conditions for old forest would be limited and unrealistic based on current conditions and the inability to reintroduce low severity fire effects.

While the intent of prescribed fire and wildfire managed for resource benefits under alternative C would be to improve forest structure, stand density, and species composition in old forest, the effects of fire are much less predictable than those of harvesting. High levels of mortality in the larger diameter classes would result in difficulty achieving desired conditions for old forest structure. Improvements in old forest structure, function, composition, and resiliency would likely be limited, especially within the dry upland forest potential vegetation group where vegetation conditions tend to be more highly departed from the HRV and the likelihood of reintroducing low severity fire effects in high density stands would be low. Additionally, the levels of smoke emissions generated under alternative C would be substantially increased, further limiting burn windows and the amount of acres that could be burned due to the increased levels of particulate matter generated. Impacts to public health from the likelihood of exceeding air quality standards would also substantially limit the amount of acres that could be burned under alternative C.

Alternative C would likely result in increased fire severity, decreased ecological resiliency, and loss of key ecosystem components and functions due to scope and scale of fire severity outside

that which historically occurred in old forest stands within the dry upland forest potential vegetation group.

Cumulative Effects

Potential cumulative effects were analyzed by considering the effects of the alternatives in the context of past, present (ongoing), and reasonably foreseeable future activities that have occurred within the cumulative effects analysis area. This analysis area consists of the 25 sub basins (HUC 4) which contain the Malheur, Umatilla, and Wallowa-Whitman National Forests and other lands. The time period into the future considered was 50 years. The effects that past activities have had on old forest are discussed in the Affected Environment section of this chapter and also in the Forested Vegetation, Timber Resources, and Wildland Fire Section. The effects of past activities are reflected in the old forest existing conditions. The cumulative effects for old forest are also discussed in the Forested Vegetation, Timber Resources, and Wildland Fire and Terrestrial Wildlife Species Diversity and Viability sections of this document. Present and foreseeable future activities that could affect old forest are summarized below:

Timber Product Manufacturing Infrastructure and Economics

The ability of the Forest Service to positively manage forest vegetation is partially dependent upon the ability to sell forest products to manufacturing companies and to use the harvesting processes, including residual slash disposal activities. If the forest products industry continues to decline in areas surrounding the Blue Mountains to the extent that it is more difficult to sell forest products, or if “stumpage prices” decrease significantly, it would affect the number of acres that could be treated during the planning period.

Under all of the alternatives, the desired conditions would be to manage for a certain percent of each upland forest potential vegetation group in old forest structural stages (15 to 45 percent of the cold upland forest potential vegetation group; 41 to 80 percent of the dry upland forest potential vegetation group; and 25 to 40 percent of the moist upland forest potential vegetation group). Under alternatives A, B, C, E, and F, old forest stands would be considered unsuitable for timber production. Old forest takes a long time to develop, with 150 years being the minimum age requirement for old forest in most forest types. Desired conditions that manage for a higher percent of the landscape in old forest would result in a long-term commitment that would subtract from the suitable land base and result in decreased timber production during the planning period. Consequently, alternatives A, B, C, E, and F would result in lower allowable sale quantities and long-term sustained yields. Under alternative D, old forest would be considered suitable for timber production. As a result, the allowable sale quantity and LTSY would be higher, in comparison to the other alternatives, due to an increase in the number of acres suitable for timber production.

Carbon Sequestration

The effects of the alternatives on carbon sequestration in general are discussed in the Forested Vegetation, Timber Resources, and Wildland Fire section. Mitigation options that can help reduce climate change impacts on carbon include: maximizing the forests’ capacity to store carbon, decreasing carbon loss potential from disturbance, and utilizing biomass for energy. However, these options need to weigh tradeoffs and risks and must ultimately be coupled with adaptation strategies. A forests’ carbon capacity could be maximized by retaining large diameter trees or by extending rotation age. Carbon loss potential from disturbance could be decreased through fuels reduction treatments that decrease fire hazard and increase ecological resiliency. Research by Hurteau and North (2009) found that, in wildfire-prone forests, tree-based carbon stocks were

best protected by fuel treatments that produced a low-density stand structure dominated by large, fire-resistant pines. However, other findings suggest that reducing the fraction by which carbon is lost in a wildfire requires the removal of a much greater amount of carbon, since most of the carbon stored in forest biomass remains unconsumed even by high-severity wildfires (Mitchell et al. 2009). Most of the treatments simulated resulted in a reduced mean stand carbon storage.

Within the dry upland forest potential vegetation group in all three national forests, where approximately 60 to 90 percent of the harvesting treatments would occur, alternatives D and E would result in the greatest increase in the percent of the potential vegetation group in the OFSS stage and the greatest decrease in the OFMS stage. These alternatives would improve ecological resiliency by creating/maintaining a forest structure within old forest stands that more closely resembles the historical open, single-story forest structure that existed prior to interruption of the historical frequent, low severity fire regime. In comparison with the other alternatives, alternatives D and E would be expected to result in old stands that are more resilient in the face of climate change. Old forest stands would be expected to exhibit a decreased risk of damage or destruction by fire or insects. However, alternatives D and E would also harvest the greatest amount of timber volume and therefore remove a substantial amount of carbon.

Climate Change

The effects of climate change on forested vegetation in general are discussed in the Forested Vegetation, Timber Resources, and Wildland Fire section. Of all of the ongoing and foreseeable future actions that have the potential to affect old forest within the Blue Mountains, climate change potentially may be one of the most important factors. Climate change may impact the composition, structure and function of old forest, primarily through increased temperatures, reduced snowpacks, earlier timing of snowmelt, increased risk from uncharacteristic wildfire and insect disturbance, increased drought stress, and increased risk of blowdown from extreme weather events. The increased noncatastrophic tree mortality rates in unmanaged old forests in the Pacific Northwest in recent decades have been attributed primarily to increased temperatures. Warming is thought to contribute to increasing mortality rates in old forests by increasing water drought stress on trees and enhancing the growth and reproduction of forest insects and pathogens (van Mantgem et al. 2009). As climate changes and overall forest fragmentation increases, old forests may become increasingly important as refugia for forest species.

Although increases in temperature, changes in precipitation, higher atmospheric concentrations of carbon dioxide (CO_2), and higher nitrogen (N) deposition may change ecosystem structure and function by the end of the 21st century, the most rapidly visible and most significant short-term effects on forest ecosystems may be caused by altered disturbance regimes (Vose et al.2012). Inadequate water availability coupled with drying conditions could contribute to an overall increase in the vulnerability of old forest to fire, insects, and drought. Recent forest dieback in the western United States and model simulations indicates that the frequency and magnitude of some disturbance events (e.g., drought, wildfire, and insect outbreaks) may be changing (Allen et al. 2010).

The relative influence of climate and fuels on fire behavior and effects varies regionally and subregionally across the western United States (McKenzie 2004). However, an increase in fire activity is expected for all major forest types in the Blue Mountains under projected climate changes (Bachelet et al. 2001, Whitlock et al. 2003, and Keeton et al. 2007). A warmer climate has already led to more frequent fires, more severe fires, earlier initiation of the fire season, and a longer fire season in the western United States (Westerling et al. 2006). Littel et al. (2009) built statistical models of the associations between seasonal and annual precipitation and temperature

and fire extent for 1916 to 2002 for the 11 contiguous western states. They found that relatively modest changes in mean climate will lead to substantial increases in area burned, particularly in crown-fire ecosystems in which distinct thresholds of fuel moisture and fire weather exist (Littel 2009). For a mean temperature increase of 4° F (expected by the mid-21st century), annual area burned by wildfire is expected to increase by a factor of 1.5 to 5.

Insect life-cycles depend on a complex interaction of temperature, moisture, and suitable hosts. Although outbreak dynamics differ from species to species and from forest to forest, climate change appears to be one driving factor for some of the current forest insect outbreaks in western North America. Temperature influences everything in an insect's life, from the number of eggs laid by a single female, to the insects' ability to disperse to new hosts, to individuals' over-winter survival and developmental timing. Elevated temperatures associated with climate change, particularly when there are consecutive warm years, can speed up reproductive cycles and reduce cold-induced insect mortality. Additionally, shifts in precipitation patterns and associated drought can also influence insect outbreak dynamics by weakening trees and making them more susceptible to attacks. For many forest insect species (primarily beetles; notably *Ips* and *Dendroctonus* species), the influence of elevated temperatures on outbreak dynamics is most notable at higher elevations and latitudes where some beetles have shifted to completing their development in a single year, rather than two or even three years. In some cases, shifts have resulted in multiple generations per year. All else remaining constant, this decrease in generation time translates to an increasing rate of population growth.

Depending on the magnitude of the temperature increase, which may vary by elevation, high elevation forests could be at greater risk than lower elevation forests where warmer temperatures may disrupt the insects' seasonality. Elevated winter temperatures are associated with increased winter survival; however, it should be noted that increased winter survival does not always coincide with increased population success based on developmental timing. Each process is affected by temperature patterns occurring at different times of the year.

Under all of the alternatives, the percent of the cold upland forest potential vegetation group in the OFMS structural stage would be projected to decrease from existing conditions to year 50 within all three national forests due to mortality caused by wildfire and insects. This structural stage may be increasingly difficult to maintain within the desired condition range, regardless of the alternative, especially with climate change potentially causing further increases in the levels of stand-replacing wildfire. If temperatures increase over the next 50 years, fires may increase in size and severity, with an increase in the annual number of acres burned by wildfire. Additionally, more acres of other stand-replacing events may occur due to mortality by insects. This may result in a decrease in the percent of landscape in old forest structural stages within the cold upland forest potential vegetation group.

Within the dry upland forest potential vegetation group, alternative C would result in higher stand densities within old forest due to increased restrictions on harvesting. As temperatures increase over time, moisture may become a more limiting factor within the dry upland forest potential vegetation group. Older age classes would be most affected within a moisture-limited system because they would be less able to compete with younger, more vigorous trees. Unless stand densities are reduced within old forest stands, increased temperatures may result in increased mortality of old trees due to competitive stress.

Fire

Most of the vegetation types in the analysis area have evolved with fire. Fire frequency and intensity varied historically by vegetation type. Historically, vast acres of shrub and timber burned each year (Agee 1993). There is evidence that Native Americans used fire to herd game and provide feed for stock. According to fire records, in the first half of the 20th century an average of 30 million acres burned each decade in the west (http://www.nifc.gov/fire_info.html). Before that, settlers report seeing vast acreages of blackened land (Gruell 1985). With the settlement of the west came the notion that fires were bad. Following the fires of 1910, the Forest Service began its campaign to suppress wildfires. Instead of fire, settlers employed plows, railroads, saw blades, sluice boxes, cattle, sheep, and other accoutrements as disturbance agents. Settlers converted many acres of rangelands to farm ground, primarily in the lower elevations while ranchers grazed horses, cattle and sheep on less productive and higher elevation sites. At the turn of the last century, livestock grazing occurred throughout the forest, introducing a new disturbance on what would later become National Forest System lands. High levels of livestock grazing reduced the fine fuels (grasses and shrubs) that carried low severity surface fires, resulting in a substantial reduction in fire disturbances on National Forest System lands.

Timber harvest replaced fire as the major disturbance on the national forest, but it did not affect an equivalent number of acres. This has led to a decrease in forests of older age classes and an increase, in some areas, of dense forests of smaller diameter classes. This change in age and size classes has resulted in conditions that are less resilient than desired.

Uncharacteristically severe wildfires are on the rise, especially in the dry upland forest potential vegetation group. Over the past 10 years, lightning-caused fires ranged from approximately 808 to 2,170 per year in the northwest. Human-caused fires ranged from approximately 1,078 to 2,666 fires per year in the northwest.[3] More fires are occurring adjacent to residential areas as people build more subdivisions and structures along public land boundaries. These changes are occurring across the west.

Most of the higher elevation, cold upland forest potential vegetation group within the cumulative effects analysis area consists of National Forest System lands. Therefore, any management activities affecting these vegetation types would be initiated by the Forest Service. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Under all of the alternatives, only approximately 5 to 10 percent of the harvest activities on Forest Service lands would occur within the cold upland forest potential vegetation groups. The majority of vegetation effects resulting from management actions within the cold forest potential vegetation group would occur as the result of wildfire managed for resource benefits. The cold upland forest potential vegetation group was historically characterized by infrequent, high severity fire. Managing wildfires for resource benefits could include a range of fire severity effects, including low severity fire to stand-replacing events with high levels of mortality. Climate change may potentially result in an increase in the size and severity of wildfires. An increase in fire size and severity could result in a decrease in the percent of the cold upland forest potential vegetation group in old forest structural stages over the next 50 years. Increased fire severity could also result in increased difficulty in managing wildfires for resource benefits to achieve desired conditions. Not every natural ignition would be managed for resource benefits. For each unplanned ignition, a decision would be made whether to suppress or manage the fire to benefit the resources in accordance with the Fire Management Plan. Under all of the alternatives, all ignitions would be managed based on safety, values at risk, and the

[3] http://www.nifc.gov/fireInfo/fireInfo_stats_lightng.html

consistency of predicted fire effects with the desired conditions. Responses can range from monitoring to full suppression.

Restoration activities occurring within the dry upland forest potential vegetation group would most likely occur in National Forest System lands. Restoration activities, such as prescribed burning or managing for old forest, would be beneficial to the overall functioning of these ecosystems and would improve wildlife habitat within these vegetation types. Some vegetation components may take many years before noticeable changes occur on the landscape. Other more localized changes would be dramatic and immediate. For example, removing large trees affects not only size class distributions of forest stands, but also the recruitment of snags over time and would reduce the density of large snags on a landscape basis. Currently, the average age structure on adjacent private forested lands is dominated by non-old forest conditions. The old forest cumulative effects analysis assumes that this would not change in the near future This would increase the importance of and dependence on old forest on National Forest System lands in sustaining the viability of wildlife species populations that depend on old forest. Given the existing deficit in old forest structure within the cumulative effects analysis area, the removal of large diameter and/or old trees on or off National Forest System lands would affect distribution of the large tree component and future snags and coarse woody debris at a landscape scale. Therefore, the retention and future development of these critical components on National Forest System lands would be essential to providing habitat elements needed by many species. Improvements to these components would cumulatively affect and improve the conditions within the dry upland forest potential vegetation group.

Issue 5: Preliminary Administratively Recommended Additions to the National Wilderness Preservation System

Introduction

Wilderness is a part of the national forest multiple use mandate. Historically, wilderness was instrumental in constructing America's unique heritage and shaping its national identity. The Wilderness Act of 1964 (P.L. 88-577) emphasizes protecting an "enduring" wilderness resource "for the American people of present and future generations." In an increasingly developed world accompanied by increased mechanization, the National Wilderness Preservation System (NWPS) was created to contrast these modifications and was established to ensure protection and preservation for wilderness areas in their natural conditions.

Section 2(c) of The Wilderness Act, "Definitions of Wilderness," states:

> A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

This definition highlights two subtle, but distinct concepts of wilderness (Scott 2001). The first provides an ideal concept of wilderness: areas that are untrammeled, undeveloped, and exemplify primeval character and influence without permanent improvements or human habitation. The second provides a practical definition as used for the purposes of the act and is "descriptive of the areas to which this definition applies" (Zahniser 1963). The two part definition, a conceptual ideal and a practical characterization, informs on both the act's intent and its application. Section(4)(b) of the act asserts that "Except as otherwise provided in this Act, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area…" Wilderness stewardship and management has developed over the subsequent decades with an emphasis on how project or planning efforts modify wilderness character of a wilderness area. Forest Service and wilderness scholars, in describing wilderness character, selected five assessment "qualities." Landres et al. (2011) notes:

> Based on Section 2c, "Definition of Wilderness," in the 1964 Wilderness Act and building on the writing of Howard Zahniser (Zahniser 1956; Harvey 2007), wilderness scholars (Rohlf and Honnold 1988; McCloskey 1999; Scott 2002), and earlier work to describe and use wilderness character (Landres et al. 2005; Landres et al. 2008b), an interagency team published Keeping It Wild (Landres et al. 2008a), which identified five distinct and necessary "qualities" of wilderness character. These qualities were selected to be tangible, link local conditions and management directly to the statutory language of the 1964 Wilderness Act, and apply throughout the entire area of a wilderness. They apply to every wilderness regardless of size, location, agency administration, or any other attribute.

The five distinct qualities described below are used to assess wilderness character and represent a combination of attributes that both define the character of wilderness and describe wilderness characteristics (Landres et al. 2011):

Natural: Wilderness ecological systems are substantially free from the effects of modern civilization. This quality is degraded by many things, such as loss of indigenous species, occurrence of nonindigenous species, alteration of ecological processes such as water flow and fire regimes, effects of climate change, loss of dark skies, and occurrence of artificial sounds. It is preserved or improved, for example, by controlling or removing nonindigenous species or restoring ecological processes.

Undeveloped: Wilderness retains its primeval character and influence and is essentially without permanent improvement or modern human occupation. This quality is influenced by what are commonly called the "Section 4c prohibited uses," that is, the presence of modern structures, installations, habitations, and use of motor vehicles, motorized equipment, or mechanical transport. The removal of structures and not conducting these prohibited uses preserve or improve this quality. In contrast, the presence of structures and prohibited uses degrades this quality, whether by the agency for administrative purposes, by others authorized by the agency, or when there are unauthorized uses.

Untrammeled: Wilderness is essentially unhindered and free from the actions of modern human control or manipulation. This quality is influenced by any activity or action that controls or manipulates the components or processes of ecological systems inside the wilderness. Management actions that are not taken support or preserve the untrammeled quality, while actions that are taken degrade this quality, even when these actions are taken to protect resources, such as spraying herbicides to eradicate or control nonindigenous species or reducing fuels accumulated from decades of fire exclusion.

Solitude or a pristine and unconfined type of recreation: Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation. This quality is primarily about the opportunity for people to experience wilderness, and is influenced by settings that affect this opportunity. It is preserved or improved by management actions that reduce visitor encounters and signs of modern civilization inside the wilderness. In contrast, this quality is degraded by agency-provided recreation facilities, management restrictions on visitor behavior, and actions that increase visitor encounters.

Other Features: In addition to these four qualities, there may be a fifth quality, called other features, based on the last clause of Section 2c in the 1964 Wilderness Act, that a wilderness 'may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.' Unlike the preceding four qualities that apply to every wilderness, this fifth quality is unique to an individual wilderness based on the features that are inside that wilderness. These features typically occur only in specific locations within a wilderness and include cultural resources, historical sites, paleontological sites, or any feature not in one of the other four qualities that has scientific, educational, scenic, or historical value.

Wilderness provides both social and biophysical benefits and values. Social benefits outlined in Section 2 (a) of the Wilderness Act state that wilderness "shall be administered for the use and enjoyment of the American people." Cole (2005) notes that wilderness experiences include recreational and social benefits described as spiritual, educational, transcendental, and symbolic. Ecological benefits include maintaining species diversity, conserving a "reservoir" of ecological processes and a diversity of genetic material, protecting threatened and endangered species, protecting watersheds, maintaining large, contiguous, nonfragmented wildlife habitats, and serving as a base line for natural conditions to compare with changes in other environments (Dawson and Hendee 2009). While these attributes may have overlapping benefits, they represent themes and values commonly attached to wilderness.

Wilderness provides social, cultural, economic, scientific, and ecological benefits for present and future generations. Many of America's iconic landscapes include wilderness areas that provide "outstanding opportunities for solitude and a primitive and unconfined type of recreation." Wilderness landscapes may also contain culturally significant and sacred sites important to Native Americans, and historic-era cultural resources that speak to the nation's collective heritage. Communities enjoy and value these lands for hunting and fishing, wildlife watching, hiking, equestrian pursuits, and other nonmotorized and nonmechanical uses. Wilderness areas are acknowledged as a scarce and dwindling resource, requiring humility on behalf of humanity in order to retain their natural condition and to convey an understanding of human and natural history. Wilderness serves as a baseline demonstrating the functions of healthy ecosystems that can be contrasted with human activities that change our world. Wilderness areas provide a variety of valuable ecosystem services including carbon sequestration, watershed protection, and air quality, and may contain habitat for numerous threatened and endangered species and other rare biological resources. Managing an area to protect its wilderness character provides unique opportunities and benefits for present and future generations that may otherwise be irreparably lost.

Key Indicators:

- Acres allocated to MA 1B Preliminary Administratively Recommended Wilderness Areas
- Acres of potential wilderness area allocated to other management area categories.

Affected Environment – Preliminary Administratively Recommended Wilderness Areas

The Wilderness Act of 1964 designated roughly 9.1 million acres of wilderness distributed in 54 areas located within 13 states. Since 1964, the National Wilderness Preservation System has grown significantly. The National Wilderness Preservation System has expanded through subsequent legislation totaling 104 wilderness bills, typically establishing wilderness areas through state-wide designations. Numerous bills are pending in Congress that would create millions of acres of new wilderness areas in national forests, national parks, national wildlife refuges, and land administered by the Bureau of Land Management. Two bills identified in the 113th Congressional session would designate wilderness areas in Oregon; however none of these bills propose wilderness designation for lands administered within the Blue Mountain national forests.

The National Wilderness Preservation System includes 757 wilderness areas encompassing approximately 109 million acres, or roughly 5 percent of the total United States land mass. The Forest Service manages approximately 36 million acres in 439 wilderness areas, representing approximately 19 percent of all National Forest System land. In Oregon, there are a total of 2.5 million acres of designated wilderness equaling about 4 percent of the State land area. Oregon wildernesses represent about 2.3 percent of the area in the National Wilderness Preservation System.

The Blue Mountain national forests currently manage nearly 1 million acres of wilderness distributed across 7 designated wildernesses. The Hells Canyon Wilderness, consisting of 217,927 acres, is “nested” within the larger Hells Canyon National Recreation Area (HCNRA). The HCNRA Comprehensive Management Plan (CMP) was updated and approved in 2003 and will be carried forward in its entirety. The HCNRA CMP is the portion of the Wallowa-Whitman National Forest Land and Resource Management Plan that guides management of the HCNRA. Designated wilderness on the Blue Mountain national forest includes 759,666 acres, not including the Hells Canyon Wilderness, in six congressionally designated areas administered as wilderness. The following six wilderness areas are solely managed by the Blue Mountain national forests:

Eagle Cap Wilderness – This is Oregon's largest wilderness encompassing 350,461 acres in the heart of the Wallowa Mountains on the Wallowa-Whitman National Forest in Wallowa County, Oregon. Approximately 534 miles of trail give access to this area. This vast region has roughly 60 high alpine lakes, which are surrounded by open meadows, bare granite peaks and ridges, and classic U-shaped glacial valleys thickly forested in their lower sections and rising to scattered stands of alpine timber. Elevations range from roughly 5,000 feet to 9,845 feet on Matterhorn Peak located centrally within the wilderness area. Many fish species can be found in over 37 miles of streams.

Monument Rock Wilderness – This 19,650-acre wilderness is shared by the Malheur (12,620 acres) and Wallowa-Whitman (7,030 acres) National Forests in Baker and Grant Counties. The area ranges from 5,200 feet in the lower regions to the 7,815-foot peak of Table Rock. The visitor season generally runs from June into November. The area receives 40 inches of annual precipitation and summer brings hot days and chilly nights. Hunting is the most popular activity, with hiking and backpacking increasing in popularity.

North Fork John Day Wilderness – Located mostly in Grant County (Umatilla National Forest) with a small portion in Umatilla County (Wallowa-Whitman National Forest), Oregon. This 121,352-acre wilderness features rolling bench lands, the majestic Greenhorn Mountains, and the

rugged gorge of the North Fork John Day River. Trails serving this area are popular for both hiking and horseback riding and are accessible from early spring to late fall from several trailheads located around its perimeter. The nature of the area provides long-distance trips with significant elevation changes. The wilderness includes four separate units. In addition to the main body of the wilderness, the Baldy Creek Unit lies to the east (on the Wallowa-Whitman National Forest), the Greenhorn Unit lies to the south (bordering the Vinegar Hill-Indian Rock Scenic Area), and the Tower Unit lies just to the north and includes Tower Mountain.

North Fork Umatilla Wilderness – At 20,435 acres, this is one of the smaller wilderness areas in northeast Oregon, and is located on the Umatilla National Forest in Union and Umatilla Counties. The area feels much bigger and visitors find the area peaceful, yet challenging as the wilderness is characterized by varying terrain; elevation ranges from 2,000 to 6,000 feet. Using the low elevation areas, hikers and equestrians on the 31-mile trail system have ample opportunity for spring hiking and horseback-riding trips. A main attraction is the North Fork Umatilla River.

Strawberry Mountain Wilderness – This 69,350-acre wilderness, located on the Malheur National Forest in Grant County, has over 100 miles of hiking trails crossing through the area dominated by the Strawberry Mountain Range. This area has extremely diverse ecological makeup; five of the seven major life zones in North America can be found here. The land is rugged; elevations range from 4,000 feet to the 9,038-foot summit of Strawberry Mountain.

Wenaha-Tucannon Wilderness – This 177,423-acre wilderness on the Umatilla National Forest is in Wallowa County, Oregon, and Columbia County, Washington. It contains 200 miles of managed trails providing a primitive, unconfined recreation experience. The landscape is rugged, with high basalt ridges separated by deep, steep canyons. Major streams include the Wenaha River, Tucannon River, and Crooked Creek. Elevations range from 2,000 feet at the Wenaha River to 6,400 feet at Oregon Butte.

The Wallowa-Whitman National Forest administers a portion of the Homestead Wilderness Study Area (HWSA). The HWSA, including the neighboring Federal lands managed by the Bureau of Land Management, contains about 14,000 acres of public land.

Inventoried roadless areas were reviewed, and the portion of the Homestead roadless area managed by the Wallowa-Whitman National Forest increased from approximately 5,700 acres to roughly 9,000 acres. Most of the area is within the Hells Canyon National Recreation Area, and the remainder of the roadless area is within the Whitman Ranger District. The 1991 Bureau of Land Management wilderness study process included the national forest acres and did not propose to recommend this roadless area for wilderness designation. The study has not yet been accepted by Congress, so these acres remain in the wilderness study area category. Wilderness values and resources will be protected until such time as Congress either designates the area as part of the National Wilderness Preservation System or releases the area from consideration.

There are no proposed administratively recommended wilderness areas in the 1990 forest plans for the Malheur, Umatilla, or Wallowa-Whitman National Forest.

Within the Malheur National Forest, about 5 percent or 82,000 acres are designated wilderness areas. Within the Umatilla National Forest, about 22 percent, or 304,200 acres are designated wilderness areas. Within the Wallowa-Whitman National Forest, about 24 percent, or 588,700 acres are designated wilderness areas.

Recommendations for Wilderness Area Designation

Scoping was conducted on the Blue Mountains forest plan revision proposed action in the spring of 2010, and numerous issues and concerns were raised about the inventory of potential wilderness areas, inventoried roadless areas, and wilderness area proposals. Some respondents asked that additional wilderness area designation proposals be made to protect the values that they attach to wilderness areas. Others requested that no additional proposals for wilderness area designation be made because it would prevent them from participating in the activities that they currently enjoy within those areas. Proposals are preliminary administrative recommendations that will be further reviewed and possibly modified by the Chief of the Forest Service, Secretary of Agriculture, and the President of the United States. Congress has reserved the authority to make final decisions on wilderness area designation.

Wilderness area designation precludes the use of motorized and mechanized equipment, including motor vehicles, and imposes limitations on management activities. Wilderness areas offer human visitors solitude and opportunities for challenge, risk, and primitive and unconfined recreation. Wilderness areas are managed to ensure that human influence does not impede natural processes or interfere with natural succession in the ecosystem. Areas chosen to be preliminary administratively recommended for addition to the National Wilderness Preservation System are allocated to MA 1B under the revised forest plans. As noted previously, only Congress has the authority to make wilderness designations. MA 1B areas would be managed to maintain the quality of wilderness character that make them eligible for wilderness area designation, but they are not designated as a result of being allocated to MA 1B.

The need for additional wilderness designation in the Blue Mountain national forests was assessed in “Wilderness Need Evaluation for the Malheur, Umatilla, and Wallowa-Whitman National Forests” (USDA Forest Service 2010) and is included in the project record. The report findings, based on the above criterion, reveal that additional wilderness designation is not necessary within the Blue Mountain national forests. Protection of areas with wilderness potential including the biological species and resources that they contain may be better achieved through alternative land management designations or other legal authorities. However, it is noted that wilderness recommendations may also be made based on needs brought forward through public comment. Therefore, the decision to propose a wilderness recommendation may be made based on various land management strategies and factors, all of which include maintaining biological and natural function and diversity within and on the natural landscape.

Environmental Consequences – Preliminary Administratively Recommended Wilderness Areas

Resource Protection Methods

Designated wilderness is governed by the terms of the Wilderness Act and other specific legislation, directing management activities within wilderness and reducing human impacts and influences to desired levels. These regulations are designed to protect the qualities of wilderness character. As mentioned in the affected environment section, effects to wilderness are measured by how any particular project or planning effort may impact the wilderness character of a wilderness area. Project proposals within these areas are evaluated for compliance with wilderness values and maintaining the respective five qualities of wilderness character. Commercial use in wilderness is controlled by special use permits and the operation plans that are required under the special use permits.

General Effects

Because direction for wilderness management is detailed in law, regulation, and agency policy and in specific management plans, management of existing wilderness does not vary by alternative.

The following discussion of general effects on wilderness addresses effects from adding additional recommended wilderness. Alternatives A and D do not propose any new areas for wilderness recommendation. Alternative B proposes the least number of recommended wilderness areas at 4 wilderness additions, alternative C proposes the greatest number of recommended wilderness areas at 49 wilderness additions, and alternatives E and F are similar and propose an intermediate value of 10 wilderness additions. Table 101 through table 103 display the total number of acres proposed for wilderness recommendation by alternative, and table 104 displays a summary of these totals.

Recommended wilderness can affect existing wilderness. Designation of new wilderness may change patterns of recreation use, create larger contiguous areas, and reduce pressure within existing wilderness areas. Opportunities for wilderness-dependent recreation may increase. Motorized use would be prohibited in areas recommended for wilderness designation. Motorized use (e.g. motorcycle, all-terrain vehicle, utility vehicle, and full-size vehicle use) would be displaced within recommended wilderness areas. Winter motorized use would be allowed in Management Area 1B in alternatives B, E and F, but prohibited in alternative C. Mechanized use would be restricted to system roads and trails until Congressional designation, and then mechanical use would be prohibited.

New areas considered for recommendation for wilderness designation have the potential effect of protecting wilderness resources. In addition, these areas preserve wilderness character through management efforts to maintain the five wilderness qualities (natural, untrammeled, solitude or a pristine and unconfined type of recreation, undeveloped and other features) that define wilderness character.

Only Congress can pass legislation to create wilderness, therefore, management area (MA) allocation for recommended wilderness (MA 1B) does not create designated wilderness. MA 1B, recommended wilderness, protects the values that make the area suitable for wilderness designation. Management strategies for recommended wilderness may affect recreation opportunities and experiences within these areas. Standards and Guidelines presented in the draft Plan provide management direction to maintain wilderness area eligibility, and would exclude existing and proposed actions that may compromise the area’s eligibility.

Table 101. Acres of preliminary administratively recommended wilderness areas (PARWA) for each alternative for the Malheur National Forest

PARWA	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
Aldrich Mountain	NA	NA	4,870	NA	NA
Cedar Grove	NA	NA	5,650	NA	NA
Dry Cabin	NA	NA	12,140	NA	NA
Greenhorn	NA	NA	12,630	NA	6,139
Jumpoff Joe	NA	NA	2,130	NA	NA
McClellan Mountain	NA	NA	23,150	NA	23,145
Myrtle Silvies	NA	NA	10,930	NA	NA
Shaketable	NA	NA	7,652	NA	NA
Strawberry Mountain Wilderness Area Additions	NA	1,160	3,983	NA	1,160
Totals	**NA**	**1,160**	**83,810**	**NA**	**30,447**

Table 102. Acres of preliminary administratively recommended wilderness areas (PARWA) for each alternative for the Umatilla National Forest

PARWA	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
Asotin Creek	NA	NA	16,180	NA	NA
Greenhorn Mountain	NA	NA	11,275	NA	7,733
Hellhole	NA	NA	67,071	NA	21,980
Horseshoe Ridge	NA	NA	6,270	NA	NA
Jumpoff Joe	NA	NA	5,240	NA	NA
Meadow Creek	NA	NA	1,780	NA	NA
Mount Emily	NA	NA	5	NA	NA
North Fork John Day Wilderness Area Additions	NA	1,170	3,830	NA	1,241
North Fork Umatilla Wilderness Area Additions	NA	270	970	NA	235
North Mount Emily	NA	NA	4,616	NA	NA
Owsley	NA	NA	7,620	NA	NA
Potomas	NA	NA	6,286	NA	NA
Skookum	NA	NA	9,440	NA	NA
South Fork Tower	NA	NA	15,840	NA	NA
Spangler	NA	NA	5,710	NA	NA
Squaw	NA	NA	2,580	NA	NA
Tiger Creek	NA	NA	5,566	NA	NA
Upper Tucannon	NA	NA	13,194	NA	8,880
W-T Three	NA	NA	1,865	NA	NA
Walla Walla River	NA	NA	34,790	NA	NA
Wenatchee Creek	NA	NA	18,910	NA	NA
Willow Springs	NA	NA	9,490	NA	NA
Totals	**NA**	**1,440**	**248,535**	**NA**	**40,074**

Table 103. Acres of preliminary administratively recommended wilderness areas for each alternative for the Wallowa-Whitman National Forest

PARWA	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
Boulder Park	NA	NA	12,930	NA	NA
Castle Ridge	NA	NA	8,780	NA	NA
Dunns Bluff	NA	NA	760	NA	NA
Homestead	NA	NA	2,409	NA	NA
Huckleberry	NA	10,770	10,770	NA	10,770
Hurricane Creek	NA	NA	1,720	NA	NA
Joseph Canyon	NA	NA	6,750	NA	NA
Lake Fork	NA	NA	15,720	NA	NA
Little Creek	NA	NA	2,590	NA	NA
Little Eagle Meadow	NA	NA	6,840	NA	NA
Little Sheep	NA	NA	5,490	NA	NA
Marble Point	NA	NA	3,100	NA	NA
Monument Rock	NA	NA	5,850	NA	NA
Reservoir	NA	NA	15,300	NA	NA
Squaw	NA	NA	3,543	NA	NA
Twin Mountain	NA	NA	57,640	NA	9530
Upper Catherine Creek	NA	NA	7,020	NA	NA
Wildhorse	NA	NA	289	NA	NA
Totals	**NA**	**10,770**	**172,749**	**NA**	**20,306**

Table 104. MA 1B acreage for each alternative for each national forest

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
MAL	0	1,160	83,810	0	30,400
UMA	0	1,440	248,676	0	40,100
WAW	0	10,770	172,840	0	20,300

Potential wilderness areas, primarily inventoried roadless areas, that are not allocated to MA 1B are allocated to other management area designations. Alternative D allocates the most acreage of inventoried roadless areas to management areas that allow activities that may have an impact on existing qualities of wilderness character, followed by alternative B with the second highest amount. Alternatives E and F are similar and allocate an intermediate amount of acres to management areas that allow activities that may affect existing qualities of wilderness character. Alternative C allocates the least amount of acreage to other management areas, and all potential wilderness areas in this alternative would be designated as recommended wilderness areas. Figure 11 through figure 13 and table 105 through table 107 display the total number of acres of inventoried roadless area that are allocated to varying management areas by each alternative.

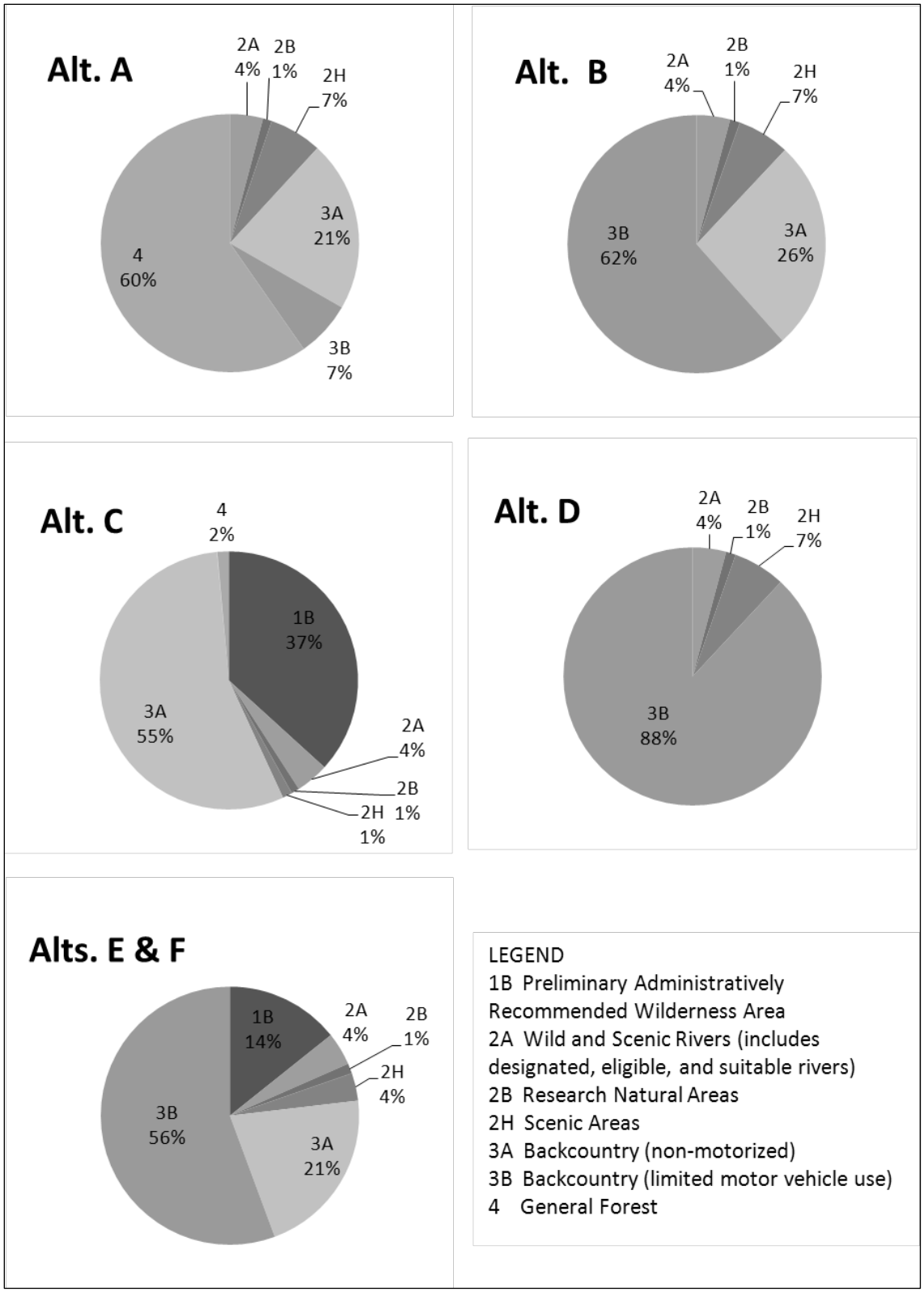

Figure 11. Inventoried roadless area allocation for each management area by alternative for the Malheur National Forest

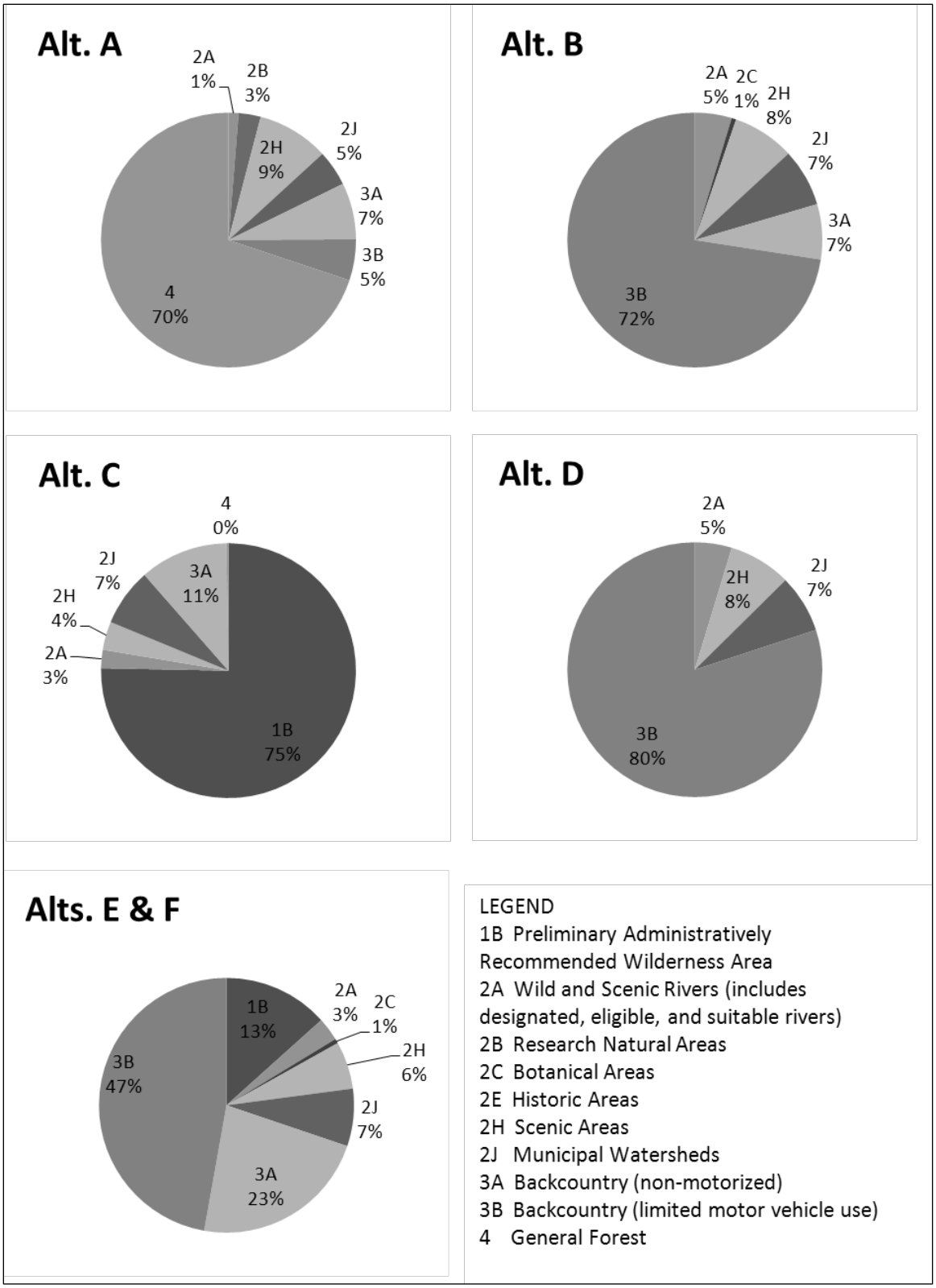

Figure 12. Inventoried roadless area allocation for each management area by alternative for the Umatilla National Forest

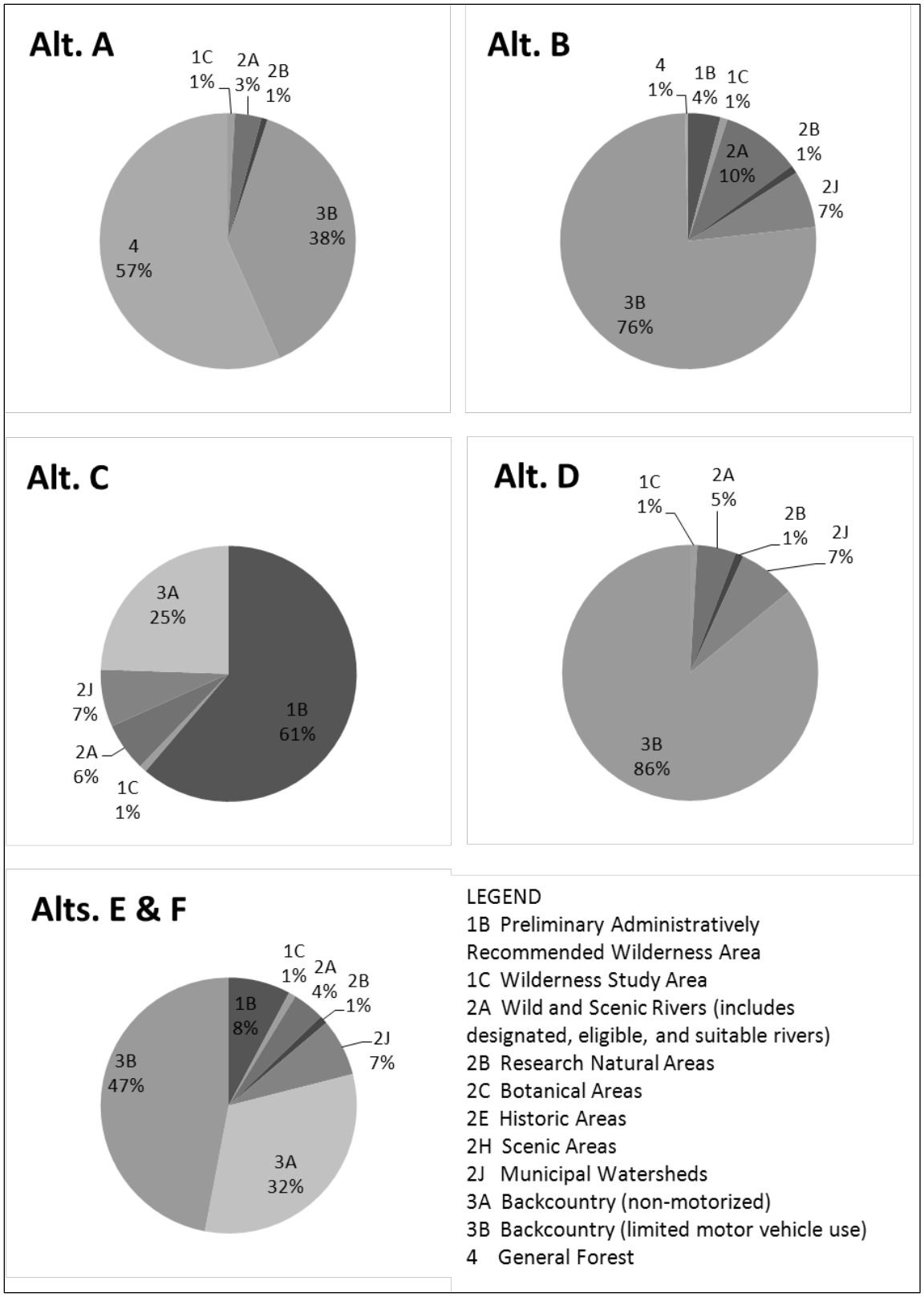

Figure 13. Inventoried roadless area allocation for each management area by alternative for the Wallowa-Whitman National Forest

Table 105. Inventoried roadless area allocation for affected management areas by alternative for the Malheur National Forest

Management Area Designation and Name	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
1B Preliminary Administratively Recommended Wilderness Area	0	0	69,200	0	26,900
2A Wild and Scenic Rivers (includes designated, eligible, and suitable rivers)	7,800	7,900	7,800	7,900	7,800
2B Research Natural Areas	2,100	2,300	1,900	2,300	2,300
2C Botanical Areas	0	100	0	0	100
2H Scenic Areas	12,400	12,300	2,300	12,300	6,500
3A Backcountry (nonmotorized use)	40,400	49,800	104,300	0	40,000
3B Backcountry (limited motor vehicle use)	13,200	116,000	0	165,800	104,900
3C Wildlife Corridor	0	0	100	0	0
4 General Forest*	112,400	0	2,700	0	0
Totals	188,300	188,400	188,300	188,300	188,500

* Acreage allocated to Management Area 4 resulted from geospatial analysis and is not intended to reassign management direction from existing inventoried roadless area management direction.

Table 106. Inventoried roadless area allocation for affected management areas by alternative for the Umatilla National Forest

Management Area Designation and Name	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
1B Preliminary Administratively Recommended Wilderness Area	0	0	207,100	0	36,600
2A Wild and Scenic Rivers (includes designated, eligible, and suitable rivers)	3,500	12,800	6,400	12,800	8,100
2B Research Natural Areas	7,700	300	0	300	300
2C Botanical Areas	300	1,600	100	1,600	1,600
2E Historical Areas	100	100	0	100	100
2H Scenic Areas	25,000	21,600	9,900	21,600	16,500
2J Municipal Watersheds	12,500	20,100	20,100	20,100	20,000
3A Backcountry (nonmotorized use)	19,700	19,200	30,800	0	62,000
3B Backcountry (limited motor vehicle use)	14,300	198,900	0	218,700	129,400
3C Wildlife Corridor	0	0	100	0	0
4 General Forest*	191,900	600	700	0	600
5 Developed Sites and Administrative Areas	200	100	100	100	100
Totals	275,200	275,300	275,300	275,300	275,300

* Acreage allocated to Management Area 4 resulted from geospatial analysis and is not intended to reassign management direction from existing inventoried roadless area management direction.

Table 107. Inventoried roadless area allocation for each management area by alternative for the Wallowa-Whitman National Forest

Management Area Designation and Name	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
1B Preliminary Administratively Recommended Wilderness Area	0	10,400	155,700	0	19,900
1C Wilderness Study Area	2,300	2,300	2,300	2,300	2,300
2A Wild and Scenic Rivers (includes designated, eligible, and suitable rivers)	8,600	25,600	15,600	12,500	10,300
2B Research Natural Areas	2,000	2,600	300	2,600	2,600
2J Municipal Watersheds	0	18,400	18,400	18,400	18,400
3A Backcountry (nonmotorized use)	0	0	62,200	0	81,200
3B Backcountry (limited motor vehicle use)	97,800	194,900	0	219,500	119,500
3C Wildlife Corridor	0	0	400	0	0
4 General Forest*	144,600	1,000	200	0	1,000
5 Developed Sites and Administrative Areas	100	100	100	100	100
Totals	255,400	255,300	255,200	255,400	255,300

* Acreage allocated to Management Area 4 resulted from geospatial analysis and is not intended to reassign management direction from existing inventoried roadless area management direction.

Indirect Effects

Preliminary administratively recommended additions to the National Wilderness Preservation System ensure that areas are managed to retain their wilderness character through explicit protection of the five qualities of wilderness character.

The Blue Mountain national forests provide recreational activities that range from high adventure self-reliance in the backcountry to driving scenic byways. Expansive wilderness areas provide opportunities for people to experience solitude and adventure in a natural environment. Management Area designations that are adjacent to the wilderness can potentially influence and affect wilderness character. The more acres allocated to more development-oriented management area designation, the higher likelihood of negative effects to existing wilderness. Conversely, the fewer acres allocated to more development-oriented management area designation, the lower the likelihood of negative effects to existing wilderness.

Non-wilderness uses adjacent to wilderness may have a negative effect on the quality of wilderness recreation experiences. Where roads and motorized activities occur along the wilderness boundary, the incidence of illegal use of motorized and mechanized vehicles in the wilderness may increase. High standard roads close to the boundary provide easy recreation access to wilderness and tend to increase use. As use numbers increase, particularly day use, concentrated use affects physical, biological, and social conditions in the wilderness.

Management areas bordering the wilderness that provide motorized use are more likely to affect wilderness condition and uses. The most highly developed areas (for commodity production or recreation use) are generally management areas 4 and 5. If new development occurs adjacent to any of the existing six wilderness areas, effects could include increased noise, modified landscapes, and motorized trespass.

Effects from Alternative A (no action)

For this alternative, the percent of the forest allocated to National Wilderness Preservation System would remain the same, with the Malheur National Forest at 5 percent, the Umatilla National Forest at 22 percent, and the Wallowa-Whitman National Forest at 24 percent in designated wilderness areas. No new proposed administratively recommended wilderness would be allocated to MA 1B. The forest plan would not make recommendations to Congress regarding areas suitable for inclusion in the National Wilderness Preservation System (NWPS). These areas would continue to be managed as part of their current management area allocations, which vary by national forest.

Management direction in alternative A, as presented in the 1990 forest plans, places an emphasis on the production of wood products and activities allocated to MA 4. Alternative A does not propose any new recommended wilderness areas. Alternative A provides for the highest level of commodity production and motorized use. Without additional recommended wilderness, recreational use within existing wilderness may increase because acres available for wilderness recreation do not increase.

Alternative A allocates the largest amount (acres) of potential wilderness areas to MA 4A. These areas would be managed to meet a variety of ecological and human needs, resulting in an increased potential for forest visitors to encounter other people and observe human activities. This alternative offers the least protection to the five qualities of wilderness character.

Malheur National Forest

For the Malheur National Forest, no new areas would be allocated to MA 1B. The majority of potential wilderness areas identified on the Malheur National Forest are allocated to MA 4 – General Forest (112,400 acres) with lesser acreage allocated to MA 3A – Backcountry (nonmotorized use) (40,400 acres) and MA 3B – Backcountry (limited motor vehicle use) (13,200 acres). Lands within Management Area 4A often display high levels of management activity and associated roads. MA 3A and MA 3B are characterized by remote settings, allowing for both motor vehicle use and nonmotorized use. Although the areas are considered remote, the area may show signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Umatilla National Forest

For the Umatilla National Forest, no new areas would be allocated to MA 1B. The majority of potential wilderness areas identified on the Umatilla National Forest are allocated to MA 4 – General Forest (191,900 acres) with lesser acreage allocated to MA 3A – Backcountry (nonmotorized use) (19,700 acres) and MA 3B – Backcountry (limited motor vehicle use) (14,300 acres). Lands within Management Area 4A often display high levels of management activity and associated roads. MA 3A and MA 3B are characterized by remote settings, allowing for both motor vehicle use and nonmotorized use. Although the areas are considered remote, the area may show signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Wallowa-Whitman National Forest

For the Wallowa-Whitman National Forest, no new areas would be allocated to MA 1B. The majority of potential wilderness areas identified on the Wallowa-Whitman National Forest are allocated to MA 4 – General Forest (144,600 acres) with lesser acreage allocated to MA 3B – Backcountry (limited motor vehicle use) (97,800 acres). No acres are allocated to MA 3A –

Backcountry (nonmotorized use). Lands within Management Area 4A often display high levels of management activity and associated roads. MA 3B is characterized by remote settings, allowing for both motor vehicle use and nonmotorized use. Although the areas are considered remote, the area may show signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Effects from Alternative B

For this alternative, the additional acreage allocated to MA 1B would slightly increase the National Wilderness Preservation System total acres should those areas be converted to Wilderness by Congress. The percent wilderness areas and recommended wilderness areas for the Malheur National Forest would remain 5 percent. For the Umatilla National Forest, it would remain 22 percent, and for the Wallowa-Whitman National Forest, it would go up 1 percent to 25 percent. For all three forests, the additional acreage in MA 1B is situated immediately adjacent to existing designated wilderness. The additions would expand existing wilderness areas and would not create new, unique wilderness designations.

Alternative B proposes four recommended wilderness areas totaling 13,400 acres. This total is more that alternatives A and D, but less than alternatives C, E, and F. Alternative B emphasizes a combination of active management and natural processes for restoring landscapes. In this alternative, four wilderness area additions would be managed to preserve wilderness character through management efforts to maintain the five wilderness qualities (natural, untrammeled, solitude or a pristine and unconfined type of recreation, undeveloped and other features) that define wilderness character.

For this alternative, winter motor vehicle use would continue to be allowed in MA 1B.

Alternative B allocates the largest amount (acres) of potential wilderness areas to MA 3B. This area is managed generally where natural ecological processes predominate, are relatively remote, and may show signs of past activities. Use includes both motor vehicle use and nonmotorized use.

Malheur National Forest

For the Malheur National Forest, the Strawberry Mountain Wilderness Area Additions, comprised of three separate areas totaling 1,160 acres, would be allocated to MA 1B.

The majority of potential wilderness areas identified in the Malheur National Forest would be allocated to MA 3B – Backcountry (limited motor vehicle use) (116,000 acres) and to MA 3A – Backcountry (nonmotorized use) (49,800 acres). These management area designations are characterized by a primitive and remote setting and include areas with naturally appearing landscapes and areas that may exhibit signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Umatilla National Forest Service

For the Umatilla National Forest, the North Fork Umatilla Wilderness Additions would total 270 acres and the North Fork John Day Wilderness Additions, comprised of two separate areas totaling 1,170 acres, would be allocated to MA 1B. The majority of potential wilderness areas identified in the Umatilla National Forest would be allocated to MA 3B – Backcountry (limited motor vehicle use) (198,900 acres). This management area designation is characterized by remote setting with both motor vehicle use and nonmotorized use. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Wallowa-Whitman National Forest

For the Wallowa-Whitman National Forest, the Huckleberry Roadless Area would total 10,770 acres and would be allocated to MA 1B. The area is immediately adjacent to the Eagle Cap Wilderness and would expand the existing wilderness. Large portions of the Huckleberry Roadless Area were previously added to the Eagle Cap Wilderness. The previous additions to the Eagle Cap Wilderness in 1972 and 1984 reduced the overall Huckleberry Roadless Area to less than 30 percent of its original area. This alternative would allocate the remaining acres to MA 1B.

The majority of potential wilderness areas identified in the Wallowa-Whitman National Forest are allocated to MA 3B – Backcountry (limited motor vehicle use) (194,900 acres). This management area designation is characterized by remote setting with both motor vehicle use and nonmotorized use. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Effects from Alternative C

For this alternative, a total of 49 new recommended wilderness areas totaling 505,000 acres would be allocated to MA 1B. This would represent an increase to the NWPS total acres should those areas be converted to Wilderness by Congress. The combined percent designated wilderness area and recommended wilderness area within the Malheur National Forest would increase 4 percent for a total of 9 percent or 165,000 acres. Within the Umatilla National Forest it would increase 17 percent for a total of 39 percent or 552,735 acres of wilderness and recommended wilderness. Within the Wallowa-Whitman National Forest it would increase 7 percent for a total of 31 percent or 761,449 acres. The additions would both expand existing designated wilderness areas and would designate new unique wilderness areas.

For this alternative, summer vehicle use would be reduced over time and winter motor vehicle use would be unsuitable in MA 1B (see the general suitability matrix table in appendix A). This change would restrict winter motor vehicle use (see the Access section for suitability changes by alternative).

Summer motor vehicle use in some locations within the Wallowa-Whitman National Forest would be affected including the Peavine, Evans, Mt Emily, Mt Fanny, Breashears, and portions of the Winom-Frazier motor vehicle trail systems. Nonmotorized use and the five qualities of wilderness character would be enhanced by these changes.

Alternative C proposes 49 new recommended wilderness areas totaling 505,000 acres. This total is more than alternatives A, B, D, E, and F. Alternative C emphasizes nonmotorized use and the role of natural process in forest restoration. This alternative would allow for the largest amount (acres) of land allocated to MA 1B. This area exhibits primitive qualities and ecosystems are influenced by natural processes with little or no human intervention. Uses are conducive to maintaining the wilderness characteristics of the area.

Alternative C would allocate the largest amount of land that contributes to enhancing the five wilderness qualities that define wilderness character when compared to the other alternatives.

Malheur National Forest

For the Malheur National Forest a total of 9 areas totaling 83,800 acres would be allocated to MA 1B. These areas would both expand existing wilderness and would create new unique wilderness designations.

The majority of potential wilderness areas identified in the Malheur National Forest would be allocated to MA 1B and to MA 3A – Backcountry (nonmotorized use) (104,300 acres). These management area designations are characterized by primitive qualities and retain high levels of integrity regarding the five wilderness character qualities.

Umatilla National Forest

For the Umatilla National Forest a total of 22 areas totaling 248,500 acres would be allocated to MA 1B. These areas would both expand existing wilderness and would create new unique wilderness designations.

The majority of potential wilderness areas identified in the Umatilla National Forest would be allocated to MA 1B and to MA 3A – Backcountry (nonmotorized use) (30,800 acres). These management area designations are characterized by primitive qualities and retain high levels of integrity regarding the five wilderness character qualities.

Wallowa-Whitman National Forest

For the Wallowa-Whitman National Forest a total of 18 areas totaling 172,700 acres would be allocated to MA 1B. These areas would both expand existing wilderness and would create new unique wilderness designations.

The majority of potential wilderness areas identified in the Umatilla National Forest would be allocated to MA 1B and to MA 3A – Backcountry (nonmotorized use) (62,200 acres). These management area designations are characterized by primitive qualities and retain high levels of integrity regarding the five wilderness character qualities.

Effects from Alternative D

For this alternative, no new areas would be allocated to MA 1B, and consequently there would not be any increase to the National Wilderness Preservation System. The percent of the forest allocated to National Wilderness Preservation System would remain the same, with the Malheur National Forest at 5 percent, the Umatilla National Forest at 22 percent, and the Wallowa-Whitman National Forest at 24 percent in designated wilderness areas. The forest plan would not make recommendations to Congress regarding areas suitable for inclusion in the National Wilderness Preservation System. These areas would continue to be managed as part of their current management area allocations, which vary by national forest.

Similar to alternative A, alternative D does not propose any new recommended wilderness areas. Alternative D proposes greater timber harvest than all other alternatives and emphasizes active management to restore the forested landscape. The alternative emphasizes retaining the areas that currently are generally suitable for motor vehicle use, resulting in more area suitable for summer and winter motor vehicle use compared to the other alternatives.

Similar to alternative B, alternative D would allocate the most acres of potential wilderness areas to MA 3B. This area is managed generally where natural ecological processes predominate, are relatively remote, and may show signs of past activities. Use includes both motor vehicle use and nonmotorized use. This alternative would contribute the least to enhancing the five wilderness qualities that define wilderness character when compared to alternatives B, C, E and F, but would enhance those qualities more when compared to alternative A.

Malheur National Forest

For the Malheur National Forest, no new areas would be allocated to MA 1B. The majority of potential wilderness areas identified on the Malheur National Forest would be allocated to MA 3B – Backcountry (limited motor vehicle use) (165,800 acres). This management area designation is characterized by remote settings, allowing for both motor vehicle use and nonmotorized use. Although the areas are considered remote, the area may show signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Umatilla National Forest

For the Umatilla National Forest, no new areas would be allocated to MA 1B. The majority of potential wilderness areas identified on the Umatilla National Forest would be allocated to MA 3B – Backcountry (limited motor vehicle use) (218,700 acres). This management area designation is characterized by remote settings, allowing for both motor vehicle use and nonmotorized use. Although the areas are considered remote, the area may show signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Wallowa-Whitman National Forest

For the Wallowa-Whitman National Forest, no new areas would be allocated to MA 1B. The majority of potential wilderness areas identified on the Wallowa-Whitman National Forest would be allocated to MA 3B – Backcountry (limited motor vehicle use) (215,500 acres). This management area designation is characterized by remote settings, allowing for both motor vehicle use and nonmotorized use. Although the areas are considered remote, the area may show signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

Effects from Alternatives E and F

For these alternatives a total of 10 recommended wilderness areas totaling 90,800 acres would be allocated to MA 1B representing a moderate increase to the National Wilderness Preservation System total acres should those areas be designated to wilderness by Congress. The combined percent of designated Wilderness and preliminary administratively recommended wilderness on the Malheur National Forest would increase 1 percent for a total of 6 percent, or 113,000 acres of Wilderness and Recommended Wilderness. On the Umatilla National Forest it would increase 2 percent for a total of 24 percent or 344,274 acres of Wilderness Area and Recommended Wilderness. On the Wallowa-Whitman National Forest it would increase 1 percent for a total of 25 percent or 609,000 acres of Wilderness Area and Recommended Wilderness. The additions would both expand existing designated wilderness areas and would designate new, unique wilderness areas.

For these alternatives, winter motor vehicle use would continue to be permitted within all proposed wilderness areas except for the McClellan Mountain area within the Malheur National Forest, where it is currently prohibited.

Alternatives E and F propose 10 new recommended wilderness areas totaling 90,800 acres. This total is more that alternatives A, B and D, but less than alternatives C. Alternatives E and F emphasize the use of vegetation management and aquatic and wildlife habitat treatments to emphasize active forest restoration.

Alternatives E and F would allocate the majority of potential wilderness areas to MA 3A followed by MA 3B. The distribution is similar to alternative B for both the Malheur and Umatilla National Forests. These management area designations are characterized by a primitive and remote setting and include areas with naturally appearing landscapes and areas that may exhibit signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designation, or by area restrictions.

This alternative would contribute more toward enhancing the five wilderness qualities that define wilderness character when compared to alternatives A, B, and D, but would contribute less when compared to alternative C.

Malheur National Forest

For the Malheur National Forest a total of three areas totaling 30,400 acres would be allocated to MA 1B. These areas would both expand existing wilderness and create new, unique wilderness designations if designated by Congress.

The majority of potential wilderness areas identified in the Malheur National Forest would be allocated to MA 3B – Backcountry (limited motor vehicle use) (104,900 acres) and to MA 3A – Backcountry (nonmotorized use) (40,000 acres). These management area designations are characterized by primitive qualities and retain high levels of integrity regarding the five wilderness character qualities.

Umatilla National Forest

For the Umatilla National Forest a total of 5 areas totaling 40,000 acres would be allocated to MA 1B. These areas would both expand existing wilderness and would create new, unique wilderness designations if designated by Congress.

The majority of potential wilderness areas identified in the Umatilla National Forest would be allocated to MA 3A – Backcountry (nonmotorized use) (62,000) and to MA 3B – Backcountry (limited motor vehicle use) (129,400 acres). These management area designations are characterized by primitive qualities and provide opportunities to protect the five qualities of wilderness character.

Wallowa-Whitman National Forest

For the Wallowa-Whitman National Forest a total of 2 areas totaling 20,300 acres would be allocated to MA 1B. These areas are adjacent to existing wilderness areas and would expand the existing wilderness boundaries if designated by Congress.

The majority of potential wilderness areas identified in the Wallowa-Whitman National Forest would be allocated to MA 3A – Backcountry (nonmotorized use) (81,200 acres) and to MA 3B – Backcountry (limited motor vehicle use) (119,500). These management area designations are characterized by primitive qualities and provide opportunities to protect the five qualities of wilderness character.

Effects Common to Alternatives B, C, E, and F

The areas that would be allocated to MA 1B have been determined to meet the criteria established to qualify for designation as wilderness areas. These areas are preliminarily recommended for designation and inclusion in the National Wilderness Preservation System. Until a decision is made by Congress, these areas will be managed to protect the five qualities of wilderness character that meet the criteria for designation of these lands as wilderness areas.

Lands allocated to MA 1B within the action alternatives were previously managed as undeveloped lands and generally do not permit activities that conflict with conserving wilderness area character. For this reason, there would not be a large shift in management activities or access limitations for MA 1B (with the exception of alternative C in some locations, see discussion above for winter motorized use restrictions).

Effects Common to Alternatives B, E, and F

For these alternatives, over snow vehicle (OSV) use is determined suitable as displayed in the general suitability matrix in appendix A. Although long-term physical impacts of over snow vehicle use may be difficult to quantify, snowmobiles do cause short-term physical and social impacts.

Snowmobiles generate biophysical and social impacts. Physical impacts may include effects to wildlife that include increased stress, reduced survival and productivity, impaired immune function, disruption to movement patterns, and changes to behavioral adaptations (Smith 2013). Additional physical impacts include effects to vegetation, soils, and air quality impacts resulting from emissions (Newman and Sears 1999). Social impacts are marked by increased noise and by reduced visual/scenic quality. Snow machines are often audible over great distances, and tracks in snowfields and high mark play areas may be widespread and affect natural appearance and sense of solitude.

The potential effects that result from over snow vehicle use in preliminary administrative recommended wilderness areas (MA 1B) include a reduction in the area's wilderness character and value, and consequently a reduction in the area's eligibility for designation and inclusion in the National Wilderness Preservation System. Wilderness recommendations and designation are often controversial, and recent congressional review and findings regarding recommended wilderness areas reveal that areas with reduced wilderness character may be considered ineligible for wilderness designation.

Social Needs and Expectations

Preliminary Administratively Recommended Wilderness Areas (MA 1B) would be unsuitable for timber harvest, summer motor vehicle use (also unsuitable for winter motor vehicle use in alternative C, see discussion above), road construction, energy development, or mechanical fuels treatment. Limited management activities would be permitted for the purposes of visitor safety and prevention of resource impacts, including invasive species treatment. Grazing would be allowed as a permitted activity. Mining would be allowed to continue unless the area is withdrawn from mineral activity. Summer recreation uses that are nonmotorized, including using mechanical vehicles, such as mountain bikes, would continue.

MA 1B would provide visitors with opportunities for quiet recreation, although in some alternatives, winter motor vehicle recreation would be permitted in some areas. Wildlife disturbance would be minimal. Recreation activities in these areas would be compatible with wildlife use of the area. Wildlife disturbance or disruption from recreation during breeding/nesting periods would be minimized. Winter recreation, such as cross-country skiing and snowmobiling, would still occur in some instances and would stress wintering animals during deep snow periods. Over-the-snow trails providing access to these areas would continue to provide animals access to areas they usually could not use during the winter because of deep snow conditions (see the Terrestrial Wildlife Species Diversity and Viability section for the wildlife habitat security discussion).

The national forests in the Blue Mountains are currently and will continue to remain popular for recreation activities in areas outside wilderness. Hunting, relaxing, fishing, hiking and walking, gathering forest products, driving for pleasure, viewing wildlife, downhill skiing, and viewing natural features comprise 73 percent of recreational use. Although some of these uses may occur in wilderness areas, none is exclusive to or dependent upon wilderness areas to provide for these activities.

While the Blue Mountains provide high potential opportunities for unconfined recreation experiences and solitude, regionally and locally, the social demand for these unconfined experiences is related to general dispersed settings, not just wilderness, that provide both motorized and nonmotorized activities. From a regional perspective, the national forests of the Blue Mountains are perceived as high opportunities for cultural and spiritual values, historic significance, scenic vistas, hunting, and off-highway vehicle use.

From a forest-level perspective, the recreational users express social values for wilderness areas in numerous ways: solitude for psychological health; un-fragmented forests for habitat and intact landscapes; spiritual uses for solace of open, quiet, beautiful places; for wildlife and pristine settings; and economic opportunities for tourism, hunting, and fishing.

Social values for nonwilderness areas are expressed by recreational users for a variety of reasons: providing a balance of nonmotorized and motorized uses; allowing multiple uses including hunting, fishing, recreation, tourism; and timber harvesting to manage for forest health and to support community economics. Recreational users often express competing or conflicting social values for wilderness and nonwilderness uses for the same places (such as motorized and nonmotorized access; unmanaged and managed landscapes; expansion of recreation trails and limitations on uses). Within the Blue Mountain national forests, there remains a wide variety of opportunities for unconfined outdoor recreation experiences within both wilderness and nonwilderness national forest lands. The desired condition for MA 1B are provided in appendix A. The management area maps show the locations of MA 1B for each of the alternatives.

Cumulative Effects

The cumulative effects for the Blue Mountain national forests would be the allocation of National Forest System lands to MA 1B Preliminary Administratively Recommended Wilderness Areas. These lands currently are allocated to other management areas. There are no cumulative effects from alternatives A and D. In alternatives B, E, and F, there would be a relatively small number of acres allocated to MA 1B, and in alternative C, the number of acres allocated to MA 1B would be greatest. Since the areas that would be allocated to MA 1B for alternatives B, C, E, and F meet the criteria established in FSH 1909.12 chapter 70, there would be no change in suitable uses for these areas, except for alternative C, which would make winter motor vehicle use unsuitable.

Areas allocated to MA 1B would increase the qualities of wilderness character. Natural quality would be increased through conserving plant and animal species and communities, physical resources, and biophysical processes. Untrammeled quality would be enhanced by reducing actions that manipulate the biophysical environment. Undeveloped quality would improve through reducing structures, installations and developments not related to recreation. The qualities of solitude or primitive and unconfined attributes would be improved by retaining remoteness and by excluding facilities that decrease self-reliance. Additional qualities including ecological, geological, or other features of scientific, educational, scenic, or historical value would be conserved. Enhancing these qualities would have a beneficial effect on wilderness characteristics and values.

As noted above, lands considered eligible for allocation to MA 1B were previously managed as undeveloped lands and generally do not permit activities that conflict with conserving wilderness area character. For this reason, there would not be a large shift in management activities or access limitations for MA 1B. In general, the areas that would not be allocated to MA 1B would be allocated to MA 3A-Backcountry (nonmotorized use), or to MA 3B-Backcountry (limited motor vehicle use). These backcountry settings would retain many of the qualities of wilderness character and would continue to conserve wilderness values.

Effects from other Management Areas: Adjacent management activities can have a direct effect on Wilderness and recommended wilderness areas. Gorte (2011) noted that while The Wilderness Act of 1964 does not speak to the issue of buffer zones around wilderness areas, subsequent legislation has prohibited creating buffer zones that would "restrict… uses and activities on federal lands around the wilderness area. The first explicit language was enacted in 1980 in P.L. 96-550; § 105 states:

> Congress does not intend that the designation of wilderness areas … lead to the creation of protective perimeters or buffer zones around each wilderness area. The fact that nonwilderness activities or uses can be seen or heard from areas within the wilderness shall not, of itself, preclude such activities or uses up to the boundary of the wilderness area."

Nearly identical language has been included in 30 wilderness statutes since 1980 (*ibid*). Although subsequent wilderness statutes prohibit wilderness buffer zones, management actions conducted adjacent to wilderness boundaries can affect both management and use of the area inside the wilderness boundary. Areas adjacent to designated wilderness and recommended wilderness that are managed for nonmotorized use are usually more compatible with wilderness management objectives and maintaining wilderness character and quality.

As noted above, management areas bordering designated and recommended wilderness that provide for motorized use are more likely to affect wilderness condition and character. The most highly developed areas (for commodity production or recreation use) are generally MA 4A and MA 5. If new development occurs adjacent to any of the existing six wilderness areas or recommended wilderness areas, effects could include increased noise levels, modified landscapes, and motorized trespass.

Effects from Timber Harvest: The Wilderness Act provides limited timber cutting for mining relating activity, and Section (4)(d)(1) specifies that "such measure may be taken as may be necessary in the control of fire, insects, and diseases, subject to such conditions as the Secretary deems desirable." Vegetation management in wilderness, wilderness study areas, and recommended wilderness is generally restricted to use of wildland fire for multiple objectives in all alternatives. Wildland fire would continue as a possible management technique under all alternatives. Fire suppression measures would be used if and where fuels and weather increase the risk of unwanted fire, either within or emanating from wilderness, wilderness study areas, or recommended wilderness. All alternatives provide for use of wildland fire for multiple objectives in these areas.

Timber harvest activity in areas adjacent to wilderness and recommended wilderness may affect qualities of wilderness character, specifically solitude or primitive and unconfined quality. Vegetation management actions outside of wilderness may affect the remoteness from occupied and modified areas from within the wilderness. Additionally, the wilderness character of natural quality may be impaired through altering plant and animal species and communities in areas

adjacent to wilderness, and through an increased potential for the introduction of nonnative species though ground disturbing activities.

Effects from Fire and Fuels Management: While all human-caused fires within wilderness have a management objective of suppression, current and past agency direction allows naturally ignited fires within wilderness and recommended wilderness to be used to accomplish resource benefit objectives including restoring the role of fire in wilderness areas. The Blue Mountain national forests actively manage naturally ignited fires within wilderness to achieve resource benefit. Natural ignitions within wilderness and recommended wilderness areas may also be suppressed to meet protection objectives for values at risk outside of wilderness, or because site specific conditions are unfavorable toward meeting desired resource benefit objectives.

The trend to allow naturally ignited fires to accomplish resource benefits in wilderness and recommended wilderness is expected to continue in the future. All alternatives have desired conditions and objectives that include allowing fire to play its natural role in the wilderness ecosystem. These objectives pertain to both designated and any recommended wilderness. The importance of fire and impacts of fire suppression have long been understood, and naturally ignited fire is recognized as a crucial factor in maintaining naturalness within wilderness (D. Cole and P. Landers 1995).

Impacts resulting from fire suppression activity include possible use of mechanized equipment such as chainsaws for fireline construction, use of motorized equipment such as helicopters, and application of retardant. Minimum Impact Suppression Tactics (MIST) are used to minimize suppression impacts to the greatest extent possible while meeting the overall suppression objective.

Restoring natural fire regimes is compounded by the attendant risk to natural and cultural resources, property, and visitors, both within wilderness and on adjacent lands. Fire, in its natural role, can enhance the natural quality and character of wilderness. Wildland fire would continue as a reintroduced process in wilderness and recommended wilderness areas under all alternatives, and would have similar effects. Wildland fire for resource benefit increases the wilderness character of natural quality, but may adversely affect “solitude or primitive and unconfined quality” where visitors may encounter crews conducting fire management activities.

Effects from Livestock Grazing: Commercial livestock grazing is permitted in wilderness by the Wilderness Act of 1964 and in areas designated after 1964, where the activity was established prior to wilderness designation. While being an allowable use, livestock grazing presents nonconforming activities within designated wilderness (e.g. motorized access, structural and nonstructural improvements). Grazing use and management direction within wilderness was further reviewed by U.S. congressional committees in the 95th and 96th Congress (Hendee and Dawson 2009). House Report 96-617 accompanied the Colorado Wilderness Act (P.L. 96-560) providing additional interpretation and clarification regarding the intent presented within Wilderness Act relating to grazing use and activity. The report, often referred to as the “congressional grazing guidelines,” “provided for continuation of existing grazing use; the maintenance and construction of supporting facilities including ‘fences, line cabins, water wells and lines, and stock tanks;’ and the temporary use of motorized equipment to repair facilities and for emergency purposes” (*ibid*). Livestock grazing is a well-established use within national forest designated wilderness as provided for in The Wilderness Act and subsequent legislation, and is an appropriate use of wilderness and recommended wilderness areas.

Livestock grazing use in wilderness may affect the five wilderness character qualities to varying degrees. Grazing allotments within wilderness are managed to conserve the range resource while observing existing law, regulation, and policy.

Recreational livestock grazing standards and guidelines vary by national forest and are not directly regulated by a permitting process; only livestock used by commercial outfitters and guides is under permit. Standards and Guidelines included in the draft Plan provide a framework for managing recreational livestock grazing use, reducing impacts and influences to desired levels, and maintaining the five wilderness character qualities.

Effects from Minerals Management: The Wilderness Act of 1964 allows for mining activity within designated wilderness. The use is conditioned by specific criteria outlined within the act and by agency regulations designed to minimize affects to wilderness character. However, given these considerations, mining activity within wilderness is generally characterized as being minimal to nonexistent and prospecting for new claims within wilderness has largely ended (Hendee and Dawson 2009). These current conditions are consistent with mineral survey findings that reveal an overall lack of major mineral deposits within wilderness that are economically viable (*ibid*). Developing mineral operations within wilderness are generally more difficult and costly and may contribute to the overall absence of development (see the Mineral Resource section for leasable minerals, geothermal, coal, locatable minerals, saleable minerals and other [wind] energy discussions).

Effects from Recreation and Access: Section (4)(b) of The Wilderness Act states that "wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use." Recreation is the most obvious and reported use of wilderness. Though recreation use is a prescribed use within wilderness, visitor and recreational use in wilderness and recommended wilderness has the potential to impair wilderness character: natural quality may be affected through impacts to physical resources (e.g. water, soil); undeveloped quality may be affected by recreation related facilities and developments; and the solitude or primitive and unconfined quality may be affected by facilities that decrease self-reliance and through management restrictions on visitor use.

Section (4)(c), Prohibition of Certain Uses, of the Wilderness Act states that "there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area." While Section (4)(c) prohibits motorized use within wilderness, use of motorized vehicles, equipment, or mechanical transport in areas adjacent to designated or recommended wilderness has the potential to impair the undeveloped quality of wilderness character. Similarly, the wilderness character of solitude or primitive and unconfined quality may be impaired by a decrease in remoteness from occupied and modified areas outside the wilderness.

Issue 6: Ecological Resilience

This section describes the affected environment and environmental consequences related to the ecological resilience significant issue. Concern about the amount, type, and extent of management activities that would be aimed at restoring ecological resilience in the proposed action was expressed during the scoping comment period. Based on perceptions of the current vegetation condition and its resilience, some people think the management approach would be too aggressive while others expressed a desire for a more aggressive approach. The level of public concern is heightened because the management approach to restoring ecological resilience would determine what ecosystem services the Blue Mountains national forests could provide.

Forest Service policy to reestablish and retain ecological resilience (FSM 2020) was developed after the 1990 forest plans were approved. Resilience is defined as the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change (FSM 2020 interim directive). While the foundational policy for the national forests is to achieve sustainable management and provide a broad range of ecosystem services, forest plans determine the management approach by defining objectives, desired conditions, and standards and guidelines and by predicting outcomes.

Affected Environment – Ecological Resilience

This issue influenced development of the alternatives, which include varying levels of restoration activities and resulting outcomes. The measures for this issue reflect the level of management activities designed to maintain or restore resilience and the anticipated effects on resilient conditions (as measured by the degree that alternatives are predicted to achieve the desired conditions). The alternatives that are predicted to make the most progress towards achieving the desired conditions would also be the alternatives that restore the highest level of resilience.

Key Indicators to Reflect the Level of Management Activity

- Annual forested vegetation active restoration activities (acres)
- Roads treatments in priority watersheds (miles)
- Forage use in priority watersheds (intensity)
- Improved riparian areas (miles)

Key Indicators to Reflect Resilient Conditions

- Watersheds in improved conditions
- Improvement in the dry upland forest potential vegetation group fire regime condition class departure score at year 50

Environmental Consequences – Ecological Resilience

Key Indicators to Reflect Levels of Management Activities

Annual Forested Vegetation Active Restoration Activities

The acres displayed in table 108 would be the sum of the annual forested vegetation harvest treatments, planting, and noncommercial thinning. These treatments would be designed to make progress toward achieving multiple desired conditions, such as forested structural stages, species composition, stand density, and fire regime condition class, to restore ecological resiliency. These projections are a reflection of the combination of plan components in each alternative, the assumptions used to identify treatment needs, and the existing vegetation condition.

Table 108. Annual acres of forested vegetation harvest treatments, planting, and noncommercial thinning (with the percent change from existing levels in parentheses) under each alternative within each national forest

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	8,600 (0%)	9,200 (7%)	4,800 (-44%)	25,100 (192%)	15,300 (78%)	10,600 (23%)

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
UMA	6,950 (0%)	7,400 (6%)	4,000 (-42%)	20,100 (189%)	13,400 (93%)	8,700 (25%)
WAW	7,150 (0%)	7,650 (7%)	3,950 (-45%)	22,650 (217%)	12,950 (81%)	9,350 (31%)

Under alternative A, harvest treatments, planting, and noncommercial thinning would continue at the current rates within the analysis area. Within all three national forests, alternative D would result in the greatest number of acres of harvest treatments, planting, and noncommercial thinning. Under alternative D, treatments would accelerate from current levels by approximately 189 percent to 217 percent within the analysis area. Within all three national forests, alternative E would result in the second greatest number of acres of harvest treatments, planting, and noncommercial thinning. Under alternative E, treatments would accelerate from current levels by approximately 78 percent to 93 percent within the analysis area. Alternative C would result in the least number of acres of harvest treatments, planting, and noncommercial thinning. Under alternative C, treatments would decelerate by approximately 42 percent to 45 percent within the analysis area.

Table 128 displays the estimated annual acres of fuels management activities inside and outside of harvest units. These acres include prescribed burning inside and outside of harvest units without ground-based mechanical pretreatment and prescribed burning or the removal of fuels with ground-based equipment inside of harvest units.

Under all of the alternatives, except alternative D, prescribed burning outside of harvest units would continue at the current rate of approximately 30,000 acres per year within all three national forests. Under alternative D, the use of prescribed fire (planned ignitions) outside of harvest units would be eliminated.

Under alternative D, most of the activity-generated fuels would be treated mechanically. The majority of the fuels treatments within harvest units would be accomplished by removal or crushing, instead of prescribed burning. Only approximately one-fourth of the total acres harvested annually would be prescribed burned.

Alternative E would result in the greatest number of acres of prescribed burning inside of harvest units within all three national forest. Within the Malheur National Forest, prescribed burning within harvest units would increase by approximately 76 percent from current levels. Within the Umatilla National Forest, prescribed burning within harvest units would increase only slightly from current levels. Within the Wallowa-Whitman National Forest, prescribed burning within harvest units would increase by approximately 108 percent from current levels.

Alternative C would result in the fewest number of acres of prescribed burning inside of harvest units within all three national forest. Within the Malheur National Forest, prescribed burning within harvest units would decrease by approximately 52 percent from current levels. Within the Umatilla National Forest, prescribed burning within harvest units would decrease by approximately 75 percent from current levels. Within the Wallowa-Whitman National Forest, prescribed burning within harvest units would decrease by approximately 54 percent from current levels.

Table 109. Annual acres of fuels management activities under each alternative within each national forest

National Forest	Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	Prescribed burning outside of harvest units*	9,500	9,500	9,500	0	9,500	9,500
	Prescribed burning inside of harvest units*	5,300	5,300	2,500	5,100	9,400	6,200
	Prescribed burning or removal of fuels with ground-based equipment inside of harvest units**	1,800	1,800	900	15,400***	3,100	2,100
UMA	Prescribed burning outside of harvest units*	10,000	10,000	10,000	0	10,000	10,000
	Prescribed burning inside of harvest units*	7,800	7,800	1,700	4,000	7,900	4,800
	Prescribed burning or removal of fuels with ground-based equipment inside of harvest units**	1,300	1,300	600	12,000***	2,700	1,600
WAW	Prescribed burning outside of harvest units*	10,500	10,500	10,500	0	10,500	10,500
	Prescribed burning inside of harvest units*	3,400	3,450	1,550	4,300	7,050	4,550
	Prescribed burning or removal of fuels with ground-based equipment inside of harvest units**	1,100	1,100	500	12,700***	2,300	1,500

* Without ground-based mechanical pretreatment. **Could include treatment of fuels with ground-based equipment.
*** Would include mostly removal of fuels with ground-based equipment.

Table 110 displays the annual acres of forested vegetation active restoration activities and the percent of management area 4A (general forest) that would be treated annually under each of the alternatives by national forest. For alternatives A and C, the percent treated annually also included the acres of management area 4C (old forest). MA 4A and 4C were used in the example because the majority of the active restoration activities would occur within these management areas. Under alternatives B, D, E, and F, acres of old forest would be included within general forest. Active restoration activities include harvest treatments, planting, non-commercial thinning, and prescribed burning outside of harvest units. Acres of prescribed burning within harvest units was not included in table 117 because those acres were already included in the harvest treatment acres. The alternative that contains the greatest number of total acres of MA 4A (general forest) (and 4C old forest under alternatives A and C) would have the potential to result in the largest percent of the landscape restored over the long-term, thereby resulting in increased ecological resilience.

Table 110. Estimated annual acres of forested vegetation active restoration activities* and the approximate percent of management area 4A treated annually under each alternative by national forest

National Forest	Restoration Activities	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	Annual acres of forested vegetation active restoration activities*	18,100	18,700	14,300	25,100	24,800	20,100
	Total acres of MA 4A and 4C	882,253	1,252,000	907,600	1,359,800	1,245,600	1,245,600
	Percent of MA 4A and 4C treated annually	2	1	2	2	2	2
UMA	Annual acres of forested vegetation active restoration activities*	16,950	17,400	14,000	20,100	23,400	18,700
	Total acres of MA 4A (and 4C**)	300,177	640,300	423,800	742,300	625,200	625,200
	Percent of MA 4A (and 4C**) treated annually	6	3	3	3	4	3
WAW	Annual acres of forested vegetation active restoration activities*	17,650	18,150	14,450	22,650	23,450	19,850
	Total acres of MA 4A and 4C	673,085	848,000	488,200	998,700	844,300	844,300
	Percent of MA 4A and 4C treated annually	3	2	3	2	3	2

* Estimated annual acres of forested vegetation active restoration activities include harvest treatments, planting, noncommercial thinning, and prescribed burning outside of harvest units.

**Alternatives A and C also include acres of management area 4C (old forest).

Within the Malheur National Forest, all of the alternatives, except for alternative B, would treat approximately 2 percent of MA 4A annually. However, alternative D would contain the greatest number of acres of general forest and would contain the greatest number of acres of annual forested vegetation active restoration activities. The number of acres of annual active restoration activities would be only slightly lower under alternative E, compared to alternative D. Alternative C would contain the fewest acres of annual active restoration activities. However, alternative C would treat approximately 2 percent of MA 4A and 4C because the total acres of these two management areas are less under alternative C, compared to the other action alternatives.

Within the Umatilla National Forest, alternative A would treat approximately 6 percent of MA 4A and 4C annually. However, alternative A would contain the fewest number of acres of MA 4A and

4C. While alternative E would treat approximately 4 percent of MA 4A annually, it would contain over 300,000 acres more of general forest than alternative A. Alternatives B, C, D, and F would treat approximately 3 percent of MA 4A (and 4C for alternative C) annually. However, the number of acres of MA 4A (and 4C under alternative C) would vary greatly between these alternatives. Alternative C would contain the fewest acres of annual active restoration activities. Alternative C would also contain the fewest number of acres of MA 4A and 4C of the action alternatives. Alternative D would contain the greatest number of acres of general forest of all of the alternatives.

Within the Wallowa-Whitman National Forest, alternatives A, C, and E would treat approximately 3 percent of MA 4A (and 4C for alternative C) annually. However, alternative C would contain the fewest number of acres of MA 4A and 4C. While alternative E would treat approximately 3 percent of MA 4A annually, it would contain over 350,000 acres more of general forest than alternative C. Alternatives B, D, and F would treat approximately 2 percent of MA 4A annually. However, alternative D would contain approximately 150,000 acres more of MA 4A. Alternative C would contain the fewest acres of annual active restoration activities. Alternative C would also contain the fewest number of acres of MA 4A and 4C of the action alternatives.

Figure 14 illustrates a comparison of the approximate number of years required to complete forested vegetation active restoration activities within all of MA 4A (and 4C for alternatives A and C) under each alternative within each national forest. The number of years was calculated by dividing the total number of acres of MA 4A (and 4C for alternatives A and C) under each alternative by the estimated number of acres of annual active restoration activities under each alternative. This analysis was conducted to compare the rates at which active restoration activities could occur under each of the alternatives. Under each alternative, not every acre within MA 4A (and 4C under alternatives A and C) would necessarily be treated. The specific areas requiring treatment would be identified during project-level NEPA analysis or other landscape-level planning efforts.

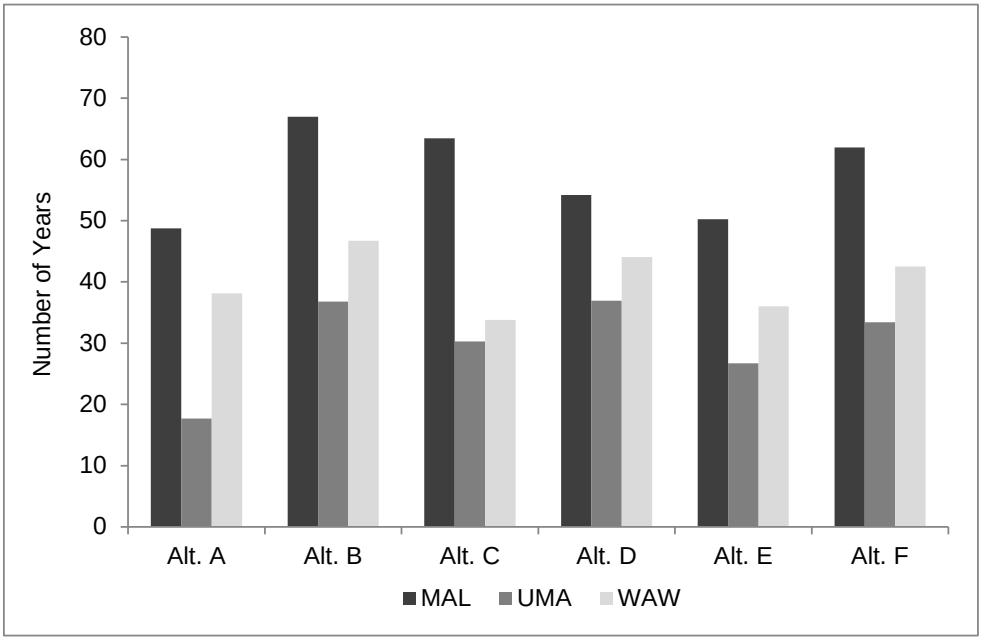

Figure 14. Comparison of the approximate number of years required to complete forested vegetation active restoration activities within management area 4A and 4C under each alternative within each national forest

All of the alternatives contain the same desired conditions for forested vegetation (forested structural stages, species composition, stand density, fire regime condition class). One of the main differences between the alternatives in terms of forested vegetation would be whether the alternatives achieve these desired conditions and the number of years required to achieve the desired conditions. The alternatives that result in the closest achievement of the desired conditions for forested vegetation in the shortest amount of time and across the largest number of acres would result in the greatest improvement in ecological resilience of forested vegetation. The rate and scale at which the desired conditions would be achieved is important because the pace of restoration activities has not kept up with the need resulting from fire suppression. Fire suppression over the past century has resulted in fuel accumulation, altered species composition, increased stand densities, altered stand structures, and an increased risk of catastrophic, stand-replacing events.

Within the Malheur National Forest, alternatives A and E would require the fewest number of years (49 and 50 years, respectively) to complete forested vegetation active restoration activities within MA 4A (and 4C for alternatives A and C). Alternative A would require the fewest number of years because this alternative would contain the fewest number of acres of MA 4A and 4C. Alternatives B, E, and F would contain approximately the same number of acres of MA 4A. At the estimated rate of 24,800 acres annually, all acres could potentially be treated within approximately 50 years under alternative E. Although alternative D would require approximately 54 years to complete active restoration activities, alternative D would include an additional 100,000 acres of MA 4A, resulting in higher levels of active restoration over the long-term within Malheur National Forest. Alternatives B and C would require the greatest number of years (67 and 63 years, respectively) to complete active restoration activities within MA 4A (and 4C under alternative C). Additionally, under alternative C, MA 4A and 4C would constitute approximately 300,000 acres to 400,000 acres less than alternatives B, D, E, and F, resulting in lower levels of active restoration over the long-term within the Malheur National Forest.

Within the Umatilla National Forest, alternative A would require the fewest number of years (18 years) to complete forested vegetation active restoration activities within MA 4A and 4C. Alternative A would require the fewest number of years because this alternative would contain the fewest number of acres of MA 4A and 4C. Alternatives B, E, and F would contain approximately the same number of acres of MA 4A. At the estimated rate of 23,400 acres annually, all acres of MA 4A could potentially be treated within approximately 27 years under alternative E. Although alternative C would require approximately 30 years to complete active restoration activities, alternative C would include approximately 200,000 fewer acres of MA 4A and 4C, compared to alternative E. Alternatives B and D would require the greatest number of years (37 years) to complete active restoration activities within MA 4A. However, alternative D would include an additional 100,000 acres of MA 4A, compared to alternatives B, E, and F, resulting in higher levels of active restoration over the long-term within the Umatilla National Forest. Alternatives A and C would contain the fewest number of acres of MA 4A and 4C, resulting in lower levels of active restoration over the long-term within the Umatilla National Forest.

Within the Wallowa-Whitman National Forest, alternative C would require the fewest number of years (34 years) to complete forested vegetation active restoration activities within MA 4A and 4C. Although alternative C would require the fewest number of years, this alternative would contain approximately 185,000 to 500,000 fewer acres of MA 4A and 4C, in comparison to the other alternatives. Alternatives B, E, and F would contain approximately the same number of acres of MA 4A. At the estimated rate of 23,450 acres annually, all acres of MA 4A could potentially be treated within approximately 36 years under alternative E. Alternatives B and D

would require the greatest number of years (approximately 47 and 44 years, respectively) to complete active restoration activities within MA 4A. However, alternative D would include an additional 150,000 acres of MA 4A, compared to alternatives B, E, and F, resulting in higher levels of active restoration within the Wallowa-Whitman National Forest. Alternatives A and C would contain the fewest number of acres of MA 4A and 4C, resulting in lower levels of active restoration over the long-term within the Wallowa-Whitman National Forest.

Road Treatments in Priority Watersheds

The emphasis of road-related treatment objectives, as stated in appendix A, is to reduce road-related sedimentation by reducing the hydrological connectivity of National Forest System roads. Hydrologically connected roads are defined as roads or portions of roads that route water and/or sediment directly to stream channels. The extent of hydrologically connected roads was estimated using GIS and approximated by the miles of roads occurring within a set distance of streams. The method provides an approximation that is used to compare alternatives.

The hydrologic connectivity of the road system would be substantially reduced for alternatives C and D, and somewhat reduced for the other action alternatives (table 111).

Table 111. Miles of road treatments in priority watersheds for each alternative for each national forest

National Forest	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
MAL	260	260	600	650	290	310
UMA	260	260	450	800	300	270
WAW	260	260	400	800	300	270

Forage Use in Priority Watersheds

Livestock use intensity, as defined by Holechek et al. (2006), is an estimate of forage use by domestic livestock relative to long-term average forage production and is used to manage livestock use to be consistent with the inherent productivity of rangeland sites. Forage production for all vegetation types was estimated using methods described in the grazing land vegetation section of this document (see the Livestock Grazing and Rangeland Vegetation section) and Johnson (1987, 1992) and was summed by subwatershed. Forage use was estimated by summing animal unit months (AUMs) by subwatershed and converting AUMs to forage use with methods described in the Forest Service Handbook (FSH 2209.13 chapter 90).

Average use levels are expected to be the same for alternatives A, B, E, and F (table 112). Average use levels would increase slightly for alternative D. Use intensity would be substantially reduced for alternative C.

Table 112. Average percent of forage use intensity in priority watersheds for each alternative for each national forest

National Forest	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
MAL	15.9%	15.9%	3.8%	17.0%	15.9%	15.9%
UMA	11.4%	10.6%	0.8%	13.8%	10.6%	10.6%
WAW	12%	12%	3%	17%	12%	12%

Improved Riparian Areas

The measure for improved riparian areas (objective) is stream miles and could include reconnection of the floodplain, stabilizing stream banks, restoring channel morphology, and addition of large wood in streams. Because channel reconstruction is costly to design and implement, the number of miles completed in any year would vary and usually would be small. However, there are a variety of actions or methods that could be used to improve stream channel and aquatic habitat conditions in lieu of channel reconstruction.

Active channel restoration is expected to occur in 6 to 9 percent of stream miles in priority watersheds, depending in the alternative selected. The fewest stream miles would be restored for alternatives B and D, while the most miles treated would occur for alternatives C and E (table 113).

Table 113. Miles of improved riparian areas for each alternative for each national forest

National Forest	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
MAL	300	300	600	300	450	400
UMA	150	150	300	150	225	210
WAW	250	250	500	250	375	350

Key Indicators to Reflect Resilient Conditions

Improvement in the Dry Upland Forest Potential Vegetation Group Fire Regime Condition Class Departure Score

The changes in vegetation and fire regime condition class departure scores would be the result of the activities listed in table 108 through table 113, as well as growth and mortality due to insects, disease, and wildfire. Forested vegetation active restoration activities would increase the Blue Mountains national forests' resilience to disturbance in the long term by improving tree vigor and stand structure, retaining a suitable mix of tree species for the site, and by reducing both surface and aerial fuels in accordance with the desired conditions. The resulting retention of forest cover after disturbances that affect all or part of a forest stand would help to ensure that a variety of ecosystem services associated with forested vegetation are provided continuously. The resulting improvement in stand structure, species composition, and ecological resilience could also improve wildlife habitat for some species. Those alternatives that are projected to make the most progress towards achieving the forested vegetation desired conditions (structure, function, and composition) would result in the most ecologically resilient conditions.

Table 114 displays the fire regime condition class departure scores by potential vegetation group under each of the alternatives projected over 50 years by national forest. The departure values for fire regime condition class are based on a score of zero to 100, with a departure score of zero indicating the least amount of departure between the existing and desired conditions/HRV and a departure score of one hundred indicating the maximum amount of departure between the existing and desired conditions/HRV. A score of less than 33 would be considered low departure from the HRV (condition class 1). A departure score of 33 to 66 would be considered moderate departure from the HRV (condition class 2). A departure score of greater than 66 would be considered high departure from the HRV (condition class 3). Fire regime condition class departure scores were calculated for all upland forest potential vegetation groups. A more thorough discussion of all upland forest potential vegetation groups can be found in the Forested Vegetation, Timber Resources, and Wildland Fire section of this document. The discussion

regarding ecological resilience uses the dry upland forest potential vegetation group fire regime condition class departure scores as a key indicator because 60 to 90 percent of all harvest treatments would occur within this potential vegetation group and because forested vegetation within this potential vegetation group tends to be the most departed from the HRV.

Table 114. Fire regime condition class departure scores within the dry upland forest potential vegetation group for each alternative by national forest

National Forest	Year	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	Existing condition	62					
	20	55	53	56	47	50	53
	50	47	45	48	33	36	43
UMA	Existing condition	60					
	20	56	55	57	49	50	53
	50	48	46	50	39	39	43
WAW	Existing condition	56					
	20	57	57	58	52	54	56
	50	53	52	54	47	47	50

Within the Malheur dry upland forest potential vegetation group, all of the alternatives would result in moderate departure of fire regime condition class (class 2) at year 50 due to the relatively large amount of departure between existing conditions and the HRV. However, alternatives D and E would result in the greatest improvement in fire regime condition class departure scores at year 50. Under alternatives D and E, the fire regime condition class departure scores would be approximately 33 and 36, respectively, at year 50. Under Alternative D, vegetation within the dry upland forest potential vegetation group would be very close to low departure (condition class 1) at year 50 at the scale of the Malheur National Forest. However, condition class 1 may be achieved sooner in some individual watersheds that currently have significant amounts of large mid-aged forests that are more than 100 years old. For many areas that currently have 80 to 100 year old forests, it would take more than 50 years for those forests to grow into the larger and older age and size classes commonly associated with the definition of old forest.

Within the Umatilla dry upland forest potential vegetation group, all of the alternatives would result in moderate departure of fire regime condition class (class 2) at year 50 due to the relatively large amount of departure between the existing conditions and the HRV. However, alternatives D and E would result in the greatest improvement in fire regime condition class departure scores at year 50. Under alternatives D and E, the fire regime condition class departure scores would be approximately 39 at year 50. Under alternatives D and E, vegetation within the dry upland forest potential vegetation group would be close to achieving low departure from the HRV (condition class 1) at the scale of the Umatilla National Forest. However, condition class 1 may be achieved sooner in some individual watersheds that currently have significant amounts of large mid-aged forests that are more than 100 years old. For many areas that currently have 80 to 100 year old forests, it would take more than 50 years for those forests to grow into the larger and older age and size classes commonly associated with the definition of old forest.

Within the Wallowa-Whitman dry upland forest potential vegetation group, all of the alternatives would result in moderate departure of fire regime condition class (class 2) at year 50 due to the relatively large amount of departure between the existing conditions and the HRV. However, alternatives D and E would result in the greatest improvement in fire regime condition class

departure scores at year 50. Under alternatives D and E, the fire regime condition class departure scores would be approximately 47 at year 50.

Under alternatives D and E, departure scores would be lower due to the increased levels of timber harvest activities, mechanical fuels treatments, and/or prescribed burning associated with these alternatives. Alternatives D and E would also show improvement at a faster rate because of the increased harvesting of smaller trees within the old forest, which may decrease mortality in older age classes (due to decreased moisture stress and fire severity) and modify closed canopy to open canopy. However, alternative D would not include prescribed burning outside of harvest units and would include decreased amounts of prescribed burning within harvest units. Under this alternative, the majority of fuels treatments within harvest units would be accomplished by removal or crushing instead of burning.

Because alternative E includes the reintroduction of fire to the ecosystem in addition to reducing the amount of departure in the dry upland forest vegetation, alternative E would be expected to result in increased ecological resiliency in the dry upland forest potential vegetation group. With this alternative, fuel composition, fire frequency, severity, pattern, and other associated disturbances would more closely resemble the HRV. Under alternative E, the risk of fire behavior, effects and associated disturbances would be similar to those that occurred prior to interruption of the historical low severity fire regime. Although the risk of loss of key ecosystem components, such as native species, large trees, and soil, would be lower under both alternatives D and E, the lack of fire under alternative D would inhibit other ecological processes. Fire is essential to nutrient cycling in fire adapted ecosystems. Fire has a fertilizer effect on the soil by increasing ammonium levels and microbial nitrogen mineralization, resulting in increased nutrient levels in both understory and overstory vegetation. Fire rejuvenates desirable grasses, depending on the species response to disturbance (i.e., sprouters, prolific seeders, and species with strong rhizome extension respond favorably to fire). Especially in combination with reduced stand densities, fire results in changes in the microclimate on the forest floor, specifically increased sunlight penetration, increased soil temperatures, and increased understory productivity. Fire has been shown to result in significant increases in herbaceous biomass, species richness, and understory productivity and diversity. Depending on timing, fire may also increase seedling establishment by aiding in seed bed and site preparation. Fire would also aid in the creation of openings for regeneration.

Under alternative C, the fire regime condition class departure score would be higher than the other alternatives at year 50 within the dry upland forest potential vegetation group within all three national forests. Under alternative C, the fire regime condition class departure score would range from approximately 48 to 54 within all three national forests at year 50. Conditions would be more highly departed from the HRV under alternative C due to increased stand densities and altered species compositions resulting from the lower levels of timber harvest and prescribed burning associated with this alternative. Alternative C would result in decreased ecological resiliency in the Wallowa-Whitman dry upland forest potential vegetation group because vegetation characteristics and other conditions would least resemble the HRV. The risk of loss of key ecosystem components, such as native species, large trees, and soil, would be greatest under alternative C due to an increased risk of uncharacteristically severe fire behavior.

Number of Subwatersheds in Improved Watershed Condition Class

A watershed condition model was used to assess watershed riparian and aquatic habitat conditions on National Forest System lands. Three primary attributes are used to represent hillslope conditions within subwatersheds: forested vegetation condition, roads, and use intensity by

domestic livestock. These attributes influence the routing of water and sediment from hillslopes to stream channels.

Watershed condition is a function of both aquatic and terrestrial factors. Activities, such as road maintenance, can improve watershed condition by reducing the amount of sediment introduced into streams and reducing the hydrologic connectivity between streams and roads. Treatments that improve forested vegetation conditions, reduce detrimental soil conditions, restore floodplains, improve riparian species composition, increase stream shade, increase aquatic habitat complexity, and improve aquatic habitat connectivity can increase the resilience of watersheds and help ensure that ecosystem services are provided continuously.

Together, vegetation condition, roads, and livestock grazing intensity comprise 50 percent of the watershed condition scores for individual watersheds. Measures of riparian and aquatic habitat condition comprise the remaining 50 percent of watershed condition scores.

For the Malheur and Wallowa-Whitman National Forests, alternative C would have the most watersheds in improved watershed condition class at year 10, followed by alternative E (table 115). Watersheds would improve the least for alternative D. For the Umatilla National Forest, the alternatives would have little variation in improved watersheds at year 10.

Table 115. Number of subwatersheds in improved condition class in10 years for each alternative for each national forest

National Forest	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
MAL	16	16	42	18	21	21
UMA	23	23	25	25	23	23
WAW	4	4	14	2	5	4

Alternative A Watershed Condition Summary

Alternative A would continue current management direction, which includes a mix of protection strategies and active management. Watershed protection and restoration would proceed at current levels, though watershed restoration is not integral to forest plan direction as amended by PACFISH and INFISH. Current direction includes planning area wide strategies for watershed protection and passive restoration. Emphasis on watershed protection and restoration would be slightly less than alternatives B, C, E, and F because of differences in riparian habitat conservation areas for intermittent streams in watersheds where no listed fish species are present, and because of lower projections for restoration. For the short term (10 to 15 years), watershed condition would be maintained and improved at current rates. For the long term (greater than 20 years), watershed conditions would continue to improve but at a slower rates (fewer watersheds in improving condition) compared to alternatives B, C, E, and F because of differences in protection and restoration levels for the alternatives.

Action Alternatives Watershed Condition Summaries

Alternatives B, C, E, and F include strategies for the plan area for riparian area protection and active restoration that likely would result in accelerated improvement in riparian area condition and the maintenance and improvement of lakes, streams, and rivers, though at varying rates, for the short and long term.

Alternative B includes a mix of protection and restoration that would improve watershed conditions and water quality more than alternative A but less than alternatives C, E, and F for the short and long term because of slightly lower levels of protection and restoration.

Alternative C would have the highest level of riparian area protection and restoration and would result in the greatest improvement in riparian condition for the short and long term. This alternative would provide a greater level of protection (wider riparian management areas) and less active management (vegetation, grazing, motor vehicle recreation). For the long term, there would be an increased risk of disturbance associated with limited active vegetation treatment particularly in dry forest types. Long term benefits to watershed condition would potentially be reduced.

Alternative D would emphasize commodity production and would have the lowest levels of riparian area protection and restoration of hydrologic and riparian function but would have the highest level of active vegetation management. Improved vegetation resilience would contribute to improved watershed conditions but would likely result in a declining trend in overall watershed improvement. A potential for degradation of watershed condition and water quality exists in some areas, because of relatively high objective levels for timber harvest, road use, and livestock grazing. This alternative would pose the greatest short- and long-term risk to watershed function and water quality, though upland vegetation conditions would be improved at the fastest rate.

Alternatives E and F include a mix of riparian area protection and active forested vegetation restoration that would, over the short term, improve watershed conditions more than alternatives B and D, but less than alternative C. These alternatives include desired conditions for road densities in anadromous and bull trout watersheds and specific guidelines for range management that would, during the long term, also contribute to improving trends in watershed condition and water quality in affected watersheds. Although less than alternative D but more than the other action alternatives, alternative E would provide greater emphasis on vegetation restoration and, during the short term, would pose a slightly greater risk to watershed conditions. For the long term, both alternatives would improve watershed conditions and water quality at a slightly slower rate than alternative C because of the levels of protection and amount of active restoration, including vegetation and roads management direction.

Summary of Key Indicators

Table 116 through table 118 display a summary of the key indicators used in the analysis of ecological resilience. The gray boxes depict the alternatives that result in either the greatest level of management activities designed to maintain or restore ecological resilience or the greatest improvement in key indicators used to reflect resilient conditions. Alternatives D and E would include the greatest number of acres of active restoration activities per year, resulting in the lowest fire regime condition class (FRCC) departure scores within the dry upland forest potential vegetation group (PVG) at year 50. Vegetation composition, structure, and density would be less departed from the HRV. Alternatives D and E would contain the greatest number of acres of general forest. Therefore, vegetation would potentially be restored to within or near the HRV within a greater percent of the landscape under alternatives D and E. However, alternative D would not include prescribed burning outside of harvest units and would include decreased amounts of prescribed burning within harvest units. Under alternative D, the majority of fuels treatments within harvest units would be accomplished by removal or crushing instead of burning. Because alternative E includes the reintroduction of fire to the ecosystem in addition to reducing the amount of departure in the dry upland forest vegetation, alternative E would be

expected to result in the greatest increase in ecological resilience in the dry upland forest vegetation.

Table 116. Summary of ecological resilience key indicators for the Malheur National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Annual forested vegetation active restoration activities (acres)	18,100	18,700	14,300	25,100	24,800	20,100
Miles of road treatments	260	260	600	650	290	310
Forage use intensity	15.9%	15.9%	3.8%	17.0%	15.9%	15.9%
Miles of riparian area improvement	300	300	600	300	450	400
Number of subwatersheds in improved condition	16	16	42	18	21	21
FRCC departure score within the dry upland forest PVG at year 50	47	45	48	33	36	43

Table 117. Summary of ecological resilience key indicators for the Umatilla National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Annual forested vegetation active restoration activities (acres)	16,950	17,400	14,000	20,100	23,400	18,700
Miles of road treatments	260	260	450	800	300	270
Forage use intensity	11.4%	10.6%	0.8%	13.8%	10.6%	10.6%
Miles of riparian area improvement	150	150	300	150	225	210
Number of subwatersheds in improved condition	23	23	25	25	23	23
FRCC departure score within the dry upland forest PVG at year 50	48	46	50	39	39	43

Table 118. Summary of ecological resilience key indicators for the Wallowa-Whitman National Forest

Key Indicator	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Annual forested vegetation active restoration activities (acres)	17,650	18,150	14,450	22,650	23,450	19,850
Miles of road treatments	260	260	400	800	300	270
Forage use intensity	12%	12%	3%	17%	12%	12%
Miles of riparian area improvement	250	250	500	250	375	350
Number of subwatersheds in improved condition	4	4	14	2	5	4
FRCC departure score within the dry upland forest PVG at year 50	53	52	54	47	47	50

Healthy, resilient landscapes have a greater capacity to survive natural disturbances and large-scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing human uses. The ecological resilience issue is complex, involving physical and biological factors as well as human actions. Risks to resilience arise from many sources, both natural and human caused. Reducing risks in

one component of the ecosystem may increase risks in others. No one alternative best addresses the issue of ecological resilience. Reliance on natural processes may be the fastest way to achieve desired conditions for some ecosystem components, while others components may require active restoration.

Physical Environment

Soils

Background

Individual soils are a product of geologic parent material as modified by the effects of weather, topography, biota, and time (Jenny 1941). Paul and Clark (1996) expand the definition of biota to include above ground vegetation as well as the variety soil organisms responsible for nutrient exchange between soils and vegetation and the decomposition of organic material responsible for the development of upper soil horizons**.**

Soils in the Blue Mountains are derived from a variety of geologic parent materials that include Paleozoic and Mesozoic sedimentary, metamorphic, and igneous rocks, of which the oldest are associated with parts of at least five known accreted terranes in northeast Oregon. These older rocks are overlain by Cenozoic Columbia River basalts, and younger volcaniclastic sediments, volcanic ash, lake sediments, glacial debris, and other rocks (Vallier and Brooks 1995). Because precipitation increases and temperature generally decreases from low elevation to high elevation, and the dominant form of precipitation changes from rain to snow with elevation, the extent of soil development, soil depth, texture, and other properties vary greatly across the Blue Mountains. Soils vary from deep, well-developed and highly productive to shallow, skeletal soils of low productivity.

About 68 percent of soils are on National Forest System lands in the Blue Mountains are derived from volcanic rocks. Seventy-four percent of volcanic soils, or 40 percent of the total are derived from Columbia River basalts, and 26 percent (28 percent of total) from other volcanic rocks. Ten percent of soils are derived from igneous intrusive rocks, eleven percent from metamorphic rocks, seven percent from sedimentary rocks, and three percent from other rock types. From 30 to 60 percent of all soils have volcanic ash deposits of varying thickness derived from the eruption Mount Mazama roughly 6800 years ago that overlie previously developed soils (USDA Forest Service 1990a, 1990c). Ash soils developed on top of pre-existing soils of all types and are among the most, if not the most productive of all soils in the Blue Mountains (Geist and Strickler 1978). The productivity of volcanic ash soils is derived from higher water holding capacity and higher organic matter content compared to all other soils.

Soils have biological, chemical, and physical properties that are fundamental to the productivity of forest ecosystems and play an integral role in the hydrological behavior of watersheds (Neary et al. 2009). Soils provide water and nutrients for vegetation, provide support for individual plants, absorb precipitation and regulate the quantity and timing of stream flow, provide habitats for a wide variety of wildlife (above and below ground), buffer effects of pollutants, and store and release carbon. Other resource values, such as water quality and quantity, wildlife habitat, and biomass production, are often dependent on and closely related to properly functioning and productive soils.

Undisturbed forest soils have forest floors composed of litter and organic material that protects the soil surface. Litter layers are underlain by a layer of decomposed organic matter, or humus, which is underlain by mineral soil. The high porosity of surface soil layers normally results in soils with high infiltration capacities and low erosion rates when undisturbed. Disturbance that results in loss of surface layers can result in loss of a substantial portion of soil organic matter, nutrients, and soil biota that are key to soil productivity (Everett et al. 1991).

Shrubland and grassland soils may have a soil surface that is protected by a biotic crust consisting of cyanobacteria, green algae, lichens, mosses, microfungi, and other bacteria (Belnap et al. 2001). Biotic soil crusts occupy the spaces between higher plants and form a thin matrix on the soil surface that protects against erosion, fixes atmospheric nitrogen, plays a key role in the dynamics of other nutrients, and helps retain soil moisture. Under undisturbed conditions, biotic soil crusts may consists of nearly 100 distinct species (Root and McCune 2012). Disturbance of soil crusts may result in lowered species diversity or loss of the crust and exposure of surface soils to erosion and soil loss, depending on the severity of disturbance (Ponzetti and McCune 2001). Partial breakdown of soil crusts is also observed to create areas of bare ground that may be more easily colonized by invasive, non-native species (Reisner et al. 2013)

The Blue Mountains physiographic province, which includes the Blue Mountains national forests, is characterized by a diverse landscape ranging from river and valley bottoms to steep mountain slopes, deeply dissected canyons, and mountain and plateau tops (USDA Forest Service 2006). Landform type and topography directly influence soil characteristics and productivity and erosional, sedimentation, and hydrologic processes; specifically mass wasting, surface erosion, and runoff (USDA Forest Service 2006). Individual soils are a product of geologic parent material being modified by the effects of weather, topography, biota, and time (Brady and Wells 1999). Soils provide water and nutrients for vegetation, provide support for individual plants, absorb precipitation and regulate quantity and timing of stream flow, provide habitats for a wide variety of wildlife (above and below ground), buffer effects of pollutants, and store and release carbon. Other resource values, such as water quality and quantity, wildlife habitat, and biomass production, are often dependent on and closely related to properly functioning soils.

Soil moisture and temperature significantly influence each soil's productive potential and how it responds to disturbances. Given the variation in topography and atmospheric moisture within the Blue Mountains, there is a consequent variation in local climatic conditions. Diurnal fluctuations in both temperature and moisture are also important environmental variables and are influenced to a large extent by elevation and aspect. Soil moisture and temperature regimes are reflected by the kinds of vegetation occurring on a landscape. Both yearly and daily fluctuations in temperature and moisture can be influenced by management activities (vegetation management and surface soil removal).

A summary of general soil types in the Blue Mountains is in the land type associations (LTAs) description (Sasich and Ottersberg 2006) and GIS layer. Land type associations are differentiated based on (1) vegetation zones, (2) geology groups, and (3) landforms. There are 80 land type associations in the Blue Mountains. In addition to the three characteristics that differentiate the land type associations, Sasich and Ottersberg (2006) give information on volcanic ash, texture, rock fragments, depth to bedrock, soil climate, hydrologic and sedimentation properties and responses, productivity, vegetation recovery, limitations for roads and heavy machinery operability, timber and range suitability, and other characteristics. More detailed, site-specific soil information for most of Umatilla and Wallowa-Whitman National Forests and the northern part of the Malheur National Forest is in the Terrestrial Ecological Unit Inventory (TEUI) GIS layer and

database. For areas that lack TEUI, Soil Resource Inventory information is available for each national forest at an intermediate scale.

The Blue Mountains are a moisture-limited region especially when compared to the Cascade Range. Many of the lower elevation soils are dry for at least 60 to 90 days during summer. The active growing season is effectively shortened by early moisture stress. In addition, many of the lower elevation soils lack a volcanic ash mantle. This reduces effective soil depth and increases soil droughtiness because such soils generally contain more coarse rock fragments (gravel-size and larger) throughout the profile that reduce plant available water. In xeric (dry) soil moisture regimes, lack of water limits organic matter production and slows soil genesis. On some xeric soils, organic matter accumulates in thick, dark topsoil. Productivity on soil that lack this thick topsoil is dependent on a surface organic matter layer (forest floor) as well as topsoil. Some soils benefit from regular low intensity fires to release nutrients accumulated in woody debris and the forest floor.

Biological Soil Crusts – Biological soil crusts are critical for stabilizing the surface soil and trapping sediment in grazing lands, particularly in dry non-forested and dry forested grazing lands. Biological soil crusts also function as living mulch by retaining soil moisture and discouraging annual weed growth on moisture-limited sites (Belnap et al. 2001). Disturbances, such as livestock grazing, fire, areas of seasonally (winter and spring) intense wild ungulate use, natural erosion processes (specifically sheet erosion), and off road vehicle use, contribute to a complex mosaic of biological soil crust composition and abundance. Frequent or continuous disturbance from grazing keeps the biological soil crust communities at an early successional stage (USDA Forest Service 1999; Brooks 2009). The degree of degradation of soil crusts is related to soil type (specifically soil texture) and soil moisture.

Affected Environment – Soils

Soil quality in Blue Mountains national forests has been altered to varying degrees in some locations by past land uses, such as timber harvest, fuels reduction activities, livestock grazing, road and trail construction, wildland fire suppression activities, introduction of invasive plant species, and motor vehicle use off of roads. Effects of these activities on soils and other resources depends on local soil characteristics and may include reduced ground cover, altered vegetative conditions, decreased infiltration rates, increased runoff and surface erosion rates, and depressed potential site productivity.

Soil Quality Standards

Following passage of the National Forest Management Act (NFMA) in 1976, regions of the U.S. Forest Service standards and guidelines for the protection of forest soils. In the Pacific Northwest region (Region 6), forest soil quality standards were in effect by 1979 and formalized in 1983 (Howes et al. 1983). Region 6 standards addressed changes in soil compaction and displacement and set limits on the areal extent of disturbance that was considered detrimental to soil productivity. In 1998, an R6 supplement to the Forest Service Watershed Protection and Management Manual (FSM 2520, 1998) defined the soil quality standards and guidelines that are still in effect on forests in the Pacific Northwest region:

Leave a minimum of 80 percent of an activity area in an acceptable soil quality condition. Detrimental conditions, as defined below, also include landings and system roads. It is assumed that roads and landings comprise 5 percent of an activity area, and that all other soil disturbance should not be more than 15 percent of any area. Detrimental soil conditions and the

accompanying criteria for determining when and where these conditions occur were defined for compaction, puddling, displacement, and detrimentally burned soils as follows:

Detrimental compaction. For volcanic ash soils, an increase of 20 percent bulk density, or more, above undisturbed soils of the same type. For all other soils, an increase of 15 percent bulk density, compared to undisturbed soils, a 50 percent reduction in macropore space , and/or a reduction in macropore space below 15 percent is defined as detrimental disturbance.

Detrimental puddling is defined as depth of ruts or imprints of six inches or more, accompanied by deformation of the soil profile.

Detrimental displacement is the removal of more than 50 percent of the A horizon from an area greater than 100 square feet, which is at least 5 feet in width.

Detrimental burned soils are soils in which the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer. The detrimentally burned soil standard applies to an area greater than 100 square feet, which is at least five feet in width.

Detrimental surface erosion is visual evidence of surface loss in areas greater than 100 square feet, rills or gullies and/or water quality degradation from sediment or nutrient enrichment.

Detrimental soil mass wasting includes any visual evidence of landslides or mass movement associated with land management activities and/or that degrades water quality.

In addition to soil quality standards, guidelines were implemented that included retention of soil organic matter, coarse woody material, and maintenance and protection of soil moisture regimes.

Methods were established for monitoring the disturbance following timber harvest (Howes et al. 1983) and implemented on National Forest System lands in the Blue Mountains. Early monitoring reports on the Wallowa-Whitman national forest revealed very high disturbance in some harvest units indicating that soil quality standards were not being met. Reports on the La Grande Ranger District indicated total disturbance on some harvest units of up to 97 percent of the area, and nearly 60 percent of the area detrimental disturbed. Review of these early reports was followed by the implementation of additional actions to protect soils and included limiting the density of skid trails, limiting the distance from established trails that equipment would be allowed to operate, retaining slash and coarse woody debris on site to cushion soils and prevent compaction. It was found that by following these additional guidelines during timber harvest and slash treatment that regional soil quality standards could be met.

It has also been observed that the amount of disturbance varies by harvest type and the type of equipment used. Ground based and tractor harvest operation typically resulted in high detrimental soil disturbance rates. Skyline logging and cut-to-length harvest resulted in lower levels of soil disturbance.

Sullivan (1988) reported the results of monitoring of 24 harvest units on the Malheur national forest between 1981 and 1985. Fifteen of 24 harvest units were found with detrimental soil conditions exceeding regional standards with the majority of disturbance resulting from soil compaction.

Geist et al. (1989) reported that compaction on five of eleven harvest units monitored 14 to 23 years following harvest on the Malheur, Umatilla and Wallowa-Whitman national forests

exceeded regional standards. Review of these results by Miller et al. (2010) suggests that all of the units would be considered as having exceeded regional standards after including the area disturbed by roads, but caution that the results depend on the accurate determination of undisturbed soil bulk density.

The 2001 monitoring report for the national forests documented evaluations of soil conditions on several planned and completed projects. Within the Malheur National Forest, all but 4 of the 18 units sampled had less than the 20 percent maximum detrimental soil impact specified by the forest plan. Over-the-snow operations resulted in greatly reduced detrimental soil conditions versus levels resulting from dry season operations.

Monitoring results for 18 harvest units on the Umatilla national forest in 2001 showed that none exceeded soil quality standards and that 12 units harvest using cut-to-length harvest methods averaged 4.5 percent detrimental disturbance. Adjustments in treatment methods made after the 1990 forest plan was implemented resulted in a reduction in detrimental impacts to soils. No sampled units exceeded the forest plan thresholds for detrimental soil conditions.

Pre-activity surveys for the Wallowa-Whitman National Forest documented that all but one proposed timber sale project areas had some units that exceeded the threshold (exact statistics were not disclosed). The lone exception was the Reservoir Timber Sale where post project monitoring found that all soil standards had been met. Subsoiling on one project was found to be enhancing the soil recovery process (unpublished).

Timber Harvest Effects

The trends in existing conditions are described for two eras of timber harvest practices. The first timber harvest era is pre-1990. The second timber harvest era is 1990 to present. Prior to 1990, the national forests offered timber sales on large tracts of land where heavy logging occurred from approximately the 1920s to the late 1980s. Timber harvest activities included the harvesting and removal of large diameter trees (often old growth ponderosa pine) with ground-based, rubber-tired tractors and skidders, and preparation and sanitization for re-planting by tractor piling, brush piling, and burning of slash residue piles. Further site preparation would often include post-harvest broadcast burning.

The second timber harvest era is a result of the National Forest Management Act (NFMA) of 1976, which included policies and guidelines directing that National Forest System lands be managed to maintain their productive potential. Compliance with the new policies was to be shown through implementation, effectiveness, and validation (research) monitoring results. The NFMA resulted in a dramatic change in design criteria and the types of constraints or mitigations, technology, and restoration activities needed to comply with revised Forest Service direction and policies (USDA Forest Service 1990), including:

- Increased skid trail and road spacing
- Reduced equipment ground passes
- Use of low ground pressure, ground-based machinery, including mechanical processers and loaders/forwarders
- Change in season of operation to limit timber harvest activities to when soils are either dry or frozen
- Use of whole-tree yarding
- Hand piling and burning of small piles

- Seasonal prescribed burning to reduce disturbance from slash reduction and site prep
- Implementation of subsoiling to ameliorate soil compaction effects for improvement of soil productivity, stand regeneration, and hydrologic processes

In the late 1900s, timber managers throughout the Blue Mountains were also faced with increased forest health issues and wildfire concerns (Everett et al. 1994). The resultant management of large acreages of overstocked stands required the use of efficient, less costly, low ground pressure mechanized harvest and yarding equipment to thin overstocked stands, harvest timber and the use of prescribed fire to reduce fuel loads and fire hazard. Research and local soil monitoring summarized in the following pages indicate a corresponding overall reduction in adverse soil impacts to the soils during the second era (USDA Forest Service 2001).

From the late 1920s to approximately the early 1990s, management focused on regeneration harvest activities and or/selection harvest activities to remove large diameter trees with high ground pressure, ground-based equipment and intense site sanitation and seedbed preparation techniques. Research and monitoring surveys estimated the amount of detrimental soil conditions throughout the Blue Mountains national forests to range from approximately 17 percent to greater than 55 percent of an individual activity area. These values exceed or come close to the threshold of no more than 20 percent of an activity area resulting in detrimental soil disturbance specified by regional guidance and revised forest plans (USDA Forest Service 1998). Harkenrider (1979) found that a clearcut lodgepole pine stand within the La Grande Ranger District that was harvested with a feller-buncher, yarded to a landing with a rubber-tired skidder, and slash dozer-piled and burned resulted in approximately 55 percent of the area's soils detrimentally compacted and 12 percent moderately compacted.

Sullivan (1988) found that 15 of 24 timber harvest units had post activity soil impacts that exceeded the regional standard of 20 percent of the area, and another 5 units had soil impacts on more than 15 percent of their area.

In the early 1990s, harvest activities focused on use of new technologies and project design criteria to comply with revised management direction and policies (USDA Forest Service 1990). Commonly used design criteria included designated trail spacing, low ground pressure machinery, mechanical harvesters, processers and loaders/forwarders, season of operation, operating over frozen ground, snow and slash, hand piling of slash, and restoration (including subsoiling). After approximately 1990, research and local soil monitoring results (USDA Forest Service 2001) indicate that the use of updated technology corresponds to an overall reduction in areal extent of detrimental soil disturbance and often results in compliance with the standard of no more than 20 percent of an activity area's soils being detrimentally impacted (USDA Forest Service 1998).

Published data for detrimental soil compaction from timber harvest activities range from approximately 5 to 30 percent of an area. Areas in the high end of the range were generally harvested in the mid to late 1990s, while areas in the low end of the range were generally harvested from the late 1990s to early 2000s. Less detrimental impacts are generally attributed to the use of multiple mitigation measures to limit soil disturbance. The variation is generally the result in changes in project design criteria, including the amount of timber removed and type equipment used. Similar soil disturbance characteristics can occur in areas of thinning harvests, clearcuts, and partial cuttings if ground-based equipment is used, although traffic patterns are likely to be less concentrated in partial cut activities, which results in less soil impacts overall (Page-Dumroese et al. 2009, Miller et al. 2010, Chanasyk et al. 2003). This trend is indicated in the research findings, where lower areal extent of detrimental soil conditions is generally

associated with thinning operations (McIver et al. 2003, and McIver 1998), operating over snow (Craigg and Howes 2007), or use of a skyline logging system (Allen et al. 1999).

Allen and Adams (1997) found that thinning of second-growth Douglas-fir with a skyline logging system resulted in only 2 percent of the area soil being detrimentally disturbed.

McIver (1998) found that 6 of 7 thinning units on the Wallowa Whitman National Forest had total disturbance levels less than 10 percent. Unit 7, yarded using a rubber-tired skidder, had the greatest amount of detrimental soil disturbance. McIver (1998) also found that mechanized cut-to-length harvesters tended to result in displacement, rather than compaction, as the primary form of detrimental soil disturbance.

Allen et al. (1999) found that utilizing a cut to length harvester and skidding operation for partial cuttings in western and northeastern Oregon resulted in detrimental soil compaction on 21 percent of the area. Skyline yarding resulted in detrimental soil disturbance (compaction and displacement) on about 6 to 7 percent of the harvested area. Results indicated that skyline yarding created more displacement than compaction. After one year, Allen et al. (1999) found that there was no off-unit sediment transport from these areas, with the exception of very limited amounts from skyline corridors.

McIver et al. (2003) found that uneven-aged and intermediate treatment activities using a cut-to-length forwarder system resulted in detrimental soil conditions in no more than eight percent of an activity area.

Craigg and Howes (2007) found that a thinning project using a low ground-pressure Timberjack cut-to-length harvester and forwarder and a variety of mitigation measures designed to reduce soil impacts, including, operating on frozen ground, snow and slash, designated trail spacing, and hand piling of slash, resulted in detrimental soil conditions on approximately three percent of the activity area.

Bliss (2006) assessed several published and non-published detrimental soil conditions surveys for the Wallow Whitman National Forest and compiled a summary of findings. Adjustments in treatment made after the 1990 forest plan was implemented resulted in a reduction in detrimental impacts to soils. In general, post harvest ground disturbance ranged from approximately 10 to 20 percent, with a range of 6 to 12 percent of new detrimental soil conditions. The amount of new disturbance was found to vary depending on the amount of new skid trails created and used.

Table 119 displays the range (in acres) of detrimental soil conditions on the landscape as a result of historic timber harvest activities. The range (in acres) of detrimental soil conditions from ground-based timber harvest activities was determined by calculating 5 percent and 55 percent of the acres of timber harvest, the lowest published detrimental soil conditions (Bliss 2006, Craigg and Howes 2007) and the highest published detrimental soil conditions (Harkenrider 1979) respectively. Five percent was added to the result to account for detrimental impacts from constructing National Forest System roads and temporary roads.

The range (in acres) of detrimental soil conditions on the landscape as a result of historic aerial timber harvest activities was determined by calculating 2 percent and 6 percent of the acres of aerial timber harvest, the lowest published detrimental soil conditions (Allen and Adams 1997) and the highest published detrimental soil conditions (Bliss 2006) respectively. Again, five percent was added to the result to account for detrimental impacts from constructing National Forest System roads and temporary roads.

The ranges (in acres) of detrimental soil conditions for both ground-based and aerial harvest systems include impacts associated with site preparation activities and post harvest treatments, including post harvest slash treatment. The acres of past timber harvest activities were calculated using GIS data. Since some areas have been harvested more than once, acres for these areas will be included more than once in the totals displayed in table 119.

Ground-based timber activities have generally been implemented on slopes with less than 30 percent rise because of increased risk of erosion when ground cover is removed or soils are disturbed. In some cases, ground-based harvesting may have occurred on slopes with greater than 30 percent rise. Sky line or aerial timber activities have generally been implemented on slopes with greater than 30 percent rise and in some areas where protection of soils and other resources is a priority (e.g., post wildfire salvage operations).

Table 119. Estimated acres of detrimental soil conditions (DSCs) for ground-based and cable and aerial logging systems for each national forest

National Forest	Ground-based Timber Harvest Activities		Cable and Aerial Timber Harvest Activities		Total Timber Harvest Activities	
	Harvest	Range of DSCs	Harvest	Range of DSCs	Harvest	Range of DSCs
MAL	407,486	40,748 to 244,491	49,347	3,454 to 5,428	456,833	44,202 to 249,919
UMA	185,936	18,593 to 111,561	64,654	4,525 to 7,111	250,590	23,118 to 118,672
WAW	300,676	30,067 to 180,405	24,846	1,739 to 2,733	325,522	31,806 to 183,138
Totals	894,098	89,408 to 536,457	138,847	9,718 to 15,272	1,032,945	99,126 to 551,729

Wildland and Prescribed Fire

Wildland fires are a natural ecological process within the Blue Mountains national forests. However, high intensity fire and severe burns over large portions of landscapes can occur, which can cause an array of ecosystem responses, including vegetation dynamics: regeneration, compositional changes, mortality, diversity, faunal community dynamics, and changes in soil productivity and nutrient and carbon cycling. Impacts to watersheds include increased soil erosion, sedimentation, flooding, landslides, and debris flows (Keeley 2009). Understanding the effects of fire throughout the plan area is difficult. The variation in natural potential vegetation and the variation in the natural historic fire regime include community composition and structure, fuel quality and quantity, climate, soil properties, topography, the long period of fire exclusion since Euro-American settlement and fire suppression, post fire restoration, and post fire timber salvage activities. The extent, intensity, fire or burn severity, and resulting impacts have varied widely. An increase in wildland fire size and quantity has been documented since the early 1960s, with greater increases documented starting in the 1980s. Significant increases in wildfire ignitions and severity have been documented in the 2000s.

Wildland fires or prescribed fires characteristic of the historic fire regime with low or moderate burn severities can improve soil fertility by facilitating periodic release of nutrients (USDA Forest Service 2006). However, high intensity, long duration fires that result in high burn severity can have significant impacts on ecosystem processes due to the total consumption of the forest floor and the loss of coarse woody debris that serve as nutrient reserves for long term storage of forest nutrients necessary for sustaining plant growth, biological activity (Harvey et al. 1987), and soil erosion, especially on steep slopes. Loss of the forest floor effective ground cover and coarse woody debris has been related to an increase in sheet, rill, and gully erosion and reduced infiltration rates leading to increased rates of erosion, sedimentation and flooding (Robichaud and

Brown 1999). The predominant process is the reduction in canopy cover and effective ground cover, and the subsequent increase in mineral soil exposed to raindrop splash and surface sealing. Increased erosion as a result of burning is also influenced by the fire intensity and burn severity. Other factors for increased erosion include creation of water repellant soil (hydrophobic) and the resultant increased runoff and overland flow. Coarse textured soils are more prone to becoming hydrophobic following a wildfire than fine textured soils. Hydrophobic compounds are slightly water soluble; therefore, hydrophobicity is broken up or washed away after the first one or two rain events or after a winter of slow wetting and freeze-thaw (Neary et al. 2005).

Since about 2000, surveys have been conducted within the Wallowa Whitman National Forest to estimate the amount of coarse woody debris following fires and salvage activities. These surveys indicated that the units generally meet or exceed the minimum recommended amounts of coarse woody debris. Recruitment of fine organic debris from needle cast and limbs both post fire and after salvage activities has contributed to sustaining the long-term nutrient stores throughout the plan area (Schnepf et al. 2009).

Salvage logging following wildfires was identified as a cause of erosion affecting stream sedimentation and productivity in central Washington (Klock 1975). Published studies reported that the implementation of resource standards and guidelines for site protection at salvage logging sites within the Wenatchee National Forest in central Washington (Klock 1975) and within the Malheur National Forest in the Blue Mountains (Mciver and McNeil 2006) were the most important factors that influenced soil erosion. In addition, ground-based yarding systems resulted in far more soil disturbance than aerial systems (Klock 1975).

Assessing or quantifying soil conditions after wildland fire and prescribed fire is difficult due to the many variables affecting ecosystem response to fire. Johnson (1998) compared reported burn intensity of fires in the Blue Mountains from 1986 through 1994 to estimates of burn severity of historical fires in the region by Agee (1996) and concluded the burn severity is likely higher now than in the past, but varies geographically within the Blue Mountains.

The overall effect of wildland and prescribed fire on above-ground organic matter (dead and down material) and subsequent soil fertility, soil carbon, and nitrogen changes are difficult to quantify on a landscape scale (Johnson and Curtis 2000). In an extensive literature review of forest management effects (including fire) on soil carbon and nitrogen, Johnson and Curtis (2000) found that the effects of fire on soil carbon and nitrogen are quite variable and difficult to quantify. They also found time after a fire event to be a significant effect, with an increase (compared to study plots) in both soil carbon and nitrogen documented after approximately 10 years. In addition, they documented decreases in soil carbon following prescribed fire and increases in soil carbon and nitrogen following wildfire. The increases following wildfire was attributed to the sequestration of charcoal and recalcitrant and hydrophobic organic matter, as well as establishment of nitrogen fixing plants following wildfires. Fire suppression activities (e.g., fireline and fuel break construction and construction of fire camps and aircraft landing zones) tend to compact or displace surface soil and have had indirect impacts on long term soil productivity and hydrologic function throughout the plan area. It is assumed that within the plan area, high wildland fire severity and fire suppression have caused an array of ecosystem responses, including vegetation changes, increased erosion, and reduced organic materials and coarse woody debris amounts to less than the optimum levels needed to sustain soil productivity and soil health (Kerrick et al. 1989).

Livestock Grazing

Commercial livestock grazing began in the late 1800s with Euro-American settlement. From the late 1800s to mid 1900s, livestock grazing management was very limited and generally involved continuous, year-round grazing. As a result, much of grazing lands in the Blue Mountains national forests were severely impacted by overgrazing. These impacts are still evident on the landscape (Quigley et al. 1997). Soil disturbances caused by historic overgrazing generally consist of compaction, displacement, alteration of vegetation community (ground cover diversity and composition), and invasion by non-native vegetation.

Soil disturbance and the degree of impact from livestock grazing activities throughout the plan area is variable. It has been influenced by many factors, including the type and intensity of historic and current livestock grazing (i.e., season of use, livestock use patterns, degree of disturbance, and type of livestock: cattle, sheep, horses, or goats), soil type (i.e., soil depth and volcanic ash content), compaction or displacement potential of the soil, slope gradient, aspect, and other inherent and dynamic properties (Heady 1975).

Overall, the greatest concentration of detrimental soil disturbance and related decrease in soil quality is associated with historic and current high use commercial livestock grazing areas. These areas generally include winter feeding grounds, holding pastures, animal trails (both in the uplands and along fence lines), historic homestead sites, historic irrigation canals, abandoned cropland (potentially seeded to pasture), roads and developed motor vehicle trails, springs and developed water sites, salting areas, and loafing areas associated with capable grazing lands (Platts 1991). Capable grazing lands are associated with land type associations with slopes with less than 60 percent rise, considered capable for sheep grazing, and slopes with less than 45 percent rise, considered capable for cattle grazing. Capable grazing lands also have a tree canopy and/or unpalatable shrub canopy of less than 60 percent and/or have the inherent capacity to produce more than 200 pounds of forage per acre (e.g., limited amounts of rock outcrops or nutrient poor or shallow soils).

Sites associated with land type associations determined to have poor suitability for grazing (i.e., greater than 40 percent slope rise for cattle, greater than 60 percent slope rise for sheep, and low forage production rates) are considered to have less resistance and decreased resiliency to grazing effects on the soil and vegetation components (USDA Forest Service 2006). However, due to the severity of topographic features, including steepness of terrain and high amount of rock outcrops limiting access to slopes with greater than 60 percent rise, these areas are generally grazed incidentally and used lightly and are assumed to have little to no detrimental soil impacts associated with livestock grazing and management.

Existing Soil Conditions at Roads and Landings

Roads and landings are considered part of the permanent national forest management infrastructure and transportation system and are estimated to be 5 percent of the managed acres within a national forest. These acres are considered to be in a permanent detrimental soil condition.

Environmental Consequences – Soils

Management activities can result in direct and indirect effects on soil resources, which may include alterations to physical, chemical, and/or biological properties. Soil disturbance is defined as any Forest Service management practice that results in soil compaction, puddling, displacement, severe burning, or the loss of ground cover (USDA Forest Service 1990). Puddling,

severe burning, and loss of ground cover are not very common, while compaction (increase in soil bulk density with a decrease in soil porosity) and displacement are common effects of management activities that can negatively affect soil productivity. Indirect effects may include erosion, mass wasting, and changes in water table, soil biology, organic detritus recruitment, and fertility, such as the fertilization effects of ash after a low intensity fire.

1990 forest plan guidelines state that at least 80 percent of an activity area is to be maintained in a condition of acceptable soil productivity potential. Forest Service Manual and Handbook (FSM and FSH) provide national management direction for soils that defines soil productivity and components of soil productivity, establishes guidance for measuring soil productivity, and establishes thresholds to assist in project planning. Numerous best management practices (BMPs) provide guidance for managing National Forest System lands to maintain or improve soil quality and to avoid permanently impairing the productivity of the land.

This Soils section of the DEIS is not a spatial analysis of effects on soils. A forest plan is a programmatic document and no specific management actions are proposed. Each alternative would comply with laws, regulations, and policies in place to ensure maintaining soil quality and meeting minimum soil productivity standards. Additionally, the maintenance of soil function is a critical component of the objectives and desired conditions developed for each of the alternatives for forest plan revision.

Alternative A (No-action Alternative)

Current direction for managing soils for all national forests is documented in the Forest Service Manual and Handbook (FSM and FSH). This direction, along with regional supplements, requires that detrimental soil conditions are not exceeded on more than 20 percent of a project activity area, including roads.

Alternatives B, C, D, E, and F

All alternatives are in compliance with soil management direction in FSM 2550 Soil Management along with any amendments and regional supplements.

The following standards and guidelines are included in all alternatives for the protection of soils: FIRE-3, FOR-7, FOR-9, RMA-FIRE-11 (see appendix A). The following desired condition is proposed for all alternatives:

> The productive potential of forest and range soils is maintained at levels that contribute to long-term sustainability of ecosystems considering the range of possible climate change scenarios. Soil physical and chemical properties (texture, porosity, strength, coarse fragment content, and fertility) and organic matter (surface woody debris, humus) are at levels that maintain soil productive potential and hydrologic function (infiltration, percolation, and runoff). Surface soil erosion and sediment deposition rates are within the natural range of variability for each biophysical setting.

Upon implementation, each alternative would lead to a unique combination of activities designed to meet land management objectives. The indicator used to analyze environmental consequences to soils is the potential acres of detrimental soil conditions associated with proposed acres of ground-disturbing activities.

Timber, Wildland Fire, and Fuels Reductions

Disturbance to forest soils can result from the use of heavy equipment during timber harvest operations, including harvesting, yarding, sorting at landings, site preparation, slash treatment,

and restoration activities. Soil disturbance caused by logging can have detrimental or negative effects on soil quality and site productivity. The intent of forest plan standards and guidelines is to minimize the extent (area) of detrimental levels of soil disturbance. Specifically, the total area exceeding criteria for detrimental disturbance in any harvest unit should be no more than 20 percent.

Table 120 displays the projected annual acres of timber harvest and fuels reduction treatments that have the potential to impact soils for each alternative for each national forest.

Table 120. Acres of ground-disturbing activities associated with timber harvest and fuels reduction treatments projected annually for each alternative for each national forest

Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Malheur						
Even-aged regeneration harvest*	150	1,500	800	3,300	2,900	1,800
Uneven-aged and intermediate harvest	6,950	5,600	2,600	17,200	9,600	6,500
Timber harvest totals	**7,100**	**7,100**	**3,400**	**20,500**	**12,500**	**8,300**
Planting	100	700	400	1,600	1,400	900
Precommercial thinning	1,400	1,400	1,000	3,000	1,400	1,400
Burning and mechanical treatment of fuels **	16,600	16,600	12,900	20,500	22,000	17,800
Umatilla						
Even-aged regeneration harvest*	260	1,200	500	2,600	2,400	1,500
Uneven-aged and intermediate harvest	4,940	4,000	1,800	13,000	8,200	4,900
Timber harvest totals	**5,200**	**5,200**	**2,300**	**15,600**	**10,600**	**6,400**
Planting	150	600	200	1,300	1,200	700
Precommercial thinning	1,600	1,600	1,500	3,200	1,600	1,600
Burning and mechanical treatment of fuels **	19,100	19,100	12,300	16,000	20,600	16,400
Wallowa-Whitman						
Even-aged regeneration harvest*	90	1,000	500	2,500	2,000	1,400
Uneven-aged and intermediate harvest	4,410	3,550	1,550	13,750	7,350	4,650
Timber harvest totals	**4,500**	**4,550**	**2,050**	**16,250**	**9,350**	**6,050**
Planting	50	500	200	1,200	1,000	700
Precommercial thinning	2,600	2,600	1,700	5,200	2,600	2,600
Burning and mechanical treatment of fuels**	15,000	15,000	12,550	17,000	19,850	16,550

* Split assumption for timber harvest is 90 percent ground-based logging system and 10 percent cable logging system.
** Mechanical treatment of fuels is expected to occur on more than 25 percent of the acres listed for this category.

Even-aged Regeneration Harvest

Even-aged regeneration harvest can include clearcut, shelterwood, and seed tree prescriptions. These prescriptions are generally followed by additional activities (fuels reductions or subsoiling) and may include planting. Even-aged regeneration harvest and yarding can be accomplished using either ground-based logging equipment, cable/aerial logging systems, or a combination of

both. Ground-based equipment is generally limited to slopes with less than 30 percent rise (USDA Forest Service 1990). A cable logging system is generally used on slopes with greater than 30 percent rise or on sites where protection of soils or other resources is a priority (e.g., post-fire harvest). For analysis purposes, even-aged management activities using ground-based equipment are assumed to result in approximately 10 to 20 percent ground displaced and disturbed soils and no more than 15 percent of the area in new detrimental soil conditions for any unit. The majority of new detrimental soil conditions are assumed to be soil compaction.

Even-aged management activities using a cable logging system are assumed to result in no more than 6 percent of the area in new detrimental soil conditions for any unit. The majority of detrimental soil conditions is assumed to be soil displacement (Han 2007, Han 2006, Drews et al. 2000, McIver and Starr 2001). These estimates for both ground-based and cable logging systems take into account disturbances from other associated timber harvest activities, including landings and fuels reductions. Landings are estimated to account for approximately 1 to 2 percent of detrimental soil conditions in a harvest unit area, and fuels reductions activities are estimated to account for approximately 1 to 4 percent of detrimental soil conditions (Bliss 2003a, Farren 2006a and 2006b). Detrimental soil conditions associated with roads are not included in new disturbances due to Forest Service direction to use existing system roads and to minimize new road construction.

Uneven-aged and Intermediate Harvest

Uneven-aged and intermediate harvest generally consists of single tree selection, small group selection, and intermediate thinning activities designed to maintain or enhance uneven-aged stand structure and reduce fire risk. These harvest activities are generally implemented using ground-based equipment. Magnitude, extent, and duration of effects on soils are expected to be considerably less than those expected for even-aged harvest. This is mainly due to the ability to use smaller, lighter equipment and the harvest of less volume of material, which, when yarded, results in fewer equipment passes.

Based on recent monitoring and research results, uneven-aged and intermediate treatment activities using ground-based equipment can be expected to result in no more than 8 percent of the area in new detrimental soil conditions (McIver et al. 2003, Craigg and Howes 2007). The majority of new detrimental soil conditions is expected to be soil compaction. This estimate takes into account new detrimental soil conditions from associated landings and post treatment fuel reduction activities (Bliss 2003a, Farren 2006a and 2006b). Uneven-aged and intermediate harvest can result in more stand entries than even-aged harvest treatments. Detrimental soil conditions associated with roads are not included in new disturbances due to Forest Service direction to use existing system roads and to minimize new road construction.

Precommercial Thinning and Mechanical Fuels Treatments

Pre-commercial thinning and mechanical fuels treatment activities may be accomplished by hand or with ground-based mechanical thinning equipment and/or grapple-piling equipment depending upon site specific design criteria, desired condition, and other resource objectives. Fuels treatments may include some combination of thinning and piling, thinning slash by hand or machine, burning or chipping, broad cast prescribed burning, mechanical crushing of fuels, or removal of small diameter biomass for commercial use. Due to the growing commercial value of biomass for fuel, the removal of small diameter logs from the treatment unit is more likely than in the recent past.

For mechanical crushing of fuels, grapple or mastication heads are mounted on small-body excavators with wide tracks similar to those used with mechanical harvesters. These machines have relatively low ground pressure and can work on top of downed logs and existing or thinning-created slash. However, this equipment has been found to produce additional compaction on operation trails and some soil displacement while turning (Bennett 2011, Farren 2006a, and Bliss 2006). Pre-commercial thinning and mechanical fuels treatment activities using ground-based equipment can be expected to result in no more than approximately 5 percent of an activity area in new detrimental soil conditions. This estimate takes into account new detrimental soil conditions associated with post thinning fuels treatments and associated landings from biomass removal (Bliss 2003a and Farren 2006a and 2006b). Detrimental soil disturbance is commonly well distributed across activity areas, and ground cover is generally minimally disturbed. Detrimental soil conditions associated with roads are not included in new disturbances due to Forest Service direction to use existing system roads and to minimize new road construction.

Activities with Few or No Predicted Effects on Soils

Some activities generate few, if any, measurable effects on soils. Planting typically is accomplished using hand-held tools and bare root or containerized seedlings. There generally is little or no soil disturbance associated with this activity, with the exception of preparing the actual planting sites with hand tools in order to achieve better seedling establishment. The degree and extent of soil disturbance associated with planting does not measurably reduce site productivity or generate soil erosion. Knowledge of the soils present at planting sites, seasonal and diurnal temperature and moisture fluctuations, soil moisture release characteristics, and coarse fragment content are all important factors considered when preparing for successful planting projects.

Pre-commercial thinning by hand (i.e., personnel using chainsaws or other equipment) generates little or no measurable soil disturbance. Thinning slash, whether left in place or hand-piled, remains largely within the unit. Burning, if prescribed, often occurs one to three years after thinning, which allows needles to fall from branches and reduce fire risk to residual trees. Piles are normally small and fire intensity from pile burning rarely produces severe soil burn effects. Detrimental soil conditions resulting from burning of hand piled fuels is estimated to be no greater than 1 percent of a treatment area (Bliss 2006).

Prescribed fire can release nitrogen into the soil, initially increasing productivity. The long-term decreases in soil productivity from nutrient losses are determined by how often and how severely the soil is disturbed. Soil productivity can increase where low-severity fires take place periodically and nutrients tied up in understory vegetation and woody debris become available for residual plant uptake (Oliver and Larson 1996). Burning can also favor fire-resistant plants, such as grasses, and some pioneering plants, such as *Ceanothus* species, which add nutrients to the soil (Sexton 1998).

Prescribed burning following harvest activities may create some areas of high-severity burn where fuels are concentrated and burn for a long time (residence time). Severe burn areas are typically associated with pockets of concentrated post-harvest fuel loads and areas adjacent to and under logs and stumps. Past monitoring of prescribed fire areas revealed that prescribed underburning produced severe burn soil effects on less than 4 percent of an area (Bliss 2001, Farren 2006a). However, severe burn effects from prescribed fire are not considered detrimental soil conditions, because severe burn areas are generally less than 100 square feet (USDA Forest Service 1990). Nevertheless, areas of severe soil burning are associated with decreased effective ground cover and soil surface organic matter important for water retention, soil structure, nutrient cycling, and microbial populations (Powers et al. 1990). Severe burning of soils has been

associated with decreased infiltration, increased runoff, and accelerated erosion. The erosion risk may or may not be realized after prescribed burning activities depending upon the extent of severely burned soils and upon weather events. The amount of severely burned soils and ground cover reduction from prescribed burning is proportional to the acres treated by underburning.

Suppressing or eradicating populations of invasive plants is an activity that generates few if any soil disturbance concerns. Most of this activity is accomplished by hand pulling and grubbing or by applications of approved herbicides by hand or from an ATV or truck bed. Hand grubbing can create some localized soil disturbance; however, its degree and extent is usually of no concern from a soil productivity or erosion standpoint. When planning a weed control project, knowledge of soil characteristics, such as organic matter content and texture, is important in order to meet label requirements for certain herbicides. Some herbicides may reside in the soil for longer periods of time and could affect soil productivity in localized areas.

While these activities may create some amount of soil disturbance, it is anticipated that there will be few, if any, measurable adverse impacts. Some alternatives would have more acres of certain activities than others; however, it would be impossible to quantify the impacts on soils and future productive potential and thus determine that any one alternative would create more detrimental soil impacts than another. Therefore, these activities will not be considered further in the analysis of soil impacts.

Discussion of Risk for Activities That Generate Effects on Soils

Fundamental to sustainable use of National Forest System lands is the ability to assess relative risk, or lack thereof, of a proposed activity at a specified location and time (Reynolds et al. 2011). This strategy recognizes that potential risk of a given action or inaction (hazard of impact and consequences of that impact) depends on numerous site specific factors and climatic conditions before and after the activity. By assessing the relative risk of incurring soil damage, an activity that best fits site-specific conditions can be prescribed and implemented. Complexity of interactions among activities, local conditions, and on- and off-site consequences must be recognized. Following is a brief description of the analysis procedure and calculations used to estimate change in detrimental soil conditions by alternative.

In evaluating the potential effects of the alternatives on soils, a comparison of the total acres that would be treated for each activity is used as a surrogate for potential detrimental soil effects. To estimate the amount of detrimental soil conditions resulting from those activities during the 10-year plan period, the number of acres of potential detrimental soil condition is calculated using the following formula: acres of activity multiplied by percent soil disturbance factor of specific treatment per year. Acres of activity by national forest and alternative on an annual basis are displayed in table 120. The soil disturbance factor for timber management activities is displayed in table 121.

Table 121. Distribution of timber management activities between potential vegetation groups

Potential Vegetation Group	Distribution of Timber Management Activities
Cold forest (associated with ash cap soils)	5-10%
Moist forest (associate with ash cap soils)	10-30%
Dry forest (associated with low ash content soils)	60-90%
Cold forest (associated with ash cap soils)	5-10%

The estimated amount of detrimental soil conditions is calculated assuming approximately 90 percent of the even-aged harvest treatment acres would be harvested using a ground-based logging sustem and the remainder (approximately 10 percent) with a cable logging system. Acres that would be treated are assumed to be equally distributed across MA 4A General Forest but not equally distributed across potential vegetation groups (PVGs). It is estimated that 60 to 90 percent of the timber harvest activities will take place within dry forest PVGs (see table 124). Approximately 5 to 10 percent and 10 to 30 percent would occur within the cold forest and moist forest PVGs, respectively. However, acres to be treated would be determined on a site-specific basis taking into account the need for the project and the condition of the area to be treated.

Table 122 displays the amount of detrimental soil conditions associated with timber harvest and fuels reduction activities that would occur annually for each alternative for each national forest. Table 123 displays the total acres of new detrimental soil conditions associated with timber management activities for each alternative for each national forest that would occur during the 10-year plan period. Actual impacts of each alternative on soil productivity and hydrologic properties would be evaluated at the project level and would be dependent on local soil characteristics, equipment used, time of operation, and other resource values.

Table 122. Acres of detrimental soil conditions associated with timber harvest and fuels reduction treatments expected annually for each alternative for each national forest

Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Malheur						
Even-aged regeneration harvest	22	25	120	495	435	270
Uneven-aged and intermediate harvest	555	448	208	1,375	768	520
Precommercial thinning	70	70	50	150	70	70
Mechanical treatment of fuels*	206	206	125	250	250	212
Total estimated acres of detrimental soil conditions	**853**	**749**	**503**	**2,270**	**1,523**	**1,072**
Umatilla						
Even-aged regeneration harvest	40	180	75	391	360	225
Uneven-aged and intermediate harvest	395	320	145	1,040	658	252
Precommercial thinning	80	80	75	160	80	80
Mechanical treatment of fuels*	194	194	150	200	250	212
Total estimated acres of detrimental soil conditions	**709**	**774**	**445**	**1,791**	**1,348**	**769**
Wallowa-Whitman						
Even-aged regeneration harvest	14	150	75	376	300	210
Uneven-aged and intermediate harvest	342	285	125	1,100	588	372
Precommercial thinning	130	130	85	260	130	130
Mechanical treatment of fuels*	188	188	88	212	250	200
Total estimated acres ofdetrimental soil conditions	**674**	**753**	**373**	**1,948**	**1,268**	**912**

* The actual amount of detrimental soil conditions that would result from mechanical fuel treatments for each alternative increases as fuel loads increase. It is assumed that any fuel treatments utilizing fire will be prescribed fire and that any soil damage would be inconsequential or not measurable; therefore, no acres of detrimental soil conditions would be associated with prescribed fire.

Table 123 displays the estimated acres of new detrimental soil conditions associated with timber management activities for the 10-year plan period for each alternative for each national forest. All alternatives would result in some degree and extent of detrimental soil conditions. Each alternative would comply with the laws, regulations, and policies in place to ensure maintaining soil quality and meeting minimum soil productivity standards. The order of impact from highest to lowest would be alternative D followed by E, F, B, C, and A.

Table 123. Acres of detrimental soil conditions projected from timber management activities for each alternative for each national forest during the first decade of the plan period

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	8,530	7,490	5,030	22,700	15,230	10,720
UMA	7,090	7,740	4,450	17,910	13,480	7,690
WAW	6,740	7,530	3,730	19,480	12,680	9,120

In summary, the acres of new detrimental soil conditions anticipated from implementation of the alternatives are based on best available science and is calculated using recent local monitoring data. Timber management activities with contemporary harvest systems (e.g., fuels reductions and timber harvest) can generally meet minimal detrimental soil condition standards. However, that actual amount of new detrimental soil disturbance would vary by degree, extent, duration, and distribution or pattern depending on highly variable soil and site characteristics (Jurgensen et al 1997) and on site-specific project design. In many instances, less detrimental soil disturbance would be achieved through use of state-of-the-art timber harvesting and processing equipment and other project design features or mitigation measures, such as avoidance of unsuitable or high risk areas. Furthermore, rehabilitation work before final completion of operations can further reduce impacts from timber harvest activities and related long-term effects to soils.

An indication of the relative magnitude of effects of activities on soil productivity between alternatives can be obtained by comparing acres of treatment occurring in different forest types (dry, moist, and cold potential vegetation groups), along with differences in inherent soil productivity and operability limitations.

Table 124. Distribution of timber management activities between potential vegetation groups

Potential Vegetation Group	Distribution of Timber Management Activities
Cold forest (associated with ash cap soils)	5-10%
Moist forest (associate with ash cap soils)	10-30%
Dry forest (associated with low ash content soils)	60-90%

When activities occur in areas with low inherent soil productivity (e.g., dry, shallow, and rocky soils) or and severe limitations to operability of ground-based equipment (e.g., thick ash capped soils with high risk of compaction), it is likely that potential soil impacts will be greater without site-specific design criteria to offset the extent, degree, and duration of soil impacts. Design criteria may include implementation of mitigation measures, such as the use of existing skid trails and wide trail spacing for shallow rocky soils or winter logging on high ash content soils. Soil impacts can also be further offset with the implementation of restoration activities, such as subsoiling. Site-specific inherent properties and limitations would be considered when developing specific project objectives and design features. Even though the potential for adverse effects on

soils may be high, actual measured effects may be lower than expected and within an acceptable range if the project is carefully designed and implemented.

Roads

Road construction and reconstruction can have large and long-lasting effects on soils and watersheds. Roads can intercept and reroute subsurface water movement down slope, which can lead to upslope and cutbank failures and sediment deposition into drainage channels and culverts. Roads intercept rainfall and channel it onto hill slopes. Road cutbanks are subject to rill erosion if not properly constructed and stabilized

Roads also remove areas from the productive land base. From a soil productivity standpoint, they are completely non-productive. Roads that are components of the permanent transportation system are not considered a soil productivity concern unless they are to be returned to the productive land base.

Disturbance caused by road construction activities can also reduce soil productivity and hydrologic function and can make up large percentages of activity areas (temporary roads) and watersheds (permanent roads). Analysis of environmental consequences of timber harvest activities on soils includes the assumption that approximately 5 percent of an activity area is comprised of detrimental soil conditions associated with permanent and temporary roads.

Road construction and maintenance effects are assumed to be greatest in landtype associations with steep and/or unstable slopes and highly erodible soils. Landtype associations have been evaluated for their suitability for road construction and the limitations they present. Road effect risk ratings from low to high have been assigned for each landtype association (more information is available from the project record). Given the scale of mapping for landtype associations, some areas of difficult road construction and high potential for detrimental soil effects may be encountered in landtype associations with low risk ratings.

Effects of trail construction and off-road vehicle use can be evaluated using the same factors.

Little, if any, future road construction is likely for any of the alternatives. Alternatives B, C, E, and F include objectives for decommissioning roads, although at low levels. This would return those roads into productive soils over time. No road construction effects on soils are expected for any of the alternatives.

Livestock Grazing

Like timber management activities, livestock grazing (as well as concentrations of herbivorous wildlife species) can have significant and often detrimental effects on soils. Impacts of timber management activities are usually immediate or occur during a relatively short time period and are, for the most part, easily observable or detectable. Grazing impacts on soils are often subtle and go unnoticed unless unimpacted areas are available for comparison or repeated observations are made over time. However, there are exceptions, such as stock watering sites, salting stations, and livestock holding facilities.

As described previously, livestock grazing impacts to soils are considered as part of the grazing suitability analysis and determination (refer to the Livestock Grazing and Rangeland Vegetation section in this chapter). All alternatives include the continuation of permitted livestock grazing. Expected AUMs are displayed in table 125.

Table 125. Permitted livestock AUMs (cattle and sheep) for each alternative for each national forest

National Forest	Alt. A	Alts. B, E, and F	Alt. C	Alt. D
MAL	131,500	131,500	31,200	140,500
UMA	47,800	44,600	3,200	57,800
WAW	91,500	90,500	23,500	129,500

The effects of livestock grazing on soils are dependent on soil risk class (more information is available from the project record). The number of acres suitable for grazing by risk class and the percent of acres in each risk class is displayed in table 126.

Table 126. Acres suitable for livestock grazing by risk class for each alternative for each national forest

National Forest	Alternative(s)	Area Suitable	Suitable Acres by risk Class (within active allotments)		
			Low	Medium	High
MAL	A, B, E, and F	1,280,000	166,000 (13%)	1,101,000 (86%)	10,000 (1%)
	C	623,000	96,000 (15%)	522,000 (84%)	4,000 (1%)
	D	1,361,000	168,000 (12%)	1,182,000 (87%)	11,000 (1%)
UMA	A, B, E, and F	376,000	11,000 (3%)	348,000 (92%)	17,000 (5%)
	C	33,000	1,000 (1%)	31,000 (95%)	1,000 (2%)
	D	500,000	13,000 (2%)	448,000 (90%)	40,000 (8%)
WAW	A, B, E, and F	464,000	22,000 (5%)	425,000 (91%)	17,000 (4%)
	C	124,000	7,000 (6%)	114,000 (92%)	2,000 (2%)
	D	649,000	25,000 (4%)	594,000 (91%)	30,000 (5%)

The process for assigning risk classes for grazing included determining the overlap of land type associations with grazing suitability maps for each alternative. Each grazing suitability class was assigned a rating of low, moderate, or high (pers. comm. Steve Howes 2011). rating of low risk to soils from grazing was given to land type associations rated with high suitability. A rating of moderate risk to soils from grazing was given to land type associations rated with low to moderate suitability. A rating of high risk to soils from grazing was given to land type associations rated unsuitable for grazing. Unsuitable grazing lands generally included land type associations associated with steep slopes, very shallow and rocky soils, and/or sites producing less than 200 pounds of forage annually.

Alternative D would have the most acres suitable for livestock grazing and alternative C the least. Alternative D would also have the most high risk class acres suitable for livestock grazing and alternative C the least. The Malheur National Forest would have one percent or less of suitable acres in the high risk class for all alternatives. The Umatilla National Forest would vary from just more than two percent of suitable acres in the high risk class for alternative C to about eight percent for alternative D. The Wallowa-Whitman National Forest would vary from about two percent of suitable acres in the high risk class for alternative C to just under five percent for alternative D.

These ratings tend to align with the Stringham et al. (2003) indicators of rangeland health (IIRH) assessments that areas with low to moderate suitability tended to have lower resilience and

resistance to grazing impacts (i.e., at a higher risk from grazing). For example, IIRH assessments generally indicated that, dry non-forested and dry forested sites tended to express slight to moderate departure for soil and site stability and moderate to extreme departure for biotic integrity. Dry non-forested and dry forested sites are generally considered to have low or moderate grazing suitability ratings. Impacts to overall rangeland health of less suitable lands tends to be expressed by greater departures in biotic integrity than soil quality attributes for the same site. It is assumed that this is due to differences in resistance and resiliency characteristics between these two ecological processes (Stringham et al. 2003).

Assessment of the areal extent of detrimental soil conditions for the plan area and even high use areas is difficult due to the scale of grazing lands and the dynamic nature of management strategies. Livestock grazing effects on soils will generally be concentrated in areas most heavily used by livestock, including corrals, trails, around salting sites, and at water developments and other water sources.

Recreation

Recreation activities effects on soils are related primarily to roads. Dispersed campsites may have compaction and displacement. Locations that are very popular and constantly occupied during the summer and fall, and where adjacent to water, would be expected to have the most impacts.

The effects from recreation for any alternative are not expected to be significant. Off-road vehicle use, access to dispersed campsites, and concentrated use near water can impact soils (Eckert et al. 1979 and Lei 2007).

Soil Restoration

Although protection of soils from detrimental disturbance is a primary goal of management activities, sometimes, especially where historic land use practices resulted in a high degree or extent of detrimental soil conditions, restoration of soils is needed in order to restore physical, chemical, and biological properties. In these cases, restoration of soils is an important aspect of forest and rangeland management.

Soil and watershed restoration objectives are similar for each alternative. However, each alternative differs in the amount of land that would receive restoration treatments. Predominant objectives for improved soil and watershed function include improving soil quality and hydrologic function in areas of detrimental soil disturbance, reducing road-related sedimentation by reducing road density and hydrologic connectivity of the road system, and improvement of forest vegetative conditions.

There are numerous soil restoration opportunities available as mitigations to offset impacts of management activities, in addition to restoration to reduce existing detrimental soil conditions. Examples include subsoiling to reduce soil compaction associated with roadbeds, skid trails, and landings; road decommissioning and obliteration; biochar; biosolids and other organic matter additions; seeding with native vegetation; use of biological organisms and nitrogen fixing shrubs and trees to help restore nutrient cycling processes on degraded sites; and implementation of soil erosion control measures. Restoration effectiveness in reducing detrimental soil conditions and improving soil function is highly variable. Selection of restoration treatment depends on the purpose and objective selected for the site-specific area. The purpose of soil restoration often is to improve dynamic properties to aid natural soil functions in the restoration process over time (e.g., improved infiltration and water holding capacity of soils, vegetation and root growth, organic matter accumulation, and fertility).

Approximately 80 percent of road-related sediment is coming from approximately 20 percent of the roads. Reduction of road related sediment may include various levels of road decommissioning (e.g., pulling carsonite signs, water barring, barrier construction, additions of woody material and other organic matter additions, reseeding, and culvert removal) and obliteration (e.g., subsoiling and recontouring). The actual method used to reduce road-related sediment would be determined at the site–specific, project level.

Restoration of soil chemical and biological properties specifically addresses nutrient cycling and availability of soil nutrients and moisture to aid plant growth. Appropriate soil restoration would include fertilization or the addition of organic material. Fertilization rarely occurs on National Forest System lands due to the length of rotation and the efforts to reserve organic material onsite. When organic material is lost due to fire or displaced by heavy equipment, the quality of the soil is altered.

Removal of forest floor detritus disrupts the decomposition process and reduces the amount of available material for soil microorganisms. Losses of carbon from soils result from processes that accelerate decomposition of organic matter and convert carbon in plant residues and soil organic materials into carbon dioxide. Fire itself can lead to carbon losses through the release of carbon dioxide. Tilling of soil, burning, physical removal of materials, and overgrazing are all management practices that either reduce the potential for organic residues to enter soils or increase the rates of decomposition. The processes of carbon loss from or carbon gain into the soil ecosystem can be influenced by management practices.

Any practice that enhances productivity and the return of plant residues (i.e., shoots, roots, and detritus) to soils increases soil organic matter. The type of vegetation has an effect on soil organic matter levels with higher levels of organic matter found under hardwood s than under coniferous vegetation. Fire can also contribute to soil organic carbon by converting dry plant material into charcoal, which enters the recalcitrant fraction. Soil carbon can also be enhanced by adding organic matter to the soil, e.g., manure, plant materials (mulch), biosolids, or biochar. Recent studies on the Umpqua National Forest have shown a 23 percent increase in water holding capacity of the droughty volcanic ash soils on the Diamond Lake Ranger District following an application of biochar (pers. comm. Archuleta 2011).

The use of biological organisms, including nitrogen fixing shrubs and trees, can restore nutrient cycling processes on degraded sites (e.g., landings, mining tailings, and roadbeds). These are natural components of the early seral species that establish on high burn intensity areas and can last for decades (Holofsky et al. 2011). The ecological benefits of these nitrogen fixing shrubs and trees are an important component in early successional landscapes. In highly degraded sites, or sites where forest cover has been removed for long periods of time, restoration of soil quality may require the introduction of mycorrhizael inoculants.

Restoration of soil physical properties specifically addresses the movement of roots, water, and animals through the soil. The most obvious changes in soil physical condition are related to soil compaction, which alters soil structure and soil pore space. Over time, natural processes will ameliorate soil compaction, but that may take decades. Burrowing animals and roots may serve to rehabilitate soil compaction over time. Depending on location, freeze/thaw cycles may also serve to rehabilitate soil compaction if the depth of freezing is consistent with the depth of compaction. More typically, however, ameliorating compaction requires mechanical assistance with decompaction or subsoiling equipment that breaks up the compacted layer.

Subsoiling is characteristically done to treat areas with a high degree and extent of compaction and is generally associated with skid trails, roads, and landings. Restoration of detrimental soil compaction by subsoiling serves to reduce the total area of pre-existing and new detrimental soils within activity areas (Craigg 2000, Archuleta and Baxter 2008). Subsoiling is assumed to effectively mitigate adverse compaction (Andrus and Froehlich 1983) by breaking up compacted layers; however, some percentage of the soil profile retains dense clods that are not decompacted. Subsoiling equipment, if used properly, lifts and shatters the soil profile to improve infiltration of water and aid in seed capture and create a more favorable seed bed without churning the surface soil.

Soil restoration through decompaction equipment creates conditions where natural soil functions can continue the restoration process and accelerate the physical processes that break down soil compaction over time (e.g. improved infiltration and water holding capacity of soils, vegetation and root growth, and organic matter accumulation). Subsoiling does not mitigate detrimental soil displacement. An example of this is subsoiling of road beds, which reduces compaction and increases infiltration, but soils remain detrimentally disturbed because the original topsoil is still displaced (Bliss 2006 and Powell 2005).

Subsoiling can generally be done with either a bulldozer drawn implement or with an excavator mounted implement. The excavator offers other abilities, such as grapple piling of harvest debris. Backhoe buckets have been used to effectively to decompact roadbeds, aid in seed capture, and decrease surface erosion (pers. comm. Archuleta 2011). Subsoiling can churn soil and may increase soil displacement when implemented incorrectly, used ineffectively, or used where environmental settings and conditions are improper (Archuleta and Baxter 2008 and Bliss 2006). Tines on brush blades and rock rippers rip through and displace soil but the adjacent soil is not decompacted (Bennett 2011). Subsoilers that churn soils increase rates of organic matter decomposition and increase respiration of carbon dioxide into the air. While not a concern on old roadbeds where little organic matter is found in the soil profile, it is a concern for productive forest lands. It is not appropriate to subsoil shallow or rocky soils or to subsoil on slopes with greater than 30 percent rise (Bliss 2006). To maximize fracture potential and minimize soil churning, subsoiling is recommended where soil depth is at least 20 inches and where soils are moist. Monitoring would be required to assess the actual effects of subsoiling on soil conditions.

Decommissioning a road includes many forms and intensities of treatments. The effectiveness of improving detrimental soil conditions and decreasing road-related sediment varies (Bliss 2006). These treatments include pulling carsonite signs, which is the least intensive and least effective treatment method, and water barring, barrier construction, additions of woody material and other organic matter, reseeding, culvert removal, and obliteration by subsoiling or re-contouring. Re-contouring is considered to be the most effective treatment for reducing detrimental soil conditions and is estimated to reduce approximately 80 to 90 percent of road-related detrimental soil conditions (Bliss 2006).

As displayed in table 127 through table 129, the acres of projected activities to improve soil and hydrologic function by improving forest vegetation condition are greatest for alternative D and decrease progressively in the order of alternatives E, F, B, and C. The acres of projected activities to improve soil and hydrologic function by reducing detrimental soil disturbance, reducing-road related sedimentation, implementing erosion control measures, and subsoiling are greatest for alternative C and decrease progressively in the order of alternatives B, F, E, and D.

Table 127. Restoration activities proposed to improve soil and watershed function for each action alternative for the Malheur National Forest

Restoration Goals and Objectives	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Improve soil and hydrologic function by: • Improving forested vegetation conditions (acres) (WH1)	4,400 acres (annually)	2,000 acres (annually)	20,700 acres (annually)	7,800 acres (annually)	5,600 acres (annually)
• Improving soil hydrologic function in areas of detrimental soil disturbance (acres) (WH2)	450 acres	800 acres	400 acres	600 acres	540 acres
• Reducing road-related sedimentation by reducing road density and reducing hydrologic connectivity of the road system (WH3)	10 miles 14-18 miles road surface treated	15 miles 30-60 miles road surface treated	0 miles 50-80 miles road surface treated	10 miles 18-20 miles road surface treated	14 miles 16-18 miles road surface treated
Implement erosion control and stabilization measures on unstable hillslopes. Possible activities include road obliteration and improving forested vegetation conditions.	200-400 acres	300-500 acres	150-250 acres	200-400 acres	180-350 acres
Restore soil function.	150-300 acres	200-400 acres	75-150 acres	175-350 acres	150-300 acres

Table 128. Restoration activities proposed to improve soil and watershed function for each action alternative for the Umatilla National Forest

Restoration Goals and Objectives	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Improve soil and hydrologic function by: • Improving forested vegetation conditions (acres) (WH1)	2,500 acres (annually)	1,500 acres (annually)	12,600 acres (annually)	6,600 acres (annually)	3,700 acres (annually)
• Improving soil hydrologic function in areas of detrimental soil disturbance (acres) (WH2)	500 acres	900 acres	450 acres	750 acres	700 acres
• Reducing road-related sedimentation by reducing road density and reducing hydrologic connectivity of the road system (WH3)	10 miles 14-18 miles road surface treated	15 miles 30-60 miles road surface treated	0 miles 50-80 miles road surface treated	10 miles 18-20 miles road surface treated	10 miles 16-18 miles road surface treated
Implement erosion control and stabilization measures on unstable hillslopes. Possible activities include road obliteration and improving forested vegetation conditions.	200-400 acres	300-500 acres	150-250 acres	200-400 acres	200-360 acres
Restore soil function.	150-300 acres	200-400 acres	75-150 acres	175-350 acres	160-320 acres

Table 129. Restoration activities proposed to improve soil and watershed function for each action alternative for the Wallowa-Whitman National Forest

Restoration Goals and Objectives	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Improve soil and hydrologic function by: • Improving forested vegetation conditions (acres) (WH1)	3,500 acres (annually)	2,100 acres (annually)	17,700 acres (annually)	7,300 acres (annually)	4,600 acres (annually)
• Improving soil hydrologic function in areas of detrimental soil disturbance (acres) (WH2)	650 acres	1,200 acres	600 acres	950 acres	850 acres
• Reducing road-related sedimentation by reducing road density and reducing hydrologic connectivity of the road system (WH3)	10 miles 14-18 miles road surface treated	10 miles 30 miles road surface treated	0 miles 80 miles road surface treated	10 miles 20 miles road surface treated	10 miles 16-18 miles road surface treated
Implement erosion control and stabilization measures on unstable hillslopes. Possible activities include road obliteration and improving forested vegetation conditions.	200-400 acres	200-400 acres	300-500 acres	150-250 acres	200-400 acres
Restore soil function.	150-300 acres	150-300 acres	200-400 acres	75-150 acres	175-350 acres

Minimal additional road construction is projected for the plan area. Additionally, decommissioning and mechanical decompaction of existing authorized and unauthorized roads and areas of detrimentally compacted soils would increase, increasing acres of stable and productive soils.

Another change in physical soil quality occurs when inherent soil moisture levels are altered. There are two important examples of this occurring throughout the Blue Mountains. First, soils are considered to have been degraded in wet meadow systems and other areas that have been drained due to downcutting of streams through the area. Typically, organic rich soils form under wet soil conditions due to slow decomposition of plant material. As meadows and wetland areas are drained, this organic material is rapidly decomposed through volatilization and respiration by microorganisms. Carbon is released to the air and into the stream systems. The soil quality is severely altered causing a state transition of the type of soil found in the area. Restoration of soils in this area would require reestablishment of the groundwater regime.

Due to fire suppression, many areas of the Blue Mountain national forests have become unsustainably overstocked. During low precipitation periods when soils do not have the ability to supply moisture to support these overstocked conditions, drought stress occurs and forest health risks (e.g., insect and disease) increase. This overstocking is considered to have reduced soils quality or the inherent ability to supply water to the native vegetation communities. Along with these major changes in landscape dynamics, degradation of soils through removal of organic matter, displacement of surface soils, and soil compaction further exacerbate these conditions. Thinning of overstocked vegetation, with a focus on maintaining vegetation densities within the capacity of the soil to support productive growth, is included in the soil and watershed function restoration objectives proposed for each alternative. Restoration of these soil moisture and plant

community ecological processes is also an important aspect of adapting to climate change and creating resilient landscapes.

Cumulative Effects

Proposed actions would be designed considering balance between potential site impacts and the feasibility of operations. Previous management activities disturbed soils to varying degrees and extent, with some impacts still exceeding levels considered detrimental. Existing soil disturbance is scattered across the proposed plan area, and is concentrated on more level ground that is readily accessible primarily in the form of old skid trails and landings. Existing detrimental soil conditions often are referred to as legacy disturbance and will be factored into assessments of cumulative effects for new management actions on a site-specific level. Table 130 displays cumulative effects to detrimental soil disturbance by alternative for each national forest.

Table 130. Cumulative range of estimated acres of detrimental soil conditions associated with timber harvest activities for each alternative for each national forest

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	52,732-258,449	51,692-257,409	49,232-254,949	66,902-272,619	59,432-265,149	54,922-260,639
UMA	30,208-125717	30,855-126,367	34,318-129,827	41,028-136,357	36,598-134,800	30,808-126,317
WAW	38,546-189,878	39,336-190,668	35,536-186,868	51,286-202,618	44,480-195,818	40,926-192,258

A certain amount of overlap occurs when activities are implemented in areas with pre-existing detrimental soil conditions (e.g, as machinery reuses some trails and landing sites, or grazing impacts occur on existing developed water sites within existing allotments). This tends to reduce the amount of added, new detrimental soil impacts. This overlap is not used to reduce estimated increases in detrimental soil conditions as the extent of this effect is too uncertain. This likely results in an overestimation of total potential detrimental soil conditions in the plan area where existing soil disturbance from previous activities occur.

Effects of Climate Change on Soils

Climate change effects on soils in the West are not well known, but changes in the amount and timing of precipitation, snowpack, stream flow, and the frequency and severity of floods, fires, and droughts have important implications for soil carbon sequestration, soil water retention, and erosion.

Elevated carbon dioxide increases carbon supply below-ground through increased plant biomass, stimulated root growth, and root secretions in soils (Pendell et al. 2004, Ainsworth and Rogers 2007, and Ainsworth and Long 2005). Soil organic matter exerts strong influence on nutrient balance and can also influence soil water holding capacity and populations of soil organisms (Carney et al. 2007).

Increased root growth generates more carbon below ground, which can help accelerate decomposition and nutrient cycling, whereas warming is likely to increase respiration and decomposition rates. These effects have the potential to moderate one another relative to carbon emissions to the atmosphere (Kirschbaum 2000), but the effect is sensitive to changes in average temperature and changes in temperature variation (Sierra et al. 2011). Indirect effects of warming

temperatures and other climate changes on soil moisture availability and nutrient supply may alter soil and plant processes in unexpected ways (Pendell et al. 2004).

Increasingly warm temperatures and associated changes in rainfall patterns, increased evaporative stress, and declines in snowpack are expected to cause a decline in soil moisture availability and possibly result in decreased soil organic matter content. Reduced soil moisture availability may in turn result in increased drought stress, making forests more susceptible to mortality from insects infestations and large, severe fires. East of the Cascade Range (i.e., the Blue Mountains), soil moisture decline and increased drought stress on forests is projected to be substantial. Increased plant growth driven by increased temperatures and carbon dioxide could also increase demands on available soil moisture. Soil texture, organic matter content, and depth is important to soil water holding capacity, and hence to an ecosystem's vulnerability to drought.

Soil erosion rates are expected to change in response to changes in climate for a variety of reasons, including the erosive power of rainfall. If rainfall amounts and intensities increase in the Blue Mountains, erosion will also increase. Other factors that could contribute to soil vulnerability, or changes in rates of water runoff and soil erosion, include:

- Changes in the amount of plant cover as ecosystem distributions shift
- Changes in amounts of litter as a result of changes in decomposition and plant production rates
- Changes in soil moisture due to shifting precipitation regimes and evapotranspiration rates
- Changes in soil organic matter concentrations
- A shift of winter precipitation from snow to rainfall, or changes in the frequency of rain-on-snow flooding

Increased rain and snow runoff can also have implications for hill slope stability.

Observed and anticipated increases in fire frequency and severity in the Blue Mountains as a result of climate change also have implications for soils. High severity burns lead to higher rates of soil loss from erosion, greater duff reduction, loss in soil nutrients, and soil heating (McNabb and Swanson 1990 and Hungerford et al. 1991).

Management strategies that facilitate the conservation of soils in the face of climate changes include:

- Retaining forest floor detritus
- Avoiding carbon losses from uncharacteristically severe or frequent fire, or overgrazing
- Physical removal of biomass

Generally, the plan alternatives share plan components designed to conserve soils during project implementation, but they vary in the amount of potential soil disturbance from management activities. Alternative C has the fewest acres of timber harvest, so has the lowest likelihood that harvest disturbance will exacerbate climate change-induced soil drying and erosion. Alternative D has the greatest acres of timber harvest and, conversely, would have the highest likelihood that soil disturbance from harvest will exacerbate climate change-induced soil drying and erosion. More erosion control and stabilization measures on unstable hill slopes are projected for alternative C, potentially mitigating climate change-induced increases in runoff. With projections for the most improvement in fire regime condition class in dry and moist forests and the highest

likelihood of preventing uncharacteristically severe wildlife, alternatives D and E would likely have the least fire-induced soil erosion.

Air Quality

Air pollution has the potential to impact a variety of resources on National Forest System lands in the Blue Mountains, including visibility, water, soils, vegetation, and sensitive species of flora and fauna. Air pollution also has potential to impact human health. Activities, such as timber harvesting, livestock grazing, oil and gas well drilling and operations, road construction or maintenance, and prescribed fire, produce emissions that may affect air quality in and around the national forests.

Key indicators:

- Ambient air quality
- Visibility
- Acres of wildland fire(s)
- Acres of prescribed fires or tons of fuels treated on National Forest System lands

Affected Environment

Federal land management agencies have the unique responsibility to protect the air, land, and water under their respective authorities from degradation associated with air pollution emitted outside the borders of agency lands (Clean Air Act, as amended 1990), as well as from the impacts of air pollutants produced within those borders. These mandates are established through a series of legislative and regulatory requirements (Clean Air Act, as amended 1990; Organic Act 1977, and Wilderness Act 1997). The Clean Air Act names six criteria pollutants: carbon monoxide, lead, nitrogen, ozone, sulfur dioxide, and particulate matter as both PM10 (particulate matter less than 10 microns in diameter) and $PM_{2.5}$ (particulate matter less than 2.5 microns in diameter). These pollutants create the framework for which National Ambient Air Quality Standards (NAAQS) are established. Amendments to the Clean Air Act name 187 toxic air pollutants and establish measures for reducing the concentrations of these substances in emissions to the atmosphere. A community that does not meet or attain the NAAQS is usually designated by the Environmental Protection Agency (EPA) as a nonattainment area. The city of La Grande was named a nonattainment area for particulate matter (PM_{10}) in 1991 and is the only area in the Blue Mountains to be so named. An air quality maintenance plan was developed by Oregon Department of Environmental Quality (ODEQ), which resulted in control measures for sources of particulate matter within the La Grande Urban Growth Boundary. EPA approved a revised Air Quality Maintenance Plan for La Grande and changed its status to attainment, effective July 19, 2006. La Grande is now designated as an Air Quality Maintenance Area for PM10 and is the only area with this designation in the Blue Mountains.

The Clean Air Act has established three classes of airsheds with varying levels of protection: classes I, II and III. Class I provides the highest level of protection and includes Forest Service wilderness areas larger than 5,000 acres that were designated before August 1977. Three Class I areas are located in the Blue Mountains: Strawberry Wilderness Area, Eagle Cap Wilderness Area, and Hells Canyon Wilderness Area. Within Class I wilderness areas, the Forest Service has specific responsibilities for protection of air quality. This responsibility is carried out through the prevention of significant deterioration (PSD) permit process.

Within the Blue Mountains, smoke from wildland and prescribed fires is the dominant source of air pollution, but pollution affecting air quality in the Blue Mountains can and does occur outside of the Blue Mountains and may originate from anywhere in the western U.S. and Canada, depending on prevailing wind conditions.

Smoke emissions from Forest Service fuels treatments and prescribed fires on National Forest System lands are regulated by state Smoke Implementation Plans (SIP) in Oregon, Washington, and Idaho. From 1994 through 2008, PM_{10} emissions from the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests were limited to a combined 15,000 tons per year. PM_{10} emissions averaged approximately 4,150 tons per year from 1994 through 2001, or about 28 percent of the emissions allowed by the Oregon Smoke Management Plan (OSMP). Beginning in 2009, smoke management has been regulated by fee-based systems in Oregon and Washington that recognize the benefits of fuels reductions and prescribed burning to national forest resources while encouraging reductions in smoke emissions.

The OSMP has regulated smoke emissions from all sources since 1994. While smoke from wildland fires normally cannot be controlled, smoke emissions from other sources on National Forest System lands have complied with those regulations. The OSMP emissions cap of 15,000 tons PM10 per year from prescribed fires and fuel treatments has never been exceeded.

The OSMP identifies Baker City, La Grande, Enterprise, Burns, John Day, and Pendleton as Smoke Sensitive Receptor Areas (SSRAs). The objective of the OSMP is to restrict smoke intrusions into these communities. Where smoke intrusions cannot be avoided, the use of best management practices to control burning conditions is intended to vent smoke plumes up and minimize residual smoke. In all other instances of prescribed burning, it is the intent of the OSMP to minimize the amount and duration of smoke that comes into contact with humans at their places of residence or at places where they normally gather (OAR 629-048-0120).

Air Quality Tradeoffs between Prescribed Fire and Wildland Fire Emissions

Smoke from wildland fires is the most prevalent source of impacts on air quality in the Blue Mountains. Smoke from prescribed and wildland fires contains carbon monoxide, sulfur dioxide, nitrous oxides, particulate matter, volatile organic compounds (Liu 2004), and mercury (Friedli et al. 2003). Particulate matter (PM_{10}, $PM_{2.5}$) in wildland fire smoke is of greatest concern because of known human health effects.

The existing wildland fire regime is significantly different than it was historically because of increased fuel loading, development of fuel ladders, and increases in stand density. Approximately 10 percent of acres burned now are nonlethal underburns, while approximately 31 percent of acres burned were nonlethal underburns historically. Stand replacing fires consume much more fuel and produce much more smoke than nonlethal fires, which usually burn with fairly low surface fire intensities in the understory. Brown and Bradshaw (1994) found that emissions were greater from current fires, even though they burn fewer total acres than what burned historically, because consumption of fuel per unit area burned is greater in the current period.

Prescribed fires are ignited when fuel moisture conditions are optimal for reducing total fuel consumption. Prescribed fires are designed to disperse smoke away from populated areas and are not conducted during inversions. Summer inversions are a major cause of bad ambient air conditions associated with wildland fires.

While increasing prescribed fires can have temporary negative impacts on air quality, in the long term, the acute impacts to air quality from wildland fires can be reduced as a result (Weise et al. 2003). During the last 10 years, measurements of PM_{10} from wildland fires in urban areas well exceeded the NAAQS, and state regulators and scientists found it common for these episodes to last several days. For example, the 1994 wildland fires near Wenatchee, Washington produced 24-hour concentrations of PM_{10} that were more than double the Federal health standard, and these conditions persisted for days. Impacts to populated areas from prescribed fire emissions can be more frequent, but the impact is well within established health standards for PM_{10} (Earth Tech. 1996).

Analysis Assumptions

Air quality within the plan area, due to regional transport winds, can be affected by actions that occur at considerable distances from the area. The distance from these sources helps to buffer any potential adverse industrial/metropolitan pollutants. Population growth in the Pacific Northwest and southwestern Idaho, centered in Boise, may diminish this buffer in coming decades.

Current air quality effects on wilderness areas and surrounding Class 2 lands is primarily from smoke and regional haze that affects large areas of the West under certain, poorly understood conditions. The issue of regional haze and its effects on western vistas has been and is being studied at a scale beyond this analysis in programs, such as the Grand Canyon Visibility Transport Commission. In addition, impairment reduction goals for visibility have been mandated by the EPA.

For the anticipated effects on air quality in the Class I airshed, fire ignitions are the primary source of visual impairment. Refer to the Forested Vegetation, Timber Resources, and Wildland Fire section for estimates of fire by type and by alternative.

Natural ignitions allowed to burn under prescribed conditions produce approximately 22 percent less PM_{10} emissions per burned acre than wildland fires. Because tree crowns are not normally consumed and fuels moisture is higher, prescribed fires produce at least 37 percent less emissions per burned acre than wildland fires.

Smoke from prescribed fires would be managed by burning on days when air quality degradation can be minimized. How well the smoke will disperse is a key consideration in prescribed fire burning planning, and coordination will help ensure that prescribed fires will not violate the state standard for particulate matter. For all prescribed fire activities, site-specific environmental analyses will be conducted in accordance with agency direction in place at that time.

Legal considerations regarding smoke produced from wildland fire and prescribed fire use fall under the EPA's Exceptional Events Policy. When exceptional events occur, normal planning and regulatory processes established by the Clean Air Act are not required. Properly managed prescribed fire and wildland fire use activities are exceptional events according to the policy, and wildland fire is considered to be a natural event; pollution caused by these events is not subject to violations of NAAQS.

For all Forest Service site-specific projects, road dust would be evaluated if it is expected to present air quality issues. Mitigation measures, including road surfacing; season of use, daily time, and use restrictions; road closures; dust abatement products or road watering; and requiring lower speeds on gravel and native surface roads, may be implemented.

Key Indicator: Potential particulate emissions generated from prescribed fire

Environmental Consequences – Air Quality

Effects Common to All Alternatives

Both wildland fires and prescribed fires would generate smoke and particulates that could temporarily degrade visibility and ambient air quality conditions in downwind sensitive areas. The risk of adverse air quality impacts from fires would increase with the acreage burned.

Effects to air quality from permitted livestock would be negligible. Livestock grazing can generate dust, which can affect visibility and particulate levels. Dust impacts are expected to occur only in localized areas and for limited and short durations. Overall, the effects would be undetectable on an allotment, county, or forestwide scale, and the effects of livestock grazing on air quality would not vary measurably between alternatives.

For national forest travel routes impacts on air quality, vehicle emissions and dust from traffic on unpaved roads are the primary sources. These effects typically are localized and temporary, and their extent depends on the amount of traffic. Dust from unpaved roads increases with dryness as well as vehicle weight and speed.

Motor vehicle recreation occurs year-round. Summer use includes off-highway vehicles. Localized impacts from traffic on unpaved roads (dust) have not adversely affected air quality in sensitive areas (e.g., those with important scenic vistas). As use of the national forest transportation system increases with greater visitation, road dust impacts to sensitive areas may need to be addressed. Effects of motor vehicle emissions on air quality are not expected to result in measurable variations from the existing condition for any of the alternatives. Most of the effects of motor vehicle recreation are expected to be localized and temporary.

Winter motor vehicle recreation is mostly limited to snowmobiles. Emissions from these vehicles include carbon monoxide, oxides of nitrogen, and particulate matter. While snowmobiles can produce what is referred to as nuisance emissions, the potential for conflict is relatively low and of short duration (except within small, localized areas).

Effects from Each Alternative

None of the alternatives are expected to substantially change existing air quality. Temporary reductions in visibility and fine particulate matter increases may occur on the national forests or in population centers downwind from sizeable wildland fires.

Even though the effects of alternatives are expected to be localized, both wildland fires and prescribed fires generate smoke and particulates that can temporarily degrade visibility and ambient air quality conditions in downwind sensitive areas. Alternatives with the most fuels treatment (prescribed fire) acres proposed are alternatives B, E, and F. Alternative D proposes the least. Alternatives that emphasize natural processes would have the greatest potential for wildland fire and the most acres potentially impacted. Alternative C includes the most prescriptions that would emphasize natural processes.

Cumulative Effects

Cumulative effects include the list of past, present, and reasonably foreseeable future activities considered with regard to cumulative effects to air quality. Generally, long-term air quality impacts would likely come from adjacent communities as populations increase. Emissions could come from both mobile and stationary sources. Mobile source contributors include vehicle exhaust, dust from construction activities, and dust from road traffic within and near the Blue

Mountains. Stationary source contributions from outside the national forests include industrial and commercial operations.

Only minor road construction would occur for any alternative. The cumulative effects of road construction, reconstruction, or maintenance on air quality would not vary measurably between alternatives and would contribute only a small amount of the road-related air pollution in the region. Recreational traffic on national forest roads for all alternatives is expected to increase in response to an increasing population. Overall, air quality impacts generated by recreational use of roads would not vary measurable between the alternatives. As growth continues, pollution generated by vehicles would increase. The cumulative road-related effects on air quality would not vary measurably between the alternatives.

Cumulative effects of motor vehicle travel on air quality are unique in that past impacts to air quality are not usually evident. The emissions associated with motor vehicle travel would be cumulative only with local emission sources described in the affected environment. Since motor vehicle emission sources within the national forests would be localized and transient, actual cumulative combinations of emissions would be minor and would not result in significant effects.

Smoke from wildland and prescribed fires can adversely affect air quality. Private lands, state lands, and lands managed by the Bureau of Land Management surround the plan area. Smoke from prescribed burning operations on these lands could individually, or in combination with other fires, affect air quality in the national forests and in surrounding communities. Burning activities are coordinated to help prevent the cumulative effects of these burns from unacceptably impacting air quality. For all alternatives, wildland fire would continue to periodically cause temporary deviations from air quality standards.

For all alternatives, cumulative effects from Forest Service management activities on air quality would be minor, and in general, temporary and localized. All of the three national forests currently meet state and Federal air quality standards and show no degradation to visibility or other air-quality-related values. Compliance with local, state, and Federal air quality regulations would ensure that Forest Service management activities for any of the alternatives would continue to protect air quality. Management activities would not degrade the air quality of surrounding areas. Oregon and Washington have regulatory authority for controlling emissions, including those with potential to adversely impact national forest resources.

The cumulative effects of smoke could be significant when conditions for smoke dispersal are not satisfactory. Smoke and other pollutants that originate from outside the plan area that would contribute to visibility impairment are not likely to be the same for all alternatives and could mask differences between them.

Emissions from all fire types are expected to decrease through time (50 to 100 years) when residual fuel levels and landscape conditions approach historic accumulations. Climate change may make this prediction less certain.

Effects of Climate Change on Air Quality

Climate change will continue to effect air quality, primarily through changes in fire regimes. A warmer climate, reductions in snowpack, changes in the timing of snowmelt, early declines in soil moisture, changes in the timing and length of the growing season, and increased drought have already lead to more frequent fires, more severe fires, earlier initiation of the fire season, and a longer fire season in the western United States relative to historical levels (Westerling et al. 2006). For more detail, see the cumulative effects discussion of the Forested Vegetation, Timber

Resources, and Wildland Fire section. With these changes, the contribution of fire to regional haze and reduced visibility is expected to increase in some areas (McKenzie et al. 2006).

Most sources of greenhouse gas (GHG) emissions are point source; however, large stand replacement fires on National Forest System lands can be a major source of GHG emissions and particulates. Increased wildfire activity can result in increases in particulate emissions, carbon monoxide, carbon dioxide, ammonia, and other pollutants from National Forest System lands. Changes in atmospheric circulation may lead to longer durations and more frequent periods of stagnant air, contributing to localized increases in adverse effects from criteria pollutants, such as ozone, particulate matter, and nitrogen oxides (Jacob and Winner 2009). Mercury occurs in the atmosphere at low concentrations and is deposited in surface waters and on vegetation and soils. The concentration of mercury is increased by biological activity, beginning with the activity of microorganisms in soils (US EPA 2010). Increases in wildfire activity and the increased soil respiration due to higher temperatures can potentially release large amounts of mercury to the atmosphere (Wiedinmyer and Friedli 2007). Emissions from prescribed burning for all alternatives are expected to be minor, and they would reduce overall emissions by reducing large wildfire risk.

The relative effects of climate change would not vary measurably between the alternatives. Alternatives D and E include the most thinning and prescribed fire treatment proposals, which would create the most open canopy stands and would result in the greatest decrease in high severity fire. In the dry forest potential vegetation group, the fire regime condition class would improve the most at year 50 for alternative D. This improvement would reduce the risk of uncharacteristically severe wildfires the most and would also achieve the greatest reduction in risk of impacts on air quality and greenhouse gas emissions.

In the dry forest potential vegetation group, alternatives A and C would have the most departed fire regime condition class at year 50 and would have the most uncharacteristically severe fires as a result. Being the most departed would result in the greatest impact on air quality and GHG emissions. For alternative C, wildland fire would be used the most to achieve desired conditions, and thinning and prescribed fire treatments would be used the least to reduce the risk of uncharacteristically severe wildfire.

See the Forested Vegetation, Timber Resources, and Wildland Fire section for more information on climate change effects related to wildfire risk.

Watershed Function, Water Quality, and Water Uses

Introduction

The watersheds, rivers, and streams of the Blue Mountains national forests in northeastern Oregon and southeastern Washington provide many ecological, economic, and social benefits. More than 30,000 miles of rivers and streams and 1,700 lakes and ponds support diverse communities of aquatic and terrestrial species, including salmon and steelhead. Tens of thousands of people rely on water from the national forests for drinking water, recreation, agriculture, industry, hydropower generation, and other uses.

This section describes the affected environment, existing conditions, and environmental consequences of the alternatives on watersheds, water quality, and water uses. Some of the effects on or arising from other resources, including soils, forested vegetation, wildfire, and livestock grazing, are mentioned in this section but are discussed in more detail in other sections. This

section uses the terms subbasin, watershed, subwatershed, key watershed, and priority watershed. In some cases, the word watershed is used generically to denote the drainage area that contributes runoff to a common stream. Subwatersheds, watersheds, and subbasins are also known in the hydrological terminology currently used in the United States as successively larger hydrologic units. Hydrologic units may also be denoted numerically. For example, the Lower John Day subbasin is a 4th-level subdivision of the Columbia River region and is denoted by an 8-digit hydrologic unit code, or HUC4, of 17070201 consisting of four 2-digit pairs of numbers. This hierarchy is illustrated in figure 15. Subwatersheds typically comprise areas of approximately 10,000 to 40,000 acres, watersheds have areas of about 40,000 to 250,000 acres, and subbasins have areas of greater than 450,000 acres. Key and priority watersheds, whenever the terms are used in this section, refer to subwatersheds as displayed in appendix B.

Setting

The climate of the Blue Mountains is largely continental with cold winters and hot, dry summers. Annual precipitation for the period from 1971 to 2000 ranged from less than 10 inches in low elevation valleys to more than 100 inches at the uppermost elevations in the Wallowa Mountains. The majority of precipitation falls as snow between October and April. Summers are usually dry and summer precipitation is associated with thunderstorm activity. The combined runoff of all rivers originating in the Blue Mountains totals about 7.4 million acre-feet per year, of which 5.2 million acre-feet (70 percent) originates in National Forest System lands (Gecy 2013e). Fifty to 80 percent of runoff is derived from snowmelt and occurs in spring and summer. Spring runoff begins as early as late February at lower elevations and continues into August in high elevation watersheds. Parts of the Blue Mountains that lie directly east of the Columbia River Gorge receive higher precipitation amounts from winter storms that are able to pass through the natural gap in the Cascade Range (Ferguson 1999).

Annual precipitation averages about 22 inches per year for the Malheur National Forest and about 33 inches per year for both the Umatilla and Wallowa-Whitman National Forests. Total precipitation in National Forest System lands amounts to about 13.5 million acre-feet per year, of which about 5.2 million acre-feet, or 38 percent, becomes streamflow. The ratio of runoff to precipitation varies from about seven percent in the Lower John Day subbasin to more than 64 percent in the Walla Walla subbasin, but may be higher or lower than this range in smaller watersheds.

Watersheds in National Forest System lands in the Blue Mountains are distributed among 8 hydrologic basins and 25 hydrologic subbasins, and the amount of National Forest System lands varies by subbasin (see table 131). All rivers and streams in the Blue Mountains are tributaries of the Snake River, the Columbia River, or the closed basins of east-central Oregon. Major tributary rivers originating in National Forest System lands in the Blue Mountains include the John Day, Umatilla, Malheur, Burnt, Powder, Imnaha, and Grande Ronde rivers in Oregon and the Tucannon and Walla Walla rivers and Asotin Creek in Washington. Silver Creek, Silvies River, and several smaller streams flow into the closed Harney-Malheur Lakes basin that is at the northwestern-most extent of the Great Basin. The headwaters of all of these streams are located in National Forest System lands.

National Forest System lands in the Blue Mountains comprise about 25 to 30 percent of the combined area of all subbasins and from 1 to 73 percent of the area of individual subbasins (see table 131). Remaining lands include private lands, lands managed by state and Federal agencies, and American Indian reservations.

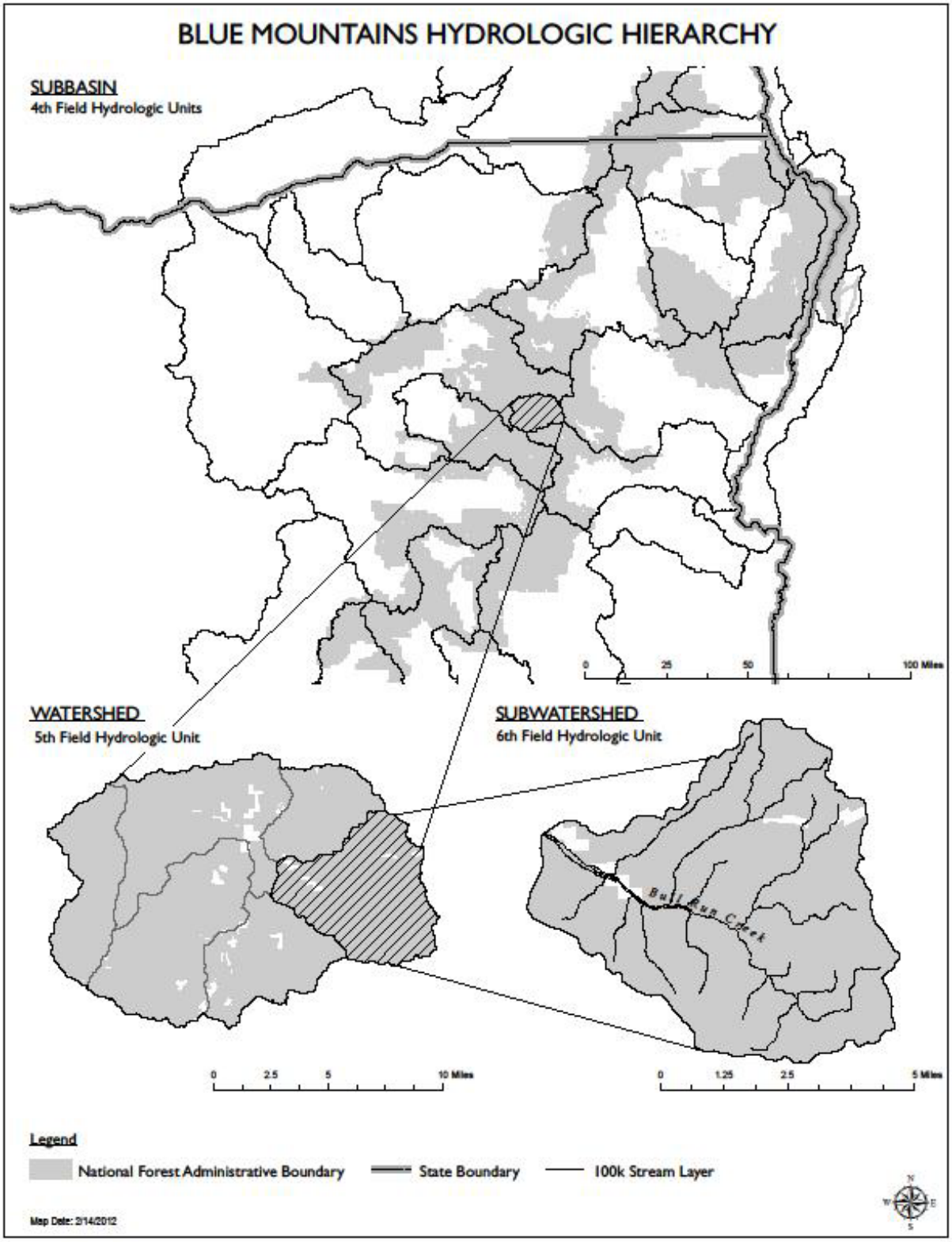

Figure 15. Hydrologic unit hierarchy: outlined areas are individual subbasins, cross-hatched polygon (top) is a watershed (Granite Creek) within the North Fork John Day subbasin: cross-hatched polygon (bottom) is a subwatershed (Bull Run Creek) within the Granite Creek Watershed

Table 131. Acres of National Forest System (NFS) lands by subbasin within the Blue Mountains

HUC4	HUC Name	MAL	UMA	WAW	NFS Acres	Total Acres
17050116	Upper Malheur	370,342		95	370,437	1,553,967
17050119	Willow (Snake)			2,890	2,890	485,731
17050201	Brownlee Reservoir			137,468	137,468	834,147
17050202	Burnt River	61	38	199,494	199,592	703,512
17050203	Powder River			355,148	355,148	1,093,330
17060101	Hells Canyon			252,167	252,167	346,521
17060102	Imnaha River			384,396	384,396	544,438
17060103	Lower Snake-Asotin		63,122	47,220	110,343	450,287
17060104	Upper Grande Ronde River		85,908	391,100	477,008	1,047,265
17060105	Wallowa River			282,572	282,572	610,666
17060106	Lower Grande Ronde		252,894	234,208	487,102	971,746
17060107	Lower Snake-Tucannon		77,265		77,265	933,447
17060209	Lower Salmon*			119	119	30,779
17060210	Little Salmon River*			13,936	13,936	80,437
17070102	Walla Walla		100,919		100,919	1,126,790
17070103	Umatilla		178,955	5,341	184,296	1,611,345
17070104	Willow (Columbia)		12,063		12,063	555,626
17070201	Upper John Day	427,376		2	427,378	1,368,978
17070202	North Fork John Day	36,927	564,996	89,780	691,703	1,182,939
17070203	Middle Fork John Day	270,494	20,820	31	291,345	506,976
17070204	Lower John Day		46,942		46,942	2,019,400
17070303	South Fork Crooked	14,177			14,177	980,018
17120001	Harney-Malheur Lakes	46,791			46,791	948,213
17120002	Silvies	388,742			388,742	813,847
17120004	Silver	154,111			154,111	1,085,632
	Totals	**1,709,020**	**1,403,922**	**2,395,969**	**5,508,911**	**21,886,039**

General Land Use History

During the last 150 years, watershed conditions in the Blue Mountains have been altered by a series of human uses, including mining, logging, agriculture, water diversions, flood control, wildfire exclusion, grazing, road construction and maintenance, and hydro-electric development. The combined impacts of past land uses include, but are not limited to changes in vegetative conditions, simplification and loss of aquatic habitats, increases in sediment delivery to streams, and degradation of riparian and floodplain functions (McIntosh et al. 1994a, Wissmar 2004). The resulting degradation and fragmentation of aquatic and riparian habitats and impacts to water quality contributed to declines or outright extinction of many resident and anadromous fish stocks, the listing of several fish stocks under the Endangered Species Act, and the listing of many streams as water quality impaired beginning in the early 1990s.

Recent Past

PACFISH (USDA and USDI 1995) and INFISH (USDA Forest Service 1995) were implemented in response to the potential listing under the Endangered Species Act of several anadromous and resident fish species in the Snake River and interior portions of the Columbia River basin and included measures that were intended to halt further degradation of the habitats of these species on federal lands. Both strategies include:

- Designation of riparian habitat conservation areas (RHCAs) to be managed for the benefit of aquatic- and riparian-dependent species
- Identification of and increased protection of watersheds supporting listed species in good condition or that could be restored
- Requirements for land management activities, and
- Monitoring

Key elements of PACFISH and INFISH were incorporated into existing forest plans by amendment in 1995. Subsequent Biological Opinions by the National Marine Fisheries Service (NMFS 1995, 1998) and USFWS (1998) specified additional requirements for the protection and restoration of aquatic and riparian habitats in National Forest System and BLM lands, including the development and implementation of an area-wide monitoring strategy (PIBO, Kershner et al. 2004) to track the effects of implementing the two strategies, the development of a regionwide watershed and aquatic restoration strategy (USDA Forest Service 2005), and an analysis of the effects of forest roads (Road Density Analysis Team 2002).

PACFISH and INFISH both specified watershed analysis as a necessary tool for identifying desired conditions and restoration opportunities but did not include formal guidance for watershed and aquatic restoration.

PACFISH and INFISH were intended as interim strategies that were expected to be replaced upon finalization of the Interior Columbia Basin Ecosystem Management Project (ICBEMP) (Quigley et al. 1997). ICBEMP was expected to provide the long-term strategy used on federal lands in the interior Columbia River basin.

Subsequently, the Forest Service developed the Aquatic and Riparian Conservation Strategy (ARCS) (USDA Forest Service 2008) as guidance intended to provide a regionally consistent approach to the management of watersheds and riparian and aquatic habitats. The rationale for the ARCS was based on lessons learned from 15 years of successful implementation of PACFISH, INFISH, and the Northwest Forest Plan (FEMAT 1993). PACFISH and INFISH, and the development of the ARCS are discussed in more detail in the Aquatics Species, Diversity and Viability section.

The Pacific Northwest Region of the Forest Service developed guidance for aquatic habitat restoration on national forest system lands in 2005. The regional Aquatic Restoration Strategy (ARS) prioritized river basins and watersheds for the purposes of investing in the most critical areas and completing whole watershed restoration (USDA Forest Service 2005).

Community-based Watershed Restoration

In the early 1990s, the Northwest Power Planning Council selected several watersheds in the Blue Mountains watersheds with high fisheries values, including the Asotin, Pataha, Tucannon, and Grande Ronde model watershed programs to support and promote cooperative restoration.

Three American Indian treaty tribes, the Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, and Confederated Tribes of the Warm Springs Indian Reservation, have been major sponsors of watershed restoration on ceded lands in the Blue Mountains for decades. The Oregon Watershed Enhancement Board, a state agency, provides grants to help Oregonians care for local streams, rivers, wetlands and natural areas. In 1999, the Washington state legislature created the Salmon Funding Recovery Board to provide funding for elements to support overall salmon recovery and other activities that benefit salmon. The Forest Service has joined in community-based partnerships through these and other programs and has cooperators in every basin in the Blue Mountains.

Of the 25 subbasins displayed in table 131, national forests in the Blue Mountains manage roughly 25 percent of the land base, not including lands managed by the Ochoco National Forest in the Lower John Day and South Fork Crooked sub-basins. Remaining lands include lands owned or managed by the Bureau of Land Management, Tribes, state lands, and private lands.

Affected Environment – Watershed Function, Water Quality, and Water Uses

The following discussion describes the affected environment for watershed function, water quality, and water uses. Watershed condition is described in terms of its component parts, described here as hydrologic function, stream channel function, riparian and wetland function, and water quality. Soils are partially addressed here as part of hydrologic function, but are addressed in more detail elsewhere in this document. Aquatic habitat is considered a component of watershed condition and is addressed separately in this document.

Key indicators for watershed function used in this analysis are:

- Upslope conditions within watersheds based on changes in forested vegetation condition, hydrological connectivity of the road system, and grazing use intensity
- Grazing influence on riparian habitats
- The extent of riparian habitat conservation areas or riparian management areas
- Riparian, stream channel, and aquatic habitat restoration (miles and acres)
- Detrimental soil conditions resulting from timber harvest
- Changes in overall watershed conditions

Indicators for water quality include all of the previous items in addition to objectives for:

- Water quality restoration plans implemented

Watershed Function

Naiman et al. (1992) described the fundamental components of ecologically healthy watersheds as basin geomorphology, hydrologic pattern, water quality, riparian forest characteristics, and habitat characteristics and proposed that ecologically healthy watersheds require preservation of the interactions between these components as well as the spatial and temporal variability of system components. Following Naiman et al. (1992), watershed function, as used in this analysis, includes: watershed condition, hydrologic function, riparian and wetland function, water quality, and stream channel and aquatic habitat function. A more detailed description of these functions and their relation to watershed condition can be found in Gecy (2013b) in the project record.

Some aspects of watershed-related functions or conditions are also discussed in the following sections of this document:

- Livestock Grazing and Grazing Land Vegetation;
- Aquatic Species Diversity and Viability; and
- Plant Species Diversity and Threatened, Endangered, and Sensitive Plants

The components of watershed function, as described in this section, all have influence on the diversity and viability of aquatic species as described in the Aquatic Species Diversity and Viability section. Watershed function also relates to water quality and water uses as discussed in this section.

Watershed conditions in the Blue Mountains were assessed through the use of a sustainability model based on the Ecosystem Management Decision Support System (EMDS; Reynolds 1996, 1999). The methods used are described in detail in (Gecy 2013a). The basic approach uses detailed analysis of watershed, riparian, stream channel, and aquatic habitat attributes. Assessment of the state of these attributes is used to define the condition of the approximately 550 subwatersheds containing National forest System lands in the Blue Mountains. The specific methods and assumptions used in the analysis are described in more detail in appendix B of this document and in Gecy (2013a) and Reiss et al. (2008).

Riparian and stream channel conditions were evaluated using riparian vegetation type, departure from historic range of variability, relative grazing use intensity, and riparian hardwood/shrub abundance. Channel and habitat attributes included average residual pool depth, pool frequency, and percent side channel, the percentage of unstable banks, the frequency of pools deeper than three feet, and large wood frequency.

The distribution of existing riparian conditions from the analysis shows 25 percent of habitats in good condition, 25 percent in poor condition; and all other habitats in an intermediate and moderately departed condition, relative to reference condition.

Impacts to riparian and aquatic habitats in the Blue Mountains increased rapidly following European settlement of the region (after 1850). Mining, agriculture, splash dams, logging, and livestock grazing each have had substantial impacts on streams in the Blue Mountains (McIntosh et al. 1994a, 1994b, Wissmar et al. 1994a, 1994b, Wissmar 2004). Of these activities, reaches where splash dams and log drives are known to have occurred stand out as having wider, shallower channels (and greater width-to-depth ratio), coarse substrate and lack of spawning gravel, lack of large woody debris, reduced channel complexity, and lower quality habitat. The width-to-depth ratio of streams in National Forest System lands is highly variable, and the measurement is subject to a high degree of observer error (Roper et al. 2008). This partially limits the usefulness of existing data. Still, available data suggests that width-to-depth ratio tends to increase with channel size and varies by channel type. The occurrence of unstable banks may be associated with greater channel width, but the effect of bank stability on width-to-depth ratio diminishes with channel size. The high variability of width-to-depth ratio indicates that many streams are in different stages of adjustment to land use impacts occurring at different times. For example, splash-dammed reaches can be distinguished from reaches where almost any other land use impact has occurred. This shows the importance of understanding land use history and the persistence of past impacts when assessing current channel conditions and identifying restoration needs.

Work by McIntosh (1992) and McIntosh et al. (1995) documents the decline in the quality and frequency of pool habitat and reduced frequency of large wood in streams in the Columbia Basin between the 1930s and 1980s. McIntosh (1994a, 1994b) showed that pool and large wood frequency declined in managed rivers in the Blue Mountains but increased in unmanaged (wilderness) watersheds during the same time period. Evaluation of aquatic habitat conditions has the highest level of uncertainty in the model because of the variability observed in the data and the influence this has on choosing reference conditions. Considering habitat features alone, model results indicate more subwatersheds with good habitat conditions (69) than poor condition subwatersheds (16), and most watersheds (477) display a midrange of habitat condition, although one or more individual features may exert more influence on existing condition.

Model results for overall existing watershed conditions place 105 of 552 subwatersheds in good condition (19 percent), 363 in fair condition (66 percent), and 84 in poor condition (15 percent).

Hydrologic Function

Hydrologic function involves all of the processes involved in the conversion of precipitation to streamflow within watersheds. This includes the routing of water, sediment, and nutrients from hillslopes through the channel network and the interaction of physical, chemical, and biological processes (Naiman et al. 1992). Key influences on the hydrologic functioning of forest and rangeland watersheds include the condition and type of vegetation, ground cover, soil properties and conditions, and the nature and condition of riparian vegetation, all of which the affect rates of material inputs to streams, and the rate of watershed runoff.

Of more than 30,000 miles of rivers and streams in the Blue Mountains national forests, about 9,000 miles (30 percent) are perennial (flow year round) (see table 132). These streams provide habitat for diverse communities of vegetation, wildlife, anadromous and resident fish, and provide water for downstream uses that include crop irrigation, domestic livestock, municipal and domestic water supplies, hydropower generation, commercial, industrial, and other uses. Other important water resources in National Forest System lands include lakes and ponds, reservoirs, and springs and seeps, which provide important habitats for a variety of plant and animal species and are the source areas of many streams that support downstream uses (see table 133 through table 135).

Table 132. Summary of stream miles in National Forest System lands (from national hydrographic dataset (NHD) flowline)

National Forest	Intermittent Streams	Perennial Streams	Totals
MAL	2,983	2,593	5,576
UMA	4,999	2,259	7,258
WAW	13,151	4,394	17,544
Totals	**21,113 (70%)**	**9,245 (30%)**	**30,378 (100%)**

Table 133. Other water resources within the Malheur National Forest (from NHD)

Water Resource Type	Quantity	Acres
Lakes and ponds	498	308
Reservoirs	3	3
Swamp/marsh	16	42
Springs and seeps	2,851	NA

Table 134. Other water resources within the Umatilla National Forest (from NHD)

Water Resource Type	Quantity	Acres
Lakes and ponds	515	390
Reservoirs	31	6
Swamp/marsh	31	181
Springs and seeps	641	NA

Table 135. Other water resources within the Wallowa-Whitman National Forest (from NHD)

Water Resource Type	Quantity	Acres
Lakes and ponds	638	3,847
Reservoirs	77	26
Swamp/marsh	410	1,211
Springs and seeps	1,193	NA

Riparian and Wetland Function

Riparian and wetland areas provide critical habitat for many terrestrial and aquatic species and important links between upland and stream habitats. Riparian areas occur within a zone where interactions occur between surface and groundwater, between the river and its floodplain, or between headwater streams and adjacent hillslopes (Stanford 1998).

Riparian habitats and riverine wetlands are composed of more than 180 distinct plant associations (Crowe and Clausnitzer 1997, Wells 2006) and occupy about 21,000 acres (1 percent) of National Forest System lands in the Blue Mountains, according to National Wetland Inventories for Oregon and Washington (USFWS 2010). Off-channel wetlands, many fed by isolated springs or groundwater, occur in a variety of settings and occupy an additional 31,400 acres of National Forest System lands (USFWS 2010). The acres of riparian and wetland habitats displayed on maps produced by the National Wetland Inventory are displayed in table 136. The area of riparian vegetation within the Blue Mountains is thought to be about 2 to 3 percent of total land area, or 110,000 to 165,000 acres (Hann et al. 1997), so it is likely that the NWI maps under-represent the area of riparian habitats by as much as 140,000 acres for the three national forests.

Table 136. Riparian and wetland acres for each national forest

Wetland Type	MAL	UMA	WAW	Totals
Riverine (riparian) wetlands	4,850	5,290	10,880	**21,015**
Lacustrine and palustrine wetlands	11,400 (4,439 sites)	6,890 (3,190 sites)	13,140 (5,500 sites)	**31,430 (13,129 sites)**
Total wetland areas[1]	16,360	12,260	24,280	**52,890**

1 Total area includes small areas of unclassified wetland types. Source is National Wetlands Inventory. Areas subject to verification.

Land Uses Affecting Watershed Function

Major land uses influencing watershed functions include roads, forested vegetation and timber harvest, wildland fire, grazing, and watershed restoration and are discussed in the following sections.

Roads

The hydrological effects of National Forest System roads include alteration of the rates of surface and increased rates of erosion and sediment delivery to streams and result in degraded water quality and aquatic habitat (Furniss 1991). Roads increase the rate of watershed runoff and contribute to reduced low flows, increased peak flows, or both, but these effects have not been shown to extend beyond single watersheds. The effects increase with increases in the hydrologic connection of roads to the stream channel network (Jones and Grant 1996, Wemple et al. 1996). Roads that are closer to stream channels have a greater potential for sediment delivery to streams (Haupt and Kidd 1965, Wemple et al. 1996), but Montgomery (1994) suggests that ridgetop roads may also contribute to increased runoff. Croke et al. (2005) found that the greatest contribution to runoff occurred at stream crossings where road runoff discharges directly into streams. McIntosh et al. (1995) observed that nearly 90 percent of streams in managed watersheds in the Columbia Basin had roads either along the channel or within the floodplain.

Effects of roads on watershed function vary greatly due to the influence of such factors as topography, geology, slope stability, road design, and the amount of traffic on a particular road (Bilby et al. 1989, Duncan and Ward 1985, Luce et al. 2001, Wemple et al. 2001, Swanson and Dyrness 1975, Sugden and Woods 2007). Rates of road surface erosion and sediment delivery to streams vary with disturbances (floods and fire), and range from episodic pulses to chronic contributions of sediment (Switalski et al. 2004).

Roads on National Forest System lands are known to intercept subsurface runoff from hillslopes and route it through the road drainage system into the stream channel network (Megahan 1972, Megahan and Clayton 1983). Wemple et al. (1996) cited two hydrologic flow paths that resulted in the integration of road systems and channel networks: roadside ditches that drain to streams and roadside ditches that drain to culverts with gullies below their outlets. These roads are considered "hydrologically connected."[4]

The production of road-related sediment varies with geology (Duncan and Ward 1985, Sugden and Woods 2007). In steep terrain, roads increase the rates of hill slope failures and soil mass wasting (Swanston and Swanson 1976, Swanston 1991). McCashion and Rice (1983) noted that 51 percent of observed erosion occurred on roads constructed on slopes steeper than 60 percent. Fine sediments can be delivered to natural streams by erosion of road surfaces and from unvegetated road cut and fill surfaces (Reid and Dunne 1984). The amount of road surface erosion has been found to increase with the amount of road traffic (Reid and Dunne 1984, Bilby et al. 1989) and to vary with topography and sensitivity to land sliding and mass wasting (Furniss et al. 1991). Road-stream crossings are common sources of sediment, for example, when culverts become blocked by debris, and runoff is routed along the road surface (Furniss et al. 1998).

Road density has been used as a measure of past land use intensity, particularly in areas of active timber harvest (Lee et al. 1997, Sharma and Hilborn 2001). However, Lee et al. (1997) acknowledged the difficulty in discriminating the varying effects of roads over large landscapes and suggested that local conditions can have a large influence on runoff and sediment delivery from a given road segment. McCaffery et al. (2007) found significant relationships between fine sediment in streams and road density, open road density, and number of stream crossings. Jorgensen et al. (2009) used road density as one of several factors to predict stream temperatures and substrate characteristics in evaluation of habitat quality for Chinook salmon in the Wenatchee River in Washington. Cederholm et al. (1981) noted an association of fine sediment accumulation

[4] Hydrologically connected roads are defined as roads or portions of roads that route water and/or sediment directly to stream channels.

in headwaters streams in heavily roaded areas of the Clearwater River basin in Washington and noted an increase in sediment production by 2.6 to 4.3 times when road density exceeded 2.5 kilometers per square kilometer (4 mi/mi^2). An analysis of National Forest System roads within the Umatilla National Forest in the Wall Creek watershed indicates that 90 percent of road-related sediment is produced by 12 percent of the road network. This information is being used to target erosion reduction treatments to the most critical sites (Nelson et al. 2010).

Effects of roads to watershed function can be reduced by considering location, design, and management to disperse road runoff (Furniss et al. 1991). Examples include road surfacing (Burroughs and King 1989, Bilby et al. 1989), seasonal road closures to protect both unsurfaced and surfaced (i.e., crushed aggregate or gravel) roads from use during adverse weather, and designating undisturbed riparian zones along streams to allow filtering of fine sediments (Newbold et al. 1980). Madej (2001) found that road decommissioning greatly reduced road-related sediment delivery to streams but did not completely eliminate erosion associated with forest roads. Haupt and Kidd (1965) suggested that 30-foot wide riparian buffers were sufficient to prevent road-related sediment delivery to streams. In contrast, Ketcheson and Megahan (1996) suggested that 100-meter (330 feet) buffers may be insufficient to prevent sediment delivery to streams, depending on geology and the steepness of adjacent slopes.

Lastly, not all effects of roads are preventable. McCashion and Rice (1983), in a study of forest road effects in northern California, concluded that as little as 24 percent of road-related erosion was avoidable. In contrast, Megahan et al. (1992) concluded that, while some increases in sedimentation due to forest roads is unavoidable, road-related sediment delivery to streams in the Salmon River basin of Idaho could have been reduced by 45 percent to 95 percent using available management practices.

Miles of existing roads, open (ML2 through 5) roads, and riparian roads are displayed in table 137. Riparian roads, as used in this analysis, are approximated by the miles of roads within 300 feet of any stream channel. The resulting road densities are displayed in table 138.

Table 137. Miles of existing roads and open roads for each national forest

Road Type	MAL	UMA	WAW	Totals
Existing roads	9,508	4,486	9,020	23,014
Open roads	6,843 (72.0%)	2,477 (55.2%)	4,730 (52.4%)	14,050 (61.0%)
Riparian roads	1,552 (16.3%)	556 (12.4%)	1,200 (13.3%)	3,308 (14.4%)

Table 138. Road density (miles) for each national forest

Road Type	MAL	UMA	WAW	Totals
Road density, including wilderness areas and existing roadless areas				
Existing road density (all NFS lands)	3.56	2.04	2.40	2.67
Open road density (all NFS lands)	2.56	1.13	1.26	1.63
Road density, outside of wilderness areas and existing roadless areas				
Existing road density	4.23	3.48	3.71	3.86
Open road density	3.05	1.92	1.94	2.35

Malheur National Forest – There are 177 subwatersheds within or partially within the Malheur National Forest. The road miles and densities displayed in table 137 and table 138 occur in 165 of those subwatersheds. Open road density greater than one mile per square mile occurs in 139 subwatersheds, while 105 have open road density greater than two miles per square mile, and 11 have open road density greater than four miles per square mile. Out of 33 key watersheds displayed in the appendix, table B-4, 21 have open road density greater than two miles per square mile and four have open road density greater than four miles per square mile. Nineteen of 26 priority watersheds have open road density greater than two miles per square mile and three have road density greater than four miles per square mile. Since 1990, 1,740 miles of roads have been closed within the Malheur National Forest.

Umatilla National Forest – There are 162 subwatersheds within or partially within the Umatilla National Forest. The road miles and densities displayed in table 137 and table 138 occur in 143 of those subwatersheds. Open road density greater than one mile per square mile occurs in 74 subwatersheds, while 19 have open road density greater than two miles per square mile, and three have open road density greater than four miles per square mile. Out of 38 key watersheds displayed in the appendix, table B-54, two have open road density greater than two miles per square mile and none have open road density greater than four miles per square mile. No priority watershed has an open road density greater than two miles per square mile. Since 1990, 1,090 miles of roads have been closed within the Umatilla National Forest.

Wallowa-Whitman National Forest – There are 272 subwatersheds within or partially within the Wallowa-Whitman National Forest. The road miles and densities displayed in table 137 and table 138 occur in 219 of those subwatersheds. Open road density greater than one mile per square mile occurs in 143 subwatersheds, while 84 have open road density greater than two miles per square mile, and 11 have open road density greater than four miles per square mile. Out of 80 key watersheds displayed in the appendix, table B-6, 26 have open road density greater than two miles per square mile and four have open road density greater than four miles per square mile. Eleven of 26 priority watersheds have open road density greater than two miles per square mile and none have open road density greater than four miles per square mile. Since 1990, 1,415 miles of roads have been closed within the Wallowa-Whitman National Forest.

Forested Vegetation and Timber Harvest

Forested watersheds in the western United States are generally areas of higher elevation and consequently have more precipitation and greater streamflow than surrounding areas. The effects of timber harvest on forested watersheds has been described in terms of evapotranspiration and site water balance, snow accumulation and melt rates, and influences on soil structure, infiltration, and water transmission rates (Chamberlin et al. 1991).

Stand density and leaf area index are both related to site water balance (Grier and Running 1977). Forested vegetation intercepts a percentage of precipitation that is evaporated back to the atmosphere (Patric 1966, Stewart 1977), and water that infiltrates forest soils is transpired through vegetation (Ziemer 1979). The combined effect of evaporation and transpiration (evapotranspiration) may comprise 20 to 80 percent of precipitation in western U.S. watersheds and appears to be regulated by the difference between precipitation and potential evapotranspiration (Riggs and Wolman 1990).

Removal of forested vegetation by timber harvest (Goodell 1967, Bosch and Hewlett 1982, Jones 2000, Lewis 2001) and high-severity fires (Helvey 1980, Megahan 1983) has been shown to increase watershed runoff, at least temporarily, until forest cover is restored (Farley et al. 2005).

Removal of vegetation in forested watersheds alters the watershed response to precipitation by reducing interception, evaporation, and transpiration and increasing soil water storage and runoff (Lewis et al. 2001, MacDonald and Stednick 2003). Water yield increases of 40 mm (1.6 inches) for each 10 percent change in forested cover have been documented in coniferous forests in the U.S. and elsewhere (Hibbert 1967, Bosch and Hewlett 1982), but this effect can be highly variable and may be decreased where young, fast-growing vegetation establishes quickly after logging (Hibbert 1967). Keppeler and Ziemer (1990) reported statistically significant increases in low flows and annual runoff following selective harvest in northern California but also reported that low flow increases diminished within five years. Ziemer (1964) reported that water savings from reduced evapotranspiration following clear-cutting diminished to zero after 16 years. The results of timber harvest effects on watershed runoff have been highly variable and have not been extended past small watersheds (Ziemer 1987).

The effect of forest management on watershed runoff in rain and snow-dominated watersheds has been an active area of research for decades (Troendle 1983, Slaughter et al. 2001). Snow accumulation is strongly associated with both meteorological variables and forest characteristics (Anderson 1967). At higher elevations, creation of canopy openings by timber harvest may result in changes in the water content in winter snowpack and in the timing of snowmelt (Troendle and King 1985). Timber harvest has been observed to increase snow accumulation in forest openings and to result in earlier snowmelt timing (Moore and Wondzell 2005), and there is some evidence to suggest that forest management may increase the volume of snowmelt runoff (Pike and Sherer 2003). Kattleman et al. (1983) suggested that limited potential existed to modify water yields in Sierra Nevada watersheds through forest management because of the rate of harvest required to increase water yield and the recovery time of vegetation between harvests would make it difficult to sustain any flow increase. A 30-year long study of watershed response to timber harvest in the northern Blue Mountains at the High Ridge evaluation area within the Umatilla National Forest showed water yield increases were small, lasting only a few years even with clear-cutting. As the study progressed in the 1980s, harvest effects to water quality from increased erosion and shade loss became more of a concern than the potential for increasing water yield. Practices used in the study, including clear-cutting and skidding across streams, were later restricted or prohibited (Helvey et al. 1995).

Processes that contribute to streamflow from adjacent hillslopes include overland flow, subsurface storm flow, and groundwater flow (Freeze 1974). In forested watersheds, the litter layer provides ground cover that contributes to high soil infiltration rates (Arend 1942) and low surface erosion (Plamandon et al. 1972). High infiltration rates in forested watersheds tend to limit the occurrence of overland flow (Harr 1977), except in cases where precipitation intensity exceeds infiltration capacity (Montgomery and Dietrich 1995), soils become saturated (Betson 1964, Dunne and Black 1970), or disturbance results in the loss of ground cover (Brandt 1987) or compaction of forest soils (Hills 1971).

The percent composition of the three dominant upland forest potential vegetation groups for each national forest, the average departure from the historical range of variability (HRV) as described in the forested vegetation section of this document, and the acres of the different potential vegetation groups are displayed in table 139. The departure is expressed as the percentage difference between existing stand density, structure, and species composition compared to reference conditions (NIFTT 2010), which in this analysis is the HRV. The methods used in the departure analysis are available from the project record. Dry upland forests have been the focus of timber harvest within the Blue Mountains national forests and are typically the most departed

from historic conditions. The predominant direction of departure is towards dense stands of younger-aged trees and a decline in the number and distribution of older trees.

Table 139. Upland forest potential vegetation groups percent of total acres and percent departure from HRV, and approximate acres for each national forest

Potential Vegetation Group	Percent Departure and Acres	MAL	UMA	WAW
Dry Forest	Percent of national forest [percent departure]	72% [62%]	43% [60%]	34% [56%]
	Approximate acres	1,220,000	600,000	612,000
Moist Forest	Percent of national forest [percent departure]	6% [36%	31% [23%]	8% [23%]
	Approximate acres of national forest	102,000	434,000	144,000
Cold Forest	Percent of national forest [percent departure]	9% [54%]	8% [13%]	18% [37%]
	Approximate acres of national forest	153,000	112,000	324,000

In the 1990 forest plans, 780,000 acres of the Malheur National Forest, 380,000 acres of the Umatilla National Forest, and 590,000 acres of the Wallowa-Whitman National Forest are considered suitable for timber production. The 1990 forest plans originally projected a combined annual timber harvest of 450 million board feet, but actual harvest levels declined sharply to an average of less than 100 million board feet per year in 2004. An average of 260,000 acres per year were expected to be harvested within all three national forests in 1990, compared to the actual average harvest of 76,000 acres from 1998 to 2002. One factor in the decline of timber harvest volume and acres harvested has been the limitations placed on timber harvest within riparian habitat conservation areas (RHCAs) following the implementation of PACFISH and INFISH in 1995. Within streamside zones, the departure of dry upland forests from the historical range of variability remains highly departed.

Beginning in 1995, management actions within RHCAs were intended to be limited to those that specifically benefitted aquatic and riparian-dependent habitats and the species that occupy them. RHCAs are estimated to include 168,550 acres of the Malheur National Forest, 237,500 acres of the Umatilla National Forest, and 360,100 acres of the Wallowa-Whitman National Forest.

Wildland Fire

Wildland fire includes planned and unplanned ignitions.Unplanned ignitions may be either human caused or of natural origin. Planned ignitions (prescribed fires) are fires ignited by management and used under an existing management plan to achieve resource management objectives, including reducing the risk of high severity fire effects. Unplanned ignitions of natural origin may also be managed to achieve resource objectives under various strategies based on values at risk and resource management objectives. Wildland fire activities and the associated effects on forested vegetation are described in greater detail in the Forested Vegetation, Timber Resources, and Wildland Fire section. This section addresses the effects of wildland fire activities on watershed function, water quality, and water uses.

The forests in the Blue Mountains have historically developed under the influence of a variety of disturbances, including wildland fire, that have shaped species composition and stand structure (Johnson 1994, Agee 1998). The combined effects of forest management and fire exclusion since the early 1900s contributed to changes in forest structure and species composition, and the altered

fire frequency and severity contributed to changes in forest patch size (Hessburg et al. 2005, Johnson 1994). Fire consumes vegetation, partially or completely removes ground cover, and may form water repellant (hydrophobic) soil layers depending on soil temperatures during the burn and the characteristics of the local vegetation and soils (Debano and Krammes 1966). Fire effects on watershed function depend on physical and biologic attributes of individual watersheds, on the severity of the fire, and on weather conditions following the fire. Low severity fires, by definition, consume little of the organic material that covers and protects the soil from surface erosion. High severity fires consume much of the above ground vegetation, soil organic material, and litter. Changes in ground cover can greatly increase the erosion risk of forest soils following a fire.

Increases in post-fire erosion in mountainous areas of the western U.S. highlight the impacts of wildland fire on watershed function (Roering and Gerber 2005). Erosion rates after large or high severity wildland fires may be elevated by more than a factor of 200 immediately after the fire (Morris and Moses 1987) but decline to background levels in as little as three years (Moody and Martin 2001). Debris flows and shallow landslides may occur following fires (Wondzell and King 2003) or following any other mechanism that removes surface vegetation or affects root strength on susceptible sites (Reneau and Dietrich 1987).

Historically, fire intensity was generally lower in riparian areas due to increased water availability and higher fuel moisture, but accumulations of fuels in riparian zones and the potential for increased fire severity in riparian areas in recent years has elevated concerns about riparian area fuels management (Dwire and Kauffman 2003, Halofsky and Hibbs 2008, Dwire et al. 2010). Additionally, increased conifer crown loadings and ladder fuels have resulted in increased fire severity in riparian areas, in comparison to historic conditions.

Prescribed fires used to reduce forest fuels typically create low severity burn conditions, but concentrations of fuels may burn at higher severities and develop areas of hydrophobic soil (Robichaud 2000). In a recent Blue Mountains study of prescribed fire effects on erosion and sediment delivery to riparian areas, treatments were found to have low on-site erosion and no sediment delivery to prescribed riparian protection zones (Harris et al. 2005).

High severity fire may result in increased streamflow due to loss of vegetation and decreases in evapotranspiration (Helvey 1980). Timber harvest following fire may have an additive effect on watershed runoff not observed in areas subject only to wildfire (Megahan 1983). Wildland fires are a source of large wood recruitment to streams (Bêche et al. 2005, Robinson et al. 2005), and woody debris may be mobilized and redistributed along streams following fires (Young 1994).

Planned fire ignition (prescribed fire) is a tool used to modify existing vegetation or reduce excess fuel loadings that would otherwise contribute to uncharacteristic fire conditions (Mitchell et al. 2009). In most of the forested areas of the western U.S., including the Blue Mountains, the role of fire in forest ecosystems has been altered by fire suppression and other management activities since 1900 (Hessburg and Agee 2003, Heyerdahl et al. 2001). Fire exclusion may have provided near-term protection from the effects of uncharacteristic wildfires to local watersheds but has also led to accumulation of fuels that increase the risk of high severity fire. Studies of year-to-year variability and seasonality of wildfires in the western U.S. also show the close association of climate conditions and the severity and extent of wildfires in the western U.S. (Littell et al. 2009, Westerling et al. 2003). Projected changes in temperature and precipitation for the Pacific Northwest are expected to increase the risks associated with high severity fires and increase the area burned (Littell et al. 2010).

Prescribed fire is often used either alone or in conjunction with forest thinning to reduce wildland fire risk (Graham et al. 2004, Agee and Skinner 2005). Prescribed fires and thinning may be used together in areas where high fuel accumulations exist due to long-term fire exclusion (Harrod et al. 2009). Research shows that the most effective method to reduce fire severity is to use prescribed fire in conjunction with forest thinning (Covington et al. 1997, Graham et al. 1999). Most prescribed fires are ignited under conditions that limit the potential for high severity fires (Wondzell 2001) and typically have less effect on soil organic matter and soil structure and result in lower risk of soil erosion compared to higher severity fires (De Bano et al. 1998). Management actions associated with prescribed fires that disturb the soil profile, such as mechanical fuel treatment, reopening roads for access to harvest sites, or construction of fuel breaks, may result in increased erosion risk. In recent years, the widespread occurrence of high severity fires has resulted in increased emphasis on finding ways to reduce potential fire severity in riparian areas (Elliott et al. 2010).

From 1960 through 1979, an average of 4,400 acres per year was affected by wildfires in National Forest System lands in the Blue Mountains, compared to an average of 26,500 acres per year from 1980 through 2000. A total of 445,000 acres were affected by lightning-started fires from 1985 through 1994.

Livestock Grazing

Livestock grazing is among the most widespread land uses in the interior Pacific Northwest (Kauffman and Krueger 1984). Livestock grazing effects include trampling, soil compaction, and loss of vegetative cover on both upland and riparian sites (Platts 1991). As a result of heavy grazing, erosion and runoff from the breakup of soil crusts has been shown to accelerate (Blackburn 1983). Overuse in riparian zones affects the stability of stream channels, changes channel form (widening), and reduces resistance to floods (Marston 1994). While livestock grazing has effects on uplands, the focus of this section is on effects to riparian, stream, and aquatic habitats because of the sensitivity of these areas and their preferential use by domestic livestock.

Riparian areas of the western United States typically comprise one to two percent of summer range, but provide 20 percent of available forage (Clary and Webster 1990). Riparian vegetation provides several key functions in stream ecosystems, including the provision of shade, bank stability, nutrient transfer, retention of organic material, and source of woody debris (Gregory et al. 1991). Overuse of riparian vegetation by domestic livestock has been recognized as contributing to the decline of riparian shrubs along interior Pacific Northwest streams (Lee et al. 1997). McIntosh et al. (1995) noted that deteriorated range conditions in the Columbia River Basin had been documented by 1900 and that management practices improved after about 1930.

Impacts of livestock grazing are often greater in riparian zones because these areas are used preferentially because of the availability of shade, water, and more succulent vegetation (Bryant 1982, Platts 1991). Brookshire et al. (2002) suggest that relatively light levels of livestock grazing, combined with intense wild ungulate browsing, can affect plant structure and limit reproduction of riparian willows. Holechek et al. (2006) suggested that adverse effects of grazing could be avoided if use intensity, expressed as a percentage of long-term average forage production, did not exceed about 40 percent of forage produced in a given area. Elmore (1992) suggests that stream and riparian habitat conditions can be improved with proper grazing management.

Changes in grazing management, such as rest, implementation of rest-rotation grazing schemes, reduced livestock numbers, and adherence to forage utilization standards, have led to improved range, riparian and stream channel conditions (Gifford and Hawkins 1976, Elmore 1992, Nagel and Clifton, 2003). Changes in grazing practices in the 1930s, 1950s, and since 1970, have improved range conditions across the three national forests compared to conditions in the early 1900s.

Additional measures restricting the management of livestock in National Forest System lands were implemented following the establishment of PACFISH and INFISH guidelines in 1995, which were intended to provide protection for anadromous and resident fish, riparian areas, and water quality. For example, the majority of perennial streams on several allotments were fenced to exclude or restrict livestock access, and monitoring data indicate that some riparian and channel attributes have improved in the Blue Mountains (Archer et al. 2009).

Livestock grazing may result in long-term impacts to aquatic systems, especially from changes in ground cover, shifts in species composition, and changes in sedimentation rates that are difficult to discern because streams are dynamic and variable (Platts 1991). In addition, degraded stream channels may remain in relatively poor condition long after the original impact because of changes in stream channel conditions, making it difficult to identify the principal cause of degradation. Maloney et al. (1999) reported elevated stream temperatures in intensively grazed watersheds in the John Day basin, and the lowest stream temperatures were observed in ungrazed watersheds, but results were confounded by 100 years of prior grazing history.

Beaver were historically abundant in parts of the Blue Mountains (Cline 1988). The contributions of beaver dams in small streams are similar to the functions often attributed to large woody debris in larger streams (Pollock 2003). Beaver dams are sources of organic material to streams and are sites of nutrient retention that increase stream productivity (Naiman et al. 1986, Naiman et al. 1994). Beaver dams dissipate stream energy and provide channel stability (Gurnell 1998). They also create habitat diversity that benefits numerous other species (Pollock et al. 1995, Snodgrass 1997, Wright et al. 2002). The presence of livestock in areas of potential beaver habitat produce competition for limited food resources (Marston 1994) and can disrupt the beaver-willow mutualism that occurs in less competitive environments (Baker et al. 2005). Riparian management practices that favor shrub production also favor the positive benefits of beaver-created landscapes (Munther 1982).

About 42 percent of the National Forest System lands in the Blue Mountains are classified as suitable for sheep or cattle grazing. This includes 1.3 million acres within the Malheur National Forest (81 percent of the national forest), 344,000 acres within the Umatilla National Forest (25 percent of the national forest), and nearly 433,000 acres within the Wallowa-Whitman National Forest (24 percent of the national forest).

Animal unit months (AUMs) totaled about 290,000 for the three national forests in 2009, an average of about 34 acres per AUM. Some livestock grazing occurs within 455 of 552 subwatersheds within National Forest System lands in the Blue Mountains. In order to evaluate relative levels of livestock use within the national forests, available estimates of forage production by vegetation type from Countryman and Justice (2010) were compared to forage use based on stocking levels as of 2009. Use intensity was then compared to use categories by Holechek (2006) who suggested that good range conditions could be maintained with average forage use of 40 percent or less of forage production. Results indicate that average livestock forage use across all three national forests averages about 13 percent of forage production.

Watershed Restoration and Monitoring

During the last two decades, efforts to protect and restore watershed functions within the national forests have progressed. In the 1990s, there was a focus on individual stream reaches and on restoring specific attributes (for example, placing instream structures to create pool habitat). Beginning in 2000, efforts were made to prioritize restoration actions across subbasins and watersheds. Finally, beginning in 2005, whole watershed restoration plans were developed to address upland contributions to watershed functions, in addition to streamside and aquatic habitat conditions, and to identify the most critical restoration needs to improve watershed conditions, from passive protection to active restoration.

Aquatic habitat and riparian conditions within reference and managed watersheds have been monitored since about 2000 by the PACFISH-INFISH Biological Opinion Monitoring Program (PIBO, Archer 2009). Data collected by this program includes measurements of 13 channel-habitat attributes and 11 vegetative attributes. Preliminary results of repeat sampling of 218 monitoring sites in the Blue Mountains show favorable changes in 8 of 11 habitat attributes on managed (grazed) sites (3 significant), and favorable changes in 9 of 11 vegetation attributes (4 significant). One of the notable features of the data is the large difference in some attributes between reference (ungrazed) sites and managed (grazed) sites. While there may be reason for caution in comparing reference and managed conditions directly, Kershner et al. (2004) suggest this as a credible way to report conditions in lieu of trend information from individual sites.

Compared to reference reaches, managed reaches tend to have a lower habitat index, lower residual pool depth, and lower pool area but also have higher pool frequency (Al-Chokhachy et al. 2010). Managed reaches tend to have less bank stability and less wood volume. Managed reaches also tend to have less vegetative cover, more cover of nonnative species, and less cover by woody species.

Monitoring data are showing improvements in riparian and habitat conditions on managed sites but not all attributes and not all sites show favorable trends. Also, while there has been sufficient data collected to show significant changes in some attributes at the scale of the Blue Mountains, the data are not yet sufficient to determine changes at the scale of individual national forests. The monitoring framework in appendix A identifies monitoring questions and parameters that address the status and trend of watershed and aquatic habitat conditions.

Water Quality

Water produced within the three national forests is generally of high quality. Monitoring programs include an extensive network of stream temperature sensor sites, sediment sampling in selected streams as part of project monitoring, and measurements of other water quality parameters. The most persistent and widespread water quality concern for all three national forests is high stream temperatures during low stream flows in summer. High summer air temperatures, changes in stream surface shading caused by Forest Service management activities, and low flows are important factors contributing to warmer water. Sediment levels in streams vary significantly with stream flows, with the highest levels during winter and spring runoff. Some stream reaches show evidence of sediment accumulation from varying sources, such as local stream bank erosion or contributing watershed conditions (e.g., high sediment-producing geology and roads close to streams). Sediment accumulation is a natural function in lower gradient streams, but some areas show evidence of sediment accumulation from past and ongoing management activities. Heavy metals and related acid discharges have been identified in streams in highly mineralized geologic zones with past and present mining activities. These areas include the Granite and Upper North Fork John Day River watersheds within the Wallowa-Whitman and

Umatilla National Forests and the Upper Middle Fork John Day River watershed within the Malheur National Forest. Other water quality concerns that have been observed include nutrient and bacteria sources from livestock, wildlife, and recreation uses. Impacts generally occur during times of concentrated use (at concentrated use areas).

Water quality has improved in recent years as a result of changes in management motivated by direction in PACFISH and INFISH, implementation of water quality best management practices (BMPs), direction in the Regional Aquatic Restoration Strategy, fish recovery plans, and through partner investments. Examples include increased emphasis on protecting streamside areas to reduce impacts to shade producing vegetation, repairing and removing unstable roads, and diverting acid mine discharge into off-stream settling ponds. At the project level, Forest Service staff design and implement a wide variety of BMPs as part of land management activities. Monitoring occurs on a sample of practices to determine BMP implementation and effectiveness and need for adjustment. For example, Umatilla National Forest personnel monitored salvage logging BMPs from 2006 through 2008 and reported adequate riparian areas, roads practices, and water quality protection. Monitoring of road decommissioning and stabilization conducted by the Rocky Mountain Research Station since 2008 has assessed treatment effectiveness in reducing impacts to aquatic ecosystems. Monitoring results indicated treatments reduced erosion and sediment delivery and lowered risk to aquatic ecosystems.

Impaired Waters

Water quality is assessed in terms of designated beneficial uses as defined by the Oregon Department of Environmental Quality (ODEQ) and Washington Department of Ecology (WDOE). Under section 303(d) of the Clean Water Act, states, territories, and some American Indian tribes are required to develop lists of impaired waters which are submitted to Congress every two years. Streams that do not meet water quality standards and thereby do not protect designated beneficial uses are referred to as impaired and are included on state 303d lists. The law requires that states develop total maximum daily loads (TMDLs) for these waters that address the sources of pollution and identify actions needed to improve water quality. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. TMDLs establish load allocations that are expected to provide conditions that meet state water quality standards over time.

ODEQ’s 2004/2006 water quality assessment is used to compile the list of impaired waters for Oregon for use in this analysis. For streams in Washington, the listing of impaired waters as of 2008 is used in this analysis. For the Blue Mountains, for all ownerships in subbasins with National Forest System lands, about 4,500 miles of streams were identified on state 303d lists as water quality limited. About 1,240 miles (492 stream segments in Oregon and 5 segments in Washington), or one-third of impaired stream miles, are located within national forests (see table 140). This includes 464 miles within the Malheur National Forest, 326 miles within the Umatilla National Forest, and 454 miles within the Wallowa-Whitman National Forest. The most common water quality impairment in National Forest System lands is stream temperature. Other parameters for listing streams include sedimentation, turbidity, and nutrient, bacteria, and iron content. Because the concentration of dissolved oxygen in water is temperature dependent, streams with high water temperatures often have correspondingly low dissolved oxygen levels, which is detrimental to beneficial uses (cold water fish species).

Table 140. Miles of water quality impaired (303(d)) stream by subbasin within each national forest as of 2004/2006 (OR) and 2008 (WA)

Subbasin	MAL	UMA	WAW	303(d) Miles in NFS lands
17050116	110	NA	NA	110
17050201	NA	NA	53	53
17050202	NA	NA	40	40
17050203	NA	NA	38	38
17060101	NA	NA	55	55
17060102	NA	NA	86	86
17060103	NA	7 (WA)	12	19
17060105	NA	NA	62	62
17060106	NA	20	68	88
17070102	NA	22	NA	22
17070104	NA	1	NA	1
17070201	124	NA	NA	124
17070202	1	268	41	309
17070203	132	1	NA	134
17070204	NA	7	NA	7
17120001	13	NA	NA	13
17120002	33	NA	NA	33
17120004	52	NA	NA	42
Totals	**464**	**326**	**454**	1,244

For 303d-listed streams in National Forest System lands in the Blue Mountains, 59 percent of stream miles are listed due to stream temperature. Sources of temperature impairment identified in TMDLs by ODEQ and WDOE include loss of stream shade, changes in channel morphology, loss of floodplain and shallow groundwater connection, and changes in streamflow. Both agencies recognize that stream shade provided by riparian vegetation has the most widespread achievable effect on reducing stream temperatures by reducing direct solar radiation. This emphasis on shade shows the importance of restoring healthy communities of riparian vegetation. The agencies recognize that changes in channel morphology are often more costly and take longer to achieve results. Both states have administrative procedures for transferring water rights from out-of-stream uses to instream flows for benefit of water quality, aquatic species, and recreation uses.

As of 2010, ODEQ and WDOE have completed analysis of TMDLs and Water Quality Implementation Plans for the John Day, Upper Grande Ronde, Lower Grande Ronde, Tucannon, Walla Walla, Umatilla, Willow (Oregon), Malheur, and Snake River-Hells Canyon basins (see table 141).

Table 141. Status of total maximum daily loads (TMDLs) and water quality restoration plans (WQRPs)

National Forest	Subbasin/ Watershed	Water Quality Concern Addressed	TMDL Parameters	TMDL Date	WQRP Date	WDOE or ODEQ Response/Approval
UMA	Lower Snake-Tucannon (WA)	Temperature	Temperature	2010	None	WDOE included federal land management requirements in streamlined process, FS not part of TMDL, provided data and comment
UMA	Walla Walla Basin (OR)	Temperature	Temperature	2005	2007	ODEQ provided comment on 303(d) listed (pre-TMDL) WQRP. 1 TMDL WQRP in preparation in cooperation with DEQ, TMDL completed
UMA	Umatilla River Basin (OR)	Temperature, pH, Sedimentation, Turbidity, Aquatic Weeds, Algae	Temperature, pH, Sedimentation, Turbidity, Aquatic Weeds, Algae	2001	None	No 303(d) listed (pre-TMDL) WQRP submitted. No WQRP implementation plan required, TMDL completed
UMA	Willow Creek Subbasin (OR)	Temperature, Bacteria, and pH	Temperature, Bacteria, and pH	2007	None	No WQRP submitted, TMDL completed
MAL UMA WAW	John Day Basin (OR)	Temperature, Bacteria, DO, and Excessive Amounts Of Fine-Grained Streambed Sediment.	Temperature, Bacteria, and DO	2010	In progress	No 303(d) listed (pre-TMDL). TMDL completed, WQRP in development.
MAL	Malheur River Basin and Middle Snake-Payette Subbasin (OR/WA)	Temperature, Bacteria, Chlorophyll-a, toxics, DDT, Dieldrin, and DO	Temperature, Bacteria, and Chlorophyll a (Controls on total phosphorus).	2010	In progress	TMDL completed, WQRP in development.
UMA WAW	Upper Grande Ronde Subbasin (OR)	Temperature, pH, Algae, DO, Sedimentation	Temperature, Sediment, Nitrogen, Phosphorous	2000	None	No 303(d) Listed (pre-TMDL) WQRP Submitted, TMDL Completed
UMA WAW	Lower Grande Ronde, Wallowa, Imnaha Subbasins	Temperature, Bacteria (E Coli and Fecal Coliform), pH, DO, and Sedimentation	Temperature, and Bacteria (E Coli and Fecal Coliform)	2010	None	No 303(d) listed (pre-TMDL) WQRP submitted. No WQRP TMDL Implementation Plan Required, TMDL Completed
WAW	Snake River/Hells Canyon (part 1)	Temperature, Total Dissolved Gas, DDT, DDE, DDD, Dieldrin	Temperature, Total Dissolved Gas, DDT, DDE, DDD, Dieldrin	2004	None	No WQRP Submitted, TMDL Completed
WAW	Snake River/Hells Canyon (part 2)	Phosphorus, Sediment and Dissolved Oxygen	Phosphorus, Sediment and Dissolved Oxygen	2004	None	No WQRP Submitted, TMDL Completed
WAW	Powder Basin, Brownlee Reservoir Subbasin	NA	NA	NA	NA	TMDL not started (minimal or no activity)

The TMDL process was initiated in the Deschutes-Crooked, Burnt, Powder, and Brownlee subbasins in 2010 and has not yet been started for Silver Creek or the Silvies River. Completed TMDLs identify the sources of water quality impairment and the measures needed to restore water quality in each basin. The Forest Service has contributed to the development of TMDLs since 1998 by providing relevant data and technical assistance for streams within the Blue Mountains national forests and has participated in technical and stakeholder groups. As the designated management agency, the Forest Service is responsible for developing water quality implementation plans that outline the BMPs and restoration strategies needed to restore water quality in impaired waters and reduce pollution to surface waters in National Forest System lands. Watershed restoration plans are currently being implemented in 3 watersheds and 22 subwatersheds.

The majority of water bodies within the three national forests support designated beneficial uses, which include domestic and agricultural, cold-water fisheries, recreation, domestic livestock, and wildlife uses. Maintaining the quality of these waters is becoming increasingly important as the demand for clean water resources increases and the timing and volume of surface runoff changes in responses to climate change.

The ability to maintain existing high quality habitats and to restore degraded habitats will be influenced by climate change over the next several decades with projected higher average air temperatures, more winter precipitation falling as rain versus snow, and diminishing winter snow packs resulting in earlier snowmelt. Changes in runoff volume and lower summer base flows, higher surface water temperatures, and likely greater year-to-year variability in precipitation could also result in extended drought periods and more severe floods than have occurred in recent history. Changes in timing and amount of runoff associated with climate change affect every resource, including terrestrial vegetation, wildlife, riparian and aquatic species, and water availability for human use. The effects of climate change to water resources are further described in the discussion of cumulative effects.

Water Uses

Water from the national forests is valued for many ecological, economic, and social purposes. Ecological values are described in the watershed function and water quality sections. Water uses are described in terms of consumptive and nonconsumptive uses for defined purposes recognized by federal and state agencies. For some American Indian tribes, water is considered a culturally significant food used for ceremonies and subsistence needs.

Within the national forests, water is used for a number of purposes including habitat for anadromous and resident fish species, domestic and municipal uses, commercial and industrial uses, Forest Service management, mining, irrigation, and other uses. By volume, the largest water uses are for instream flows for the maintenance of freshwater habitats, water quality or recreation (greater than 40 percent of total streamflow), and irrigation (20 percent). Instream water rights are held by several state agencies in Oregon and Washington.

Most of the water diverted within the national forests is used for agricultural uses on private lands downstream of National Forest System lands. Domestic and municipal water uses account for less than 2 percent of total water use. Out of 4,476 points of diversion within national forests in the Oregon portion of the Blue Mountains, 3,162 points of diversion (75 percent of Forest Service-owned water rights) provide water for domestic livestock and 737 points of diversion (16 percent of FS rights) are used to provide water for wildlife. For all subbasins in the Blue Mountains,

groundwater accounts for less than 10 percent of total water withdrawals and 95 percent of withdrawals are for irrigation.

Storage water rights within the national forests total less than 120,000 acre-feet. For comparison, mountain snowpacks store an estimated 5.2 to 6.3 million acre-feet of water that is released during a roughly three to six month period between spring and mid-summer. The consumptive use of water for irrigated agriculture, primarily on lands downstream of the national forests, is approximately 1.3 million acre-feet per year, or about 18 percent of total runoff from all rivers in the Blue Mountains, with varying percentages of river volume between individual river basins.

Many communities in the Blue Mountains and surrounding areas rely on water from the national forests for their drinking water. National Forest System lands are the primary source of drinking water for the cities of Walla Walla, Pendleton, La Grande, Baker City, Long Creek, and Canyon City. Some communities have municipal water rights in National Forest System lands but currently use other sources. By state law in Oregon and Washington municipal water rights do not lapse for non-use, and communities retain the right to develop these sites in the future if they choose to do so.

Many smaller community or individual water systems have sources within National Forest System lands. In Oregon, there are 230 points of diversion within National Forest System lands and an additional 70 points outside National Forest System land but within the proclaimed boundaries of the national forests that provide water for domestic use. In the Washington portion of the Umatilla national forest, there are an additional 20 diversion points that provide water for domestic use. The majority of watersheds in National Forest System lands provide some water for domestic or municipal use.

In terms of numbers of points of diversion, the majority of federally owned water rights in National Forest System lands are used to supply water for domestic livestock. More water by volume, for existing water rights in National Forest System lands, is used to maintain instream flows to support anadromous and resident fish, water quality, or aesthetics than for any other use. In accordance with state laws instream water rights are held by state agencies in Oregon and Washington.

Of approximately 6,800 water rights within the national forests, 43 percent provide water for domestic livestock, 32 percent support instream flows, 9 percent provide water for wildlife, 5 percent support irrigation uses, and 3 percent (226 water rights) provide water for domestic and municipal uses. By volume, instream flows account for more than 75 percent of all water rights; irrigation water rights account for about 1 percent by volume; and less than 1 percent by volume is used for domestic human use. Water rights for livestock account for 43 percent of the points of diversion in National Forest System lands but use 2 percent of the total water volume of all water rights in National Forest System lands in the Blue Mountains (0.03 percent of total stream flow).

Analysis Assumptions and Methods

Alternatives

All alternatives include desired conditions for watershed function and water quality, as displayed in appendix A. Alternatives E and F include desired conditions for road density in watersheds with anadromous fish and bull trout. Allowed forage utilization by livestock varies by alternative. Livestock grazing would be most restricted in alternative C, because livestock use would not occur in watersheds with ESA listed fish species. Elements of the Aquatic and Riparian Conservation Strategy (USDA Forest Service 2008) (ARCS) are included in all action

alternatives, but alternatives differ in their emphasis on riparian areas and level of watershed restoration. The ARCS as incorporated into the revised forest plans preserves elements of PACFISH and INFISH and is intended to provide for consistent management for the benefit of aquatic and riparian-dependent species across all national forests in the Pacific Northwest Region.

ARCS elements include:

- Riparian management areas
- Key watersheds
- Mid-scale, or watershed analysis
- Watershed restoration
- Monitoring

These elements are intended to work together to achieve a distribution of watershed conditions that are resilient to natural disturbance and that maintain, restore, and enhance habitat for resident and anadromous fish and other aquatic and riparian dependent organisms (USDA Forest Service 2008).

As described in the proposed action, desired conditions were developed specifically for riparian management areas, watersheds, stream channels, and aquatic habitats. Most desired conditions are intended to apply to all watersheds, although some desired conditions apply specifically to key watersheds. A subset of key watersheds are identified as a priority for restoration within each national forest, recognizing that limited restoration funding would be focused on the highest priority watersheds and essential work would continue until completed.

The intent of the ARCS is to accelerate improvement of watershed and aquatic/riparian conditions across the region by: (1) conducting new and ongoing management activities in a manner that, across broad scales, protects areas in good condition and allows for passive recovery of those that are degraded, and (2) actively restoring watershed conditions in high-priority areas by implementing integrated, strategically focused restoration treatments that facilitate the recovery of critical watershed processes (Sedell et al. 1997).

Riparian management areas are areas bordering perennial and intermittent streams, wetlands, and sensitive areas where the management emphasis is to maintain, restore, or enhance the ecological health of aquatic and riparian ecosystems. The complete definitions of riparian management areas and conditions where they are applied can be found in the glossary.

Key watersheds are subwatersheds, or groups of subwatersheds, selected to serve as strongholds for important aquatic resources or that have the potential to do so. Key watersheds have a combination of watershed, riparian and aquatic habitat conditions that support, or are capable of supporting, strong populations of one or more selected focal species (Chinook salmon, steelhead, inland redband trout, and bull trout). A subset of key watersheds are named as priority watersheds and are expected to be the focus of watershed-related restoration over the life of the revised forest plan. Additional details on the selection of key and priority watersheds and tables identifying key and priority watersheds on each national forest are located in appendix B.

Mid-scale, or watershed analysis is a process for identifying and characterizing the status and trends of key physical and ecological conditions and processes influencing aquatic and riparian ecosystems at watershed scales, identifying the primary management issues associated with those conditions, and identifying opportunities to address them. Watershed analysis is not a forest plan component, but is an important process for informing forest plan implementation, as it provides

context for management activities. The results of watershed analysis are used to diagnose the status and trend of aquatic and riparian resources; tailor and/or refine broad-scale desired conditions to finer scales; establish watershed-scale objectives for aquatic and riparian resource management; identify key management needs and opportunities, including restoration; and develop local monitoring programs. Watershed analysis provides the basis for developing watershed restoration programs and implementing a diverse range of land management activities in a manner that protects and/or enables natural recovery of watershed conditions.

Watershed restoration is an integrated set of both passive and active measures intended to facilitate the recovery of the physical, biological, and chemical processes that promote the maintenance or recovery of riparian and aquatic ecosystem structure and function. Implementation of the watershed restoration element would be tiered to the Region 6 Aquatic Restoration Strategy (USDA Forest Service 2005), which uses a strategic, integrated, multi-scale approach to prioritize watershed restoration treatments. The highest priority is to first restore critical watershed processes in those areas where the structure and function of the aquatic ecosystem are largely intact, but are threatened by existing or projected watershed conditions. Watersheds with highly degraded aquatic ecosystems will be a lower priority for restoration until threats to existing strongholds (e.g., key watersheds) are mitigated.

The focus of restoration actions is to restore the processes responsible for creating and maintaining the landscape-scale diversity of aquatic and riparian habitats. Actions to accomplish this may include, but are not limited to:

- Altering the structure and composition of upland vegetation in order to move towards desired conditions, reduce wildfire risk, and restore resilience
- Increasing the diversity and complexity of aquatic and riparian habitats by promoting natural establishment and succession of riparian plant communities
- Restoring the natural range of stream flows to the greatest possible extent
- Reducing road-related erosion and sediment delivery to streams through road closure, road obliteration, improving maintenance, and/or improving erosion control
- Removing fish passage barriers that block or restrict access to historically occupied aquatic habitats or restrict connectivity between aquatic habitats
- Altering riparian habitats to favor deciduous trees and shrubs as appropriate and where such species were formerly abundant
- Reintroducing keystone species, such as beaver, into suitable habitats within their former range
- Designing watershed, riparian and aquatic habitat restoration projects that promote ecological function and the range of natural processes responsible for habitat formation
- Managing invasive species to maintain the composition and diversity of native species
- Adapting management actions to respond to the expected effects of climate change

Monitoring is a systematic, science-based process of collecting and analyzing information. There are three types of monitoring: implementation, effectiveness, and validation. Monitoring will determine whether management direction is being implemented, whether it is effective at achieving desired results, and the status and trends of particular ecological conditions or

relationships. Monitoring is essential, as it provides the basis for determining whether forest plan components and/or their implementation need to be altered.

Appendix A includes a proposed framework for monitoring the revised forest plans. The components associated with watershed and aquatic resources are intended to do the following:

- At the project-scale, assess whether design criteria (standards and guidelines) are being implemented and are effective at achieving desired aquatic resource management objectives.
- At broader-scales, track the condition and trend of watersheds, aquatic and riparian habitats, water quality, and aquatic focal species and assess progress towards achieving or maintaining the associated desired conditions.
- Track implementation of proposed restoration actions and evaluate the effectiveness of those actions in improving watershed conditions, particularly in key and priority watersheds.
- Provide information on the effects of climate change on watershed resources, particularly changes in stream flows and stream temperatures.

Collectively, this multi-scale monitoring program is intended to facilitate management by providing relevant information over both short (i.e., years) and long (i.e., decadal or longer) timeframes. For example, in the short term, project-scale implementation and effectiveness monitoring will be used to evaluate whether more focus is needed to ensure standards and guidelines are being followed and/or whether they need to be modified to achieve desired conditions. Conversely, over longer timeframes, broader-scale status and trend information will be used to evaluate whether desired conditions, objectives, and/or land allocations require adjustment.

Environmental Consequences – Watershed Function, Water Quality, and Water Uses

Summary of Effects to Watershed Function, Water Quality, and Water Uses

This section introduces the environmental consequences of the alternatives and includes a general summary of broad scale effects and relative trends for the planning area followed by more detailed discussion of the effects of each alternative for each national forest. Site-specific outcomes to watershed function (hydrologic function, riparian and wetlands areas, streams, and aquatic habitat), water quality, and water uses from the alternatives are not predicable until mid-scale assessment and/or project level NEPA analysis is completed.

Alternative A would continue current management direction, which includes a mix of protection strategies and active watershed and vegetation management. Watershed restoration would proceed at current levels, though watershed restoration is not integral to forest plan direction as amended by PACFISH and INFISH. Current management direction includes forest and regional strategies for watershed protection and passive restoration. The emphasis on watershed protection and restoration would be slightly less than it would be for alternatives B, E, and F, and much lower than for alternative C, because of differences in the area of riparian habitat conservation areas (RHCAs) for intermittent streams in watersheds where no listed fish species are present and because projections for restoration are reduced. Over the life of the plan (10 to 15 years), watershed conditions would be maintained or improved at current rates. During the long term (greater than 20 years), watershed conditions would continue to improve but at slower rates (fewer watersheds in improving condition) compared to alternatives B, C, E, and F because of differences in protection and restoration levels as described in the details of the alternatives.

Protection of watershed-related resources in this and all other alternatives is implied by the width of riparian management areas (RMAs) or RHCAs, limitations on motor vehicle use, road construction and other land disturbing actions, and the extent of management areas in which land disturbing activities would be limited.

Alternatives B, C, E, and F include planning area wide strategies for watershed protection and active restoration that would likely result in accelerated improvement in watershed condition and in the maintenance and improvement of lakes, streams, and rivers, though at varying rates, during the short and long terms. These alternatives include consistent direction for intermittent streams across all watersheds.

Alternative B includes a mix of protection and restoration proposals that would improve watershed conditions and water quality more than alternative A but less than alternatives C, E, and F during the short and long terms because of slightly lower projections for protection and restoration.

Alternative C would have the greatest level of watershed restoration and the largest contiguous areas of limited motor vehicle use. Alternative C would result in the greatest improvement in watershed condition during the short and long terms, in large part, because active restoration of riparian and aquatic habitats would be higher than in all other alternatives. This alternative would provide a greater level of protection (wider riparian management areas) and less active management (vegetation, grazing, motorized recreation). During the long term there would be an increased risk of disturbance associated with limited active vegetation treatment particularly in dry forest types, potentially reducing benefits to watershed condition.

Alternative D would emphasize commodity production and would have the lowest levels of watershed protection and restoration of hydrologic and riparian function. It would have the highest level of active vegetation management. Improving vegetation resilience would contribute to improving watershed condition but would likely result in a declining trend in overall watershed improvement and a potential for degradation of watershed condition, water quality, and soil quality in some areas because of relatively high objective levels for timber harvest, road use, and livestock grazing. Although upland vegetation conditions would improve at the fastest rate, this alternative would have the greatest short and long term risks to watershed function and water quality.

Alternatives E and F include a mix of watershed protection and active restoration that would, during the short term, improve watershed conditions more than alternatives B and D, but less than alternative C. These alternatives include desired conditions for reduced road density in anadromous and bull trout watersheds and specific guidelines for range management that would, during the long term, also contribute to improving trends in watershed condition and water quality in affected watersheds. Alternative E would provide greater emphasis on vegetation restoration and, during the short term, pose slightly greater risk to watershed conditions (less than alternative D but more than the other action alternatives). During the long term, both alternatives would improve watershed conditions and water quality at a slightly lower rate than alternative C because of the levels of protection and amount of active restoration, including vegetation and roads activities.

All action alternatives include key and priority watersheds as a basis for watershed protection and restoration, but effects to watershed function and water quality would vary in these areas because of different mixes of management area allocations, suitability, access (roads and trails), and other management activities. All alternatives would include water quality BMPs for

protection and restoration of water quality as part of project level design criteria. Water quality BMPs would be applied in all watersheds but effectiveness would vary because of differences in riparian protection and activity levels. Short term refers to the life of the plan, or 10 to 20 years, and long term refers to effects beyond the life of the plan, or beyond 20 years, and assumes the alternative intent would continue into the future.

Effects of the alternatives are described in the following order:

- Upslope conditions within watersheds are described in terms of expected changes in the condition of forested vegetation, hydrological connectivity of the road system, and grazing use intensity
- Differences in the effects of grazing on riparian habitats between alternatives
- Influence of differences in riparian habitat conservation areas (RHCAs) and riparian management areas
- Influence of restoration actions on riparian, stream channel, and aquatic habitat conditions
- Extent of detrimental soil conditions resulting from expected levels of timber harvest
- Changes in overall watershed conditions, considering all of the above factors

Comparison of Alternatives

Malheur National Forest

Key Indicator: Vegetation condition

The percent area and average departure score of each of the three dominant forested potential vegetation groups within the Malheur National Forest are displayed in table 142. Dry forest accounts for 72 percent of the Malheur National Forest and is the most departed from the historical range of variability.

Table 142. Percent of national forest and average fire regime condition class departure score by potential vegetation group for the Malheur National Forest

Potential Vegetation Group	Percent of MAL	Average Fire Regime Condition Class Departure
Dry forest	72%	62
Moist forest	6%	36
Cold forest	9%	54

From an analysis of vegetation data aggregated for all potential vegetation groups for the Malheur National Forest, 43 of 143 subwatersheds have vegetation that is slightly departed from HRV, 58 subwatersheds have vegetation that is moderately departed from HRV, and vegetation in 42 subwatersheds is highly departed from HRV. The expected change in vegetation condition is based on the modeled change in departure scores of the three dominant forest potential vegetation groups and is expressed as the change in departure scores at years 10 and 20. All of the values in table 143 represent the degree of change towards HRV, or improved vegetation condition. Alternative D, for example, would result in a 7.5 percent change in departure (towards HRV) at year 10 and 14.9 percent change at year 20. Based on the analysis of forested vegetation, alternative D would result in the greatest improvement in forested vegetation condition and alternative C the least.

Table 143. Percent change from existing condition in average forested vegetation departure score for each alternative for the Malheur National Forest

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
At year 10	4.4%	5.0%	4.1%	7.5%	6.3%	5.2%
At year 20	8.8%	9.9%	8.1%	14.9%	12.6%	10.3%

Adjusting the departure scores for forested vegetation in each subwatershed on the Malheur National Forest by the values in table 143 results in an improvement in vegetation conditions at year 10 and at year 20 as displayed in table 144 and table 145. The tables display the number of subwatersheds in each of the three condition classes by alternative compared to the existing condition. The change, or improvement, in vegetation departure score is applied to all watersheds and represents the average condition, even though it is likely that actual vegetation conditions will vary throughout the national forest.

Table 144. Forested vegetation condition classes and number of subwatersheds in each class at year 10 for each alternative for the Malheur National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	43	59	69	59	82	77	69
2	58	65	55	61	48	52	55
3	42	19	19	23	13	14	19

Table 145. Forested vegetation condition classes and number of subwatersheds in each class at year 20 for each alternative for the Malheur National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	43	87	101	87	126	116	101
2	58	45	31	43	15	24	32
3	42	11	11	13	2	3	10

At year 10 and at year 20, alternative D would result in the greatest improvement in forested vegetation condition, and would result in the most watersheds with vegetation in the least departed condition (Condition Class 1) and the fewest in the most departed state (Condition Class 3). Alternatives A and C would result in the fewest watersheds with forested vegetation in the least departed condition and the highest number (11 and 13, respectively) in the most departed condition. Alternative E would result in the second highest number of watersheds with vegetation in the least departed condition, followed by alternatives B and F.

The condition of forested vegetation in priority watersheds, the watersheds in which restoration actions are expected to be focused, is displayed in table 146 (at year 10) and table 147 (at year 20). Improved conditions are reflected by more watersheds in condition class 1 for all alternatives, relative to existing conditions. At year 10, the number of watersheds in condition class 1 would be the same for alternatives B, D, E, and F. For alternative D, modeling shows all 26 priority watersheds would potentially have vegetation in condition class 1 at year 20.

Alternatives A and C would result in the fewest number of priority subwatersheds in condition class 1 at year 20 (19 each).

Table 146. Forested vegetation condition classes and number of priority watersheds in each class at year 10 for each alternative for the Malheur National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	12	15	18	15	18	18	18
2	8	11	8	11	8	8	8
3	6	0	0	2	0	0	0

Table 147. Forested vegetation condition classes and number of priority watersheds in each class at year 20 for each alternative for the Malheur National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	12	19	20	19	26	24	20
2	8	7	6	7	0	2	6
3	6	0	0	0	0	0	0

Key Indicator: Roads

Two measures of roads, total road density and hydrologically connected roads are used in this analysis. Within the 143 subwatersheds modeled for the Malheur National Forest, there are 10,990 miles of existing roads and an average road density of 4.2 miles per square mile. The 26 priority watersheds within the Malheur National Forest contain 3,151 existing road miles and have an average road density of 4.8 miles per square mile. An estimated 4,798 miles of hydrologically connected roads occur within the national forest, including 1,454 miles in priority watersheds. In this analysis, road density is assumed to be constant between alternatives. Some road decommissioning or obliteration is expected to occur for each of the alternatives, but the miles of road to be decommissioned cannot be predicted at this time. The focus of this analysis is on the treatment of hydrologically connected roads in priority watersheds.

The objectives for road related restoration and the percentage of hydrologically connected roads in priority watersheds that this represents are displayed in table 148. Road treatments are expected to be completed with 10 years.

Table 148. Roads treatment objectives (miles) and percent of hydrologically connected roads that would be treated in priority watersheds for the action alternatives for the Malheur National Forest

Roads Treatment Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Roads that would be treated (miles)	260	600	650	290	310
Percent of priority watersheds	17.9%	41.3%	44.7%	19.9%	21.3%

The emphasis of road related treatment objectives, as stated in appendix A, is to reduce road related sedimentation in streams by reducing the hydrological connectivity of National Forest System roads. Comparing the objective levels to the estimated 1,454 miles of hydrologically connected roads, approximately 45 percent would be treated for alternative D and 18 percent for alternative B, Forty-one percent would be treated for alternative C, and approximately 20 percent each for alternatives E and F.

The existing road system extends the channel network in priority watersheds by as much as 93 percent, suggesting a relatively large increase in the rate of watershed runoff caused by forest roads (Wemple et al. 1996). Hydrologic extension of the channel network due to National Forest System roads would be reduced to 52 percent, 55 percent, 73 percent, 75 percent, and 77 percent for alternatives D, C, F, E, and B respectively. The hydrologic connectivity of the road system would be substantially reduced for alternatives C and D and only somewhat reduced for the other action alternatives. The extent of channel network extension due to the road system would exceed 50 percent for all action alternatives and would still be considered high as reflected in the roads condition classes displayed in table 149 and table 150.

Table 149. Hydrologically connected roads condition classes and number of priority watersheds in each class for the action alternatives for the Malheur National Forest

Hydrologically Connected Roads Condition Class	Existing Condition	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	0	1	3	3	1	1
2	0	3	5	6	3	3
3	26	23	21	20	23	23

Because existing road density in priority watersheds is high and is assumed to change very little in this analysis, the change in hydrologically connected roads contributes little to improving watershed condition. The hydrological condition of most priority watersheds would continue to be strongly affected by National Forest System roads (see table 150).

Table 150. Total roads condition classes and number of priority watersheds in each class for the action alternatives for the Malheur National Forest

Total Roads Condition Class*	Existing Condition	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	0	0	0	0	0	0
2	0	1	2	3	1	1
3	26	25	24	23	25	25

* The total roads condition class is based on both road density and hydrologically connected roads.

Key Indicator: Livestock grazing

Eighty-one percent of the Malheur National Forest is presently considered suitable for grazing by cattle or sheep. Active allotments cover 92 percent of the national forest's area. Acres suitable for domestic livestock would be essentially the same for alternatives A, B, D, E, and F. Suitable acres would be 50 percent less for alternative C. There would be 126,500 cattle and sheep animal unit months (AUMs) in alternative B; 125,500 AUMs for alternative D; and 123,500 AUMs in alternatives A, E, and F. There would be 50 percent less AUMs for alternative C (62,200). The

change in AUMs is used to recalculate relative forage use intensity by alternative and is assumed to change in all watersheds for the purpose of this analysis.

The difference in grazing use is used to project use intensity for the alternatives in each watershed within the national forest. The calculation of forage use in this analysis assumes that all areas of an allotment could be used by domestic livestock. Forage production in areas known to be unsuitable is given a nominal value of 50 pounds per acre per year so that most of the use is accounted for by acres that are suitable for domestic livestock. The resulting average use intensity for all 143 subwatersheds and in priority watersheds only is displayed in table 151. Calculated for existing conditions, 11 of 143 subwatersheds have apparent use intensity greater than 40 percent, the level proposed by Holechek et al. (2006) below which adverse effects to forage species can be avoided. Average use levels are expected to be nearly the same for alternatives A, B, D, E, and F. Average forage use intensity would be 3.2 percent in alternative C, and the greatest calculated forage use intensity in any single subwatersheds would be less than 16 percent.

Table 151. Average percent forage use intensity in all watersheds and in priority watersheds for each alternative for the Malheur National Forest

Watershed	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
All watersheds	15.9%	15.9%	3.8%	17.0%	15.9%	15.9%
Priority watersheds	13.6%	13.6%	3.2%	14.5%	13.6%	13.6%

Table 152 displays the condition class based on upland forage use intensity alone for watersheds in the Malheur National Forest. The number of priority watersheds in each condition class based on upland forage use intensity alone is displayed in table 153.

Table 152. Rangeland condition classes (based on upland forage use intensity) and number of watersheds in each class for each alternative for the Malheur National Forest

Rangeland Condition Class	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	78	78	140	76	78	78
2	41	41	3	36	41	41
3	24	24	0	31	24	24

Table 153. Rangeland condition classes (based on upland forage use intensity) and number of priority watersheds in each class for each alternative for the Malheur National Forest

Rangeland Condition Class	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	14	14	26	13	14	14
2	10	10	0	8	10	10
3	2	2	0	5	2	2

The number of subwatersheds with the lowest relative use intensity (subwatersheds in rangeland condition class 1) would be nearly equal for alternatives A, B, D, E, and F. This is true for all watersheds within the national forest, including priority watersheds. For alternative C, all priority watersheds and nearly all other watersheds would be expected to be in condition class 1, reflecting the lowest upland forage use intensity.

Livestock use of riparian areas is generally believed to be greater than use of uplands unless specific measures (herding, off-channel water sources, fencing, etc.) are implemented (Clary and Webster 1990, Fleischner 1994, Bengeyfield 2006). Livestock forage use in riparian areas was estimated for the existing condition, but not for each alternative in this analysis. Instead, a comparison is made of allowable forage utilization in riparian areas (see table 154).

Differences in livestock use between alternatives would also be reflected in changes in forage use intensity in riparian areas. The largest relative reduction of livestock use in riparian areas would occur for alternative C due to reductions in stocking levels permitted with that alternative.

For alternatives B and D, utilization of woody riparian species and herbaceous vegetation would be limited to 40 percent of annual growth. The same limits would apply for alternatives E and F, with the exception that utilization limits would be lower in watersheds inhabited by bull trout, and alternative F would have slightly lower utilization limits in watersheds inhabited by anadromous fish. The stricter guidelines in alternatives E and F would apply in 16 subwatersheds containing bull trout (279,000 acres or 16 percent of the national forest) and 44 subwatersheds inhabited by anadromous salmon or steelhead (490,000 acres or 29 percent of the national forest). It is expected that lower utilization of riparian vegetation in alternatives E and F would result in a greater improvement in riparian conditions relative to alternatives B and D.

Table 154. Maximum utilization and minimum residual stubble height within riparian areas (appendix A, MA4B RMA-RNG-2-G115)

Measure	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Maximum percent utilization of woody vegetation (percent of mean annual vegetative production)	40%	25%	40%	25% within bull trout spawning and rearing reaches 40% for all other watercourses including anadromous fish reaches	25% within bull trout spawning and rearing habitat (all three national forests) 35% in anadromous fish reaches (UMA and WAW) 40% outside bull trout spawning and rearing habitat (MAL) 40% outside anadromous fish reaches (UMA and WAW)
Maximum percent utilization of herbaceous vegetation	40%	10%	40%	25% within bull trout spawning and rearing reaches 40% for all other watercourses including anadromous fish reaches	25% within bull trout spawning and rearing habitat (all three national forests) 35% in anadromous fish reaches (UMA and WAW) 40% outside bull trout spawning and rearing habitat (MAL) 40% outside anadromous fish reaches (UMA and WAW)

* In addition, the minimum stubble height (applies at the greenline) for all alternatives is 4 to 6 inches. The maximum bank alteration for all alternatives is 20 percent.

Key Indicator: Riparian habitat conservation area (RHCA) and riparian management area (RMA) acres

Present management of riparian areas under PACFISH (USDA and USDI 1995) and INFISH (USDA Forest Service 1995) includes the designation of riparian habitat conservation areas (RHCAs). RHCAs are portions or zones of watersheds where riparian-dependent resources receive primary emphasis. The zones have varying widths: 300 feet on either side of fish-bearing streams and permanently flowing non-fish-bearing streams; 150 feet from ponds, lakes, reservoirs and wetlands larger than one acre; and 100 feet if listed fish are present from seasonally flowing streams, wetlands smaller than one acre, landslides, and landslide-prone areas (50 feet if listed fish are not present).

Riparian management areas for alternatives B, E, and F would use the same basic definitions as RHCAs to define extent. RMAs are designated as management areas where specific desired conditions, standards, and guidelines apply. Riparian goals in PACFISH and INFISH are rearticulated as desired conditions for the action alternatives. RMA widths and extent are similar to RHCAs except that a width of 100 feet would apply to all seasonally flowing streams and small wetlands, whether or not the streams are fish bearing. The management of RMAs and RHCAs would be similar in that work within RMAs would have to show progress towards desired conditions, and any management activity conducted within RMAs would have to be designed specifically for the benefit of aquatic and riparian-dependent resources, whereas management of RHCAs currently requires that attainment of riparian management objectives not be retarded (USDA Forest Service 1995).

The acres of RHCAs (alternative A) and RMAs (all action alternatives) and the minimum percent of national forest area are displayed in table 155.

Table 155. RMA acres and percent of Malheur National Forest for each alternative (RHCAs for alternative A)

Alt. A RHCAs acres (%)	Alt. B RMAs acres (%)	Alt. C RMAs acres (%)	Alt. D RMAs acres (%)	Alts. E and F RMAs acres (%)
168,545 (10%)	192,910 (11%)	368,998 (22%)	83,078 (5%)	192,910 (11%)

RMA acres would be greatest for alternative C, which would have 300-foot wide buffers for all streams, regardless of class. Alternative D would have the least acres within RMAs because RMA widths would be the narrowest for streams in all classes. RMA widths for alternative D are based on Oregon Forest Practices guidelines, which do not require RMAs for the smallest non-fish-bearing streams with average annual flow of less than 2 cubic feet per second. A review by the Independent Multidisciplinary Science Team (IMST 1999) of the RMAs required by the Oregon Forest Practices Act found that RMAs required by the act were insufficient to protect aquatic habitats because they were not applied to all streams and specifically not to non-fish-bearing streams. However, alternative D, as currently designed, would apply RMAs to intermittent and seasonally flowing streams and therefore would exceed the requirements of the Oregon Forest Practices Act.

Some reviews of the effectiveness of riparian buffers have concluded that widths of 300 feet, or one site-potential tree, are required in order to protect all of the desired functions of riparian areas (Wenger 1999). A review by Castelle and Johnson (2000) suggests that riparian buffer widths of 5

to 15 meters (16 to 49 feet) are sufficient to provide 50 to 75 percent of desired riparian functions, which include sediment filtration, stream temperature moderation, inputs of large organic debris, production of fine particulate organic matter, and stream bank stability. Castelle and Johnson (2000) found that most of the influence on stream bank stability was provided by fine roots within the bank itself. A study by Lakel et al. (2010) conducted in the Virginia Piedmont indicated that undisturbed riparian strips 50 feet wide were capable of trapping 97 percent of eroded sediment as long as flow was not channelized. Tang and Montgomery (1995) suggest that riparian buffers 100 meters wide would include 75 to 90 percent of potentially unstable ground in watersheds within the Olympic Peninsula in Washington. Lastly, a review by Pollock and Kennard (1998) concluded that buffer widths of 50 to 250 feet should be sufficient to provide most, if not all, of the desired functions of riparian areas in watersheds in eastern Washington.

Based on these reviews of effectiveness, the RMAs proposed for alternatives B, E, and F should be protective of most riparian functions. It is expected that RMAs will be delineated during project level planning and will identify areas of potentially unstable ground for inclusion within RMAs. The RMAs proposed for alternative C would likely be the most protective of unstable areas, as described by Tang and Montgomery (1995). The RMAs proposed for alternative D would be the least protective and may not be as efficient as the RMAs in all other alternatives at preventing sediment delivery to streams or providing for inputs of large organic debris but may still provide most other functions desired of RMAs.

Key Indicator: Number of wetland sites improved

Wetlands in National Forest System lands occur in a variety of settings, not all of which are associated with streams or rivers. Based on maps compiled by the U.S. Fish and Wildlife Service and provided to the National Wetland Inventory (NWI), off-channel and isolated wetlands comprise an area that is 40 percent or more of all wetlands within the Malheur National Forest. According to these maps, there potentially are more than 2,000 small wetlands within the Malheur National Forest, although the accuracy of the maps is not yet determined. These wetlands are an important component of the hydrology of watersheds within the national forest but are disproportionately important, relative to their size, as habitat for a variety of plant and animal species, and, in some cases, include species that occur only in specific wetland types. The objective for improvements to or restoration of a small number of these sites each year is included in each alternative and is displayed in table 156. Potential actions include vegetative restoration, hydrologic restoration, and protection by fencing.

Table 156. Objective for wetland site restoration for the action alternatives for the Malheur National Forest

Wetland Site Restoration Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Number of sites	20	30	30	30	30

Key Indicator: Riparian and stream channel restoration

Within priority watersheds in the Malheur National Forest, there are approximately 424 miles of perennial streams or an average of 16.3 miles in each of 26 subwatersheds. The objectives for riparian restoration for the action alternatives range from 300 to 600 miles during the first decade of the plan period (see table 157).

Table 157. Objective for riparian area improvement (miles) and percent of priority watershed miles that would be improved for the action alternatives for the Malheur National Forest

Riparian Area Improvement Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Riparian area improvement in miles	300	600	300	450	400
Percent of riparian miles that would be improved (priority watersheds)	71%	142%	71%	106%	94%

The objective levels for alternatives C and E are higher than the sum of perennial stream miles in priority watersheds by 158 miles and 26 miles, respectively. It is assumed that additional riparian habitat would be treated in key watersheds, so some improvement in riparian conditions would occur outside priority watersheds. It is also likely that not all riparian habitats are in need of active restoration, so the objective levels stated for each action alternative may exceed the need in priority watersheds, which would result in restoration work being accomplished outside of priority watersheds.

Accomplishing the objectives for stream miles improved would potentially include the reconnection of streams and floodplains, stabilizing stream banks, restoring channel morphology, and the addition of large wood in streams. Because channel reconstruction is costly to design and implement, the number of miles completed in any year will vary and usually is small. However, there are a variety of actions or methods that could be used to improve stream channel and aquatic habitat conditions in lieu of channel reconstruction. The objective miles expected to be completed during the first decade of the plan period and the percentage of perennial stream miles in priority watersheds that those objectives represent are displayed in table 158.

Table 158. Anticipated stream channel restoration (miles) in priority watersheds and percent that would be improved for the action alternatives for the Malheur National Forest

Stream Channel Restoration Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Stream channel restoration (miles)	25	40	25	38	35
Percent of stream miles that would be improved	5.9%	9.4%	5.9%	9.0%	8.3%

It is likely that stream channel restoration would occur through a variety of activities in addition to physical channel reconstruction. Other actions could include placement of large wood, reconnection of side channels, conversion of water rights to restore or protect instream flows, and reintroduction of beaver to suitable sites. Replacement or removal of culverts that block access to potential habitat is also expected to occur. Redesign of road-stream crossings is also likely to contribute to improved channel and habitat conditions, both upstream and downstream of these sites. The stream miles displayed in table 158 are much lower than total stream miles in priority watersheds, but it is likely that only a small percentage of stream channels are in actual need of this kind of restoration. Improvements to stream channel conditions would also occur in response to expected improvements in upland and riparian conditions but may take some time to be realized. Active channel restoration is expected to occur for 6 to 9 percent of stream miles in priority watersheds, depending in the alternative selected. The fewest stream miles would be restored for alternatives B and D and the most for alternatives C and E.

Key indicator: Watershed condition class: number of watersheds in improved condition

The combined effect of vegetation condition, roads, and livestock use intensity are the factors used to represent upslope condition in watersheds. For this part of the analysis only, the number of watersheds in each condition class for alternative A at 10 years is used as the baseline condition as forested vegetation conditions are expected to improve regardless of the alternative selected. Improvements to upland conditions will eventually contribute to improved conditions in riparian and aquatic habitats by moderating watershed hydrology, reducing the rate of watershed runoff, and reducing sediment delivery to streams.

The influence of restoration of riparian, stream channel and aquatic habitat is not represented in the following tables, but is expected to contribute substantially to overall watershed conditions. The influence of these actions on watershed conditions as displayed in the following tables will be described separately.

Table 159. Watershed condition classes and subwatersheds in each class along with subwatersheds improved at year 10 for each alternative for the Malheur National Forest

Watershed Condition Class	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	16	20	22	20	21	21
2	30	42	66	44	46	46
3	97	81	55	79	76	76
Subwatersheds improved	NA	16	42	18	21	21

Table 160. Watershed condition classes and priority watersheds in each class along with priority watersheds improved at year 10 for each alternative for the Malheur National Forest

Watershed Condition Class	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	0	0	0	0	0	0
2	2	8	13	10	10	10
3	24	18	13	16	16	16
Priority watersheds improved	NA	6	11	8	8	8

For all watersheds within the Malheur National Forest (see table 159), the largest change in the number of watersheds in improved condition class would occur for alternative C and would be driven by the large decrease in allowable AUMs, the higher rate of road treatments (relative to all other alternatives except D), as well as the fact that the rate of improvement in vegetation conditions is still expect to contribute to improved watershed conditions. The difference in number of watersheds improved between alternatives C and D would be largely due to the reduced livestock use intensity for alternative C and slightly higher use intensity for alternative D. Although there would be improvements in condition of priority watersheds, none would be in condition class 1 in any alternative after 10 years, and the majority of priority watersheds would remain in condition class 3. This would be primarily due to the existing high road densities and extent of hydrologically connected roads in these watersheds.

Continued improvement in the condition of forested vegetation through year 20 would increase the number of watersheds with good vegetative conditions and the number of watersheds in improved condition. The number of watersheds in good condition would increase between years

10 and 20 from 20 to 31 for alternative D, and from 22 to 32 for alternative C. The number of watersheds in improved condition would increase from 42 to 83 for alternative C and 18 to 47 for alternative D, and would increase for all alternatives. Alternative C would have the fewest watersheds (14) in condition class 3 at year 20 and all other alternatives would result in 50 or more of the 143 watersheds within the national forest in condition class 3.

There would be a small increase in the number of priority watersheds in good condition at year 20 compared to year 10. One watershed for alternative B and two each for all other action alternatives would be in condition class 1 at year 20 compared to none at year 10. The number of priority watersheds in condition class 3 would decrease from 13 at year 10 to 4 at year 20 for alternative C and from 16 to 9 for alternative D. The distributions of watersheds by condition class would be similar at year 20 for alternatives B, E, and F, with one or two watersheds in condition class 1 and 10 to 14 watersheds in condition class 3.

Table 161. Watershed condition classes and subwatersheds in each class along with subwatersheds improved at year 20 for each alternative for the Malheur National Forest

Watershed Condition Class	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	25	26	32	31	30	27
2	55	59	97	62	61	60
3	63	58	14	50	52	56
Subwatersheds improved	NA	39	83	47	45	41

Table 162. Watershed condition classes and priority watersheds in each class along with priority watersheds improved at year 20 for each alternative for the Malheur National Forest

Watershed Condition Class	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	0	1	2	2	2	2
2	12	11	20	15	14	12
3	14	14	4	9	10	12
Priority watersheds improved	NA	10	20	15	14	12

These results are tempered by the projection that the area of detrimental soil conditions during the first decade of the plan period for alternative D would be greater than for alternative C by nearly 18,000 acres as a result of the levels and types of vegetation management activities that are expected to occur (see table 163). The acres of detrimental soil conditions would be lowest for alternatives C (5,030 acres) and B (7,490 acres) and highest for alternatives D (22,700 acres) and E (15,230 acres). Soil compaction and loss of ground cover influence hydrologic conditions in watersheds and increase the potential for surface soil erosion. Sites of detrimental soil disturbance represent an increased risk of sediment delivery to streams when the sites occur near streams or near hydrologically connected roads. Objectives for improving soil hydrologic function in areas disturbed by management activities would be less than the acres of new disturbance for all alternatives except alternative C. Without additional actions to protect or improve soil conditions, implementing alternatives B, D, E, and F would increase the area of detrimental soil conditions by approximately 3,000, 18,700, 9,200, and 5,300 acres respectively during the first decade of the plan period.

Table 163. Acres of detrimental soil conditions and acres improved (treated) at year 10 for each alternative for the Malheur National Forest

Soil Condition	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Area disturbed	8,530	7,490	5,030	22,700	15,230	10,720
Area improved (treated)	NA	4,500	8,000	4,000	6,000	5,400

The acres of detrimental soil conditions combined with expected riparian and aquatic habitat restoration activities support that alternative C would result in the greatest improvement in watershed conditions while the least overall improvement in watershed conditions would occur for alternative D.

The difference in grazing use intensity based on differences in allowable AUMs would result in the greatest reductions in livestock use intensity for alternative C. Grazing effects for all other alternatives would be similar to the existing condition. The same relative differences in grazing use intensity would occur in upland as well as riparian habitats. Alternatives E and F would have livestock stocking levels the same as the existing condition but would implement stricter riparian utilization guidelines that would be expected to result in greater improvement in the condition of riparian habitats, including riparian shrubs.

Active restoration of riparian habitats would improve the condition of a higher percentage of riparian habitats for alternative C than for any of the other alternatives. The least improvement would occur for alternatives B and D.

Monitoring data collected for the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (PIBO) appears to show that riparian and aquatic habitat conditions in National Forest System lands in the Blue Mountains have improved since implementation of PACFISH and INFISH. Since the inception of monitoring in 2001 and based on repeat sampling of the sites through 2010, 8 of 13 habitat indicators and 9 of 11 vegetation indicators appear to be showing favorable, or upward, trends in condition. This trend is expected to continue for all alternatives, but would likely be strongest for alternative C and weakest for alternative D.

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Effects of the alternatives are described in the following order:

- Upslope conditions within watersheds are described in terms of expected changes in the condition of forested vegetation, hydrological connectivity of the road system, and grazing use intensity
- Differences between alternatives in the effects of grazing on riparian habitats
- The influence of differences in riparian habitat conservation areas (RHCAs) and riparian management areas (RMAs)
- The influence of restoration actions on riparian, stream channel, and aquatic habitat conditions
- The extent of detrimental soil conditions resulting from expected levels of timber harvest
- Changes in overall watershed conditions, considering all of the above factors

Key indicator: Vegetation condition

The percent area and average departure of each potential vegetation group within the Umatilla National Forest are displayed in table 164. Dry forest occurs within 43 percent of the Umatilla National Forest and is the most departed from the historical range of variability (HRV) of the three forested vegetation classes based on comparison to the historical range of stand density, age class structure, and species composition.

Table 164. Percent of national forest and average departure score by potential vegetation group for the Umatilla National Forest

Potential Vegetation Group	Percent of UMA	Average Departure Score
Dry forest	43%	60
Moist forest	31%	23
Cold forest	8%	13

From an analysis of vegetation data aggregated for all potential vegetation groups for the Umatilla National Forest, 36 of 129 subwatersheds have vegetation that is slightly departed from HRV, 29 subwatersheds have vegetation that is moderately departed from HRV, and vegetation in 64 subwatersheds is highly departed from HRV. The expected future change in vegetation condition, based on the modeled change in departure scores of the three dominant forest potential vegetation groups and is expressed as the change in departure scores at years 10 and 20. All of the values in table 165 represent the degree of change toward HRV, or improved vegetation condition. Alternative D, for example, would result in a 4 percent decrease in the departure of forested vegetation for the national forest at year 10, and a 7.9 percent decrease in departure of forested vegetation at year 20. Based on the analysis of forested vegetation, alternative D would result in the greatest improvement in vegetation condition and alternative C the least.

Adjusting the departure scores of forested vegetation in each subwatershed on the Umatilla National Forest by the values in table 165 results in an improvement in vegetation conditions at 10 years and 20 years as displayed in table 166 and table 167. The tables display the number of subwatersheds in each of three condition classes, by alternative, compared to the existing condition. The change, or improvement, in vegetation departure is applied to all watersheds, and represents the average condition, even though it is likely that actual vegetation conditions will vary throughout the national forest.

Table 165. Percent change in average forested vegetation departure score for each alternative for the Umatilla National Forest

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
At year 10	1.9%	2.2%	1.6%	4.0%	3.5%	2.7%
At year 20	3.9%	4.3%	3.2%	7.9%	7.1%	5.5%

Table 166. Forested vegetation condition classes and number of subwatersheds in each class at year 10 for each alternative for the Umatilla National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	36	43	43	40	52	49	43
2	29	31	31	34	26	29	31
3	64	55	55	55	51	51	55

Table 167. Forested vegetation condition classes and number of subwatersheds in each class at year 20 for each alternative for the Umatilla National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	36	52	52	49	63	60	56
2	29	26	29	25	22	24	28
3	64	51	48	55	44	45	45

At year 10 and year 20, alternative D would result in the greatest improvement in forested vegetation condition, and would result in the most watersheds with vegetation in the least departed state (condition class 1) and the fewest in the most departed state (condition class 3). Alternatives A, B, and C would result in the fewest watersheds in the least departed condition and the highest number (51, 48, and 55, respectively) in the most departed condition. Alternative E would result in the second highest number of watersheds with vegetation in the least departed condition. Alternative F would produce the next highest number of watersheds in the least departed condition class.

The condition of forested vegetation in priority watersheds, the watersheds in which restoration actions are expected to be focused, is displayed in table 168 and table 169. Because expected changes in vegetation condition during the first decade of the plan period are small, there would be only slight change in the number of priority watersheds with vegetation in condition class 1 and little change in the number of priority watersheds in condition class 3 across all of the action alternatives. In 20 years, vegetation conditions would continue to improve at a slow rate. In alternatives D, E and F the number of watersheds with forested vegetation in condition class 3 would be reduced from 10 and 11 to 7, but little change would occur in the condition classes for alternatives A, B. and C.

Table 168. Forested vegetation condition classes and number of priority watersheds in each class at year 10 for each alternative for the Umatilla National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	2	4	4	3	4	4	4
2	2	0	0	1	1	1	0
3	11	11	11	11	10	10	11

Table 169. Forested vegetation condition classes and number of priority watersheds in each class at year 20 for each alternative for the Umatilla National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	2	4	4	4	4	4	4
2	2	1	2	0	4	4	4
3	11	10	9	11	7	7	7

Key indicator: Roads

Two measures of roads, total road density and hydrologically connected roads are used in this analysis. Within the 129 subwatersheds modeled on the Umatilla National Forest there are 5,240 miles of existing roads and an average road density of 2.4 miles per square mile. The 15 priority watersheds on the Umatilla National Forest contain 840 existing road miles and have an average road density of 2.2 miles per square mile. An estimated 1,690 miles of hydrologically connected roads occur throughout the national forest, of which 358 miles are in priority watersheds. In this analysis, road density is not assumed to change by alternative. Some road decommissioning or obliteration is expected to occur under each of the alternatives, but the miles of road to be decommissioned cannot be predicted at this time. The focus of this analysis is on the treatment of hydrologically connected roads in priority watersheds.

The objectives for road related restoration and the percentage of hydrologically connected roads in priority watersheds that this represents are displayed in table 170.

Table 170. Roads treatment objectives (miles) and percent of hydrologically connected roads that would be treated in priority watersheds for the action alternatives for the Umatilla National Forest

Roads Treatment Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Roads that would be treated (miles)	260	450	800	300	270
Percent of priority watersheds	72.6%	125.6%	223.3%	83.7%	75.4%

The emphasis of road-related treatment objectives, as stated in appendix A, is to reduce road-related sedimentation by reducing the hydrological connectivity of the national forest road system. Comparing the objective levels to the estimated 358 miles of hydrologically connected roads, all such roads in priority watersheds would be treated in alternatives C and D. An additional 90 miles of hydrologically connected roads could be treated in key watersheds in alternative C and 440 miles road miles could be treated in key watersheds in alternative D in addition to road treatments in priority watersheds.

Seventy-three percent of hydrologically connected roads would be treated in alternative B, 84 percent in alternative E and 75 percent in alternative F. The existing road system extends the channel network in priority watersheds by about 26 percent. Hydrologic extension of the channel network due to national forest roads within priority watersheds would be reduced to near zero for alternatives C and D and to less than 7 percent on average for alternatives B, E, and F. Because the existing miles of hydrologically connected roads is low, the hydrologic influence of the road

system in all priority watersheds would be substantially reduced for all alternatives, resulting in improved conditions in all priority watersheds as displayed in table 171 and table 172.

Table 171. Hydrologically connected roads condition classes and number of priority watersheds in each class for the action alternatives for the Umatilla National Forest

Hydrologically Connected Roads Condition Class	Existing Condition	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	8	15	15	15	15	15
2	3	0	0	0	0	0
3	4	0	0	0	0	0

Table 172. Total roads condition classes and number of priority watersheds in each class for the action alternatives for the Umatilla National Forest

Total Roads Condition Class*	Existing Condition	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	8	15	15	15	15	15
2	3	0	0	0	0	0
3	4	0	0	0	0	0

* The total roads condition class is based on both road density and hydrologically connected roads.

Because expected road treatment miles are high relative to the estimated miles of hydrologically connected roads, the expected improvement in condition, considering roads alone, would place all priority watersheds in condition class 1. The projected treatment miles in alternatives C and D are higher than the estimate of miles of hydrologically connected roads. It is expected that road treatments would be applied to other key watersheds resulting in more watersheds in improved condition in these two alternatives.

Key Indicator: Livestock grazing

Seventy-nine percent of the Umatilla National Forest is presently considered suitable for grazing by domestic cattle or sheep. Active allotments currently occur on 60 percent of the national forest area. Acres suitable for domestic livestock would be slightly lower in alternatives B, D, E, and F compared to alternative A. Suitable acres would be lower in alternative C by nearly 60 percent and higher under alternative D by 4 percent, relative to alternative A. Existing AUMs for cattle and sheep combined are currently 37,800 (alternative A) and would be 35,600 in alternative B, and 35,800 in alternatives D, E, and F. Only 4,200 AUMs would occur in alternative C, primarily due to the restriction of grazing from watersheds that contain Endangered Species Act-listed fish species.

The change in AUM levels is used to recalculate relative forage use intensity by alternative and assumed to change in all watersheds for the purpose of this analysis. The calculation of forage use in this analysis assumes that all areas of an allotment could be used by domestic livestock but forage production in areas known to be unsuitable is given a nominal value of 50 pounds per acre per year so that most of the use is accounted for by the acres that are suitable for domestic livestock. The resulting average use intensity across all 129 subwatersheds and in priority watersheds only is displayed in table 173. Under existing conditions, no subwatersheds have apparent use intensity higher than 40 percent, the level below which available forage species would be assumed to be protected (Holechek et al. 2006). Average use levels are expected to be

slightly lower than alternative A in alternatives B, D, E, and F. Average forage use intensity would be near 1 percent for alternative C and the greatest calculated forage use intensity in any single subwatersheds would be near 2 percent.

Table 173. Average percent forage use intensity in all watersheds and in priority watersheds for each alternative for the Umatilla National Forest

Watershed	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
All watersheds	6.9%	6.5%	0.8%	6.3%	6.3%	6.3%
Priority watersheds	11.4%	10.7%	1.3%	10.4%	10.4%	10.4%

Based on livestock use alone, the number of watersheds in the Umatilla National Forest by condition class is displayed in table 174. The number of priority watersheds in each condition class is displayed in table 175.

Table 174. Rangeland condition classes (based on upland forage use intensity) and number of watersheds in each class for each alternative for the Umatilla National Forest

Rangeland Condition Class	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	103	107	129	94	107	107
2	23	21	0	28	21	21
3	3	1	0	7	1	1

Table 175. Rangeland condition classes (based on upland forage use intensity) and number of priority watersheds in each class for each alternative for the Umatilla National Forest

Rangeland Condition Class	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	8	8	15	7	8	8
2	6	7	0	4	7	7
3	1	0	0	4	0	0

The number of subwatersheds with the lowest relative use intensity (rangeland condition class 1) would be nearly equal in alternatives A, B, D, E, and F. This is true for all watersheds within the national forest, as well as for priority watersheds. For alternative C, all watersheds, including all priority watersheds would be expected to be in the highest condition class.

Livestock use of riparian areas is generally believed to be higher than use of uplands, unless specific measures (herding, off-channel water sources, fencing, etc.) are implemented (Clary and Webster 1990, Fleischner 1994, Bengeyfield 2006). Livestock forage use in riparian areas was estimated for the existing condition, but not for each alternative in this analysis. Instead, a comparison is made of allowable forage utilization in riparian areas (see table 154).

Differences in livestock use between alternatives would also be reflected in changes in forage use intensity in riparian areas. The largest relative reduction in livestock use of riparian areas would occur under alternative C due to reductions in stocking levels. Livestock forage use in all other alternatives would be similar to the existing condition except that use intensity would potentially be slightly higher in alternative D than in alternatives B, E, and F.

In alternatives B and D, utilization of woody riparian species and herbaceous vegetation would be limited to 40 percent of annual growth. The same limits would apply in alternatives E and F, with the exception that utilization limits would be lower in watersheds inhabited by bull trout, and alternative F would have slightly lower utilization limits in watersheds inhabited by anadromous fish, than would occur in alternative E. The stricter guidelines for alternatives E and F would apply in 35 subwatersheds containing bull trout (550,000 acres or 39 percent of national forest area) and 61 subwatersheds inhabited by anadromous salmon or steelhead (711,000 acres or 51 percent of national forest area).

Key indicator: Riparian habitat conservation area (RHCA) and riparian management area (RMA) acres

Present management of riparian areas under PACFISH (USDA and USDI 1995) and INFISH (USDA Forest Service 1995) includes the designation of riparian habitat conservation areas (RHCAs). RHCAs are portions or zones of watersheds where riparian-dependent resources receive primary emphasis. The zones have varying widths: 300 feet on either side of fish-bearing streams and permanently flowing non-fish-bearing streams; 150 feet from ponds, lakes, reservoirs and wetlands larger than one acre; and 100 feet if listed fish are present from seasonally flowing streams, wetlands smaller than one acre, landslides, and landslide-prone areas (50 feet if listed fish are not present).

Riparian management areas (RMAs) for alternatives B, E, and F would use the same basic definitions as RHCAs to define extent. RMAs are designated as management areas where specific desired conditions, standards, and guidelines apply. Riparian goals in PACFISH and INFISH are rearticulated as desired conditions for the action alternatives. RMA widths and extent are similar to RHCAs except that a width of 100 feet would apply to all seasonally flowing streams and small wetlands, whether or not the streams are fish-bearing. The management of RMAs and RHCAs would be similar in that work within RMAs would have to show progress towards desired conditions, and any management activity conducted within RMAs would have to be designed specifically for the benefit of aquatic and riparian-dependent resources, whereas management of RHCAs currently requires that attainment of riparian management objectives (RMOs) not be retarded (USDA Forest Service 1995).

The acres of RHCAs (alternative A) and RMAs (all action alternatives) and the minimum percent of national forest area that each would encompass are displayed in table 176.

Table 176. Riparian management area (RMA) acres and percent of Umatilla National Forest for each alternative (RHCAs for alternative A)

Alt. A RHCAs acres (%)	Alt. B RMAs acres (%)	Alt. C RMAs acres (%)	Alt. D RMAs acres (%)	Alts. E and F RMAs acres (%)
237,515(17%)	237,530 (17%)	499,781 (36%)	106,880 (8%)	237,530 (17%)

RMA acres would be greatest for alternative C, which would have 300-foot wide buffers for all streams, regardless of class. Alternative D would have the least acres within RMAs because RMA widths would be the narrowest for streams in all classes. RMA widths in alternative D are based on Oregon Forest Practices guidelines, which do not require RMAs for the smallest non-fish-bearing streams with average annual flow of less than 2 cubic feet per second. A review by the Independent Multidisciplinary Science Team (IMST 1999) of the RMAs required by the Oregon

Forest Practices Act found that RMAs required by the act were insufficient to protect aquatic habitats because they were not applied to all streams, and specifically not to non-fish-bearing streams. However, alternative D, as currently designed would still apply RMAs to intermittent and seasonally flowing streams and therefore exceeds the requirements of the Oregon Forest Practices Act.

A discussion of reviews of the effectiveness of riparian buffers is included with discussion of RMAs for the Malheur National Forest and will not be repeated here. Based on these reviews, the RMAs in alternatives B, E, and F should be protective of most riparian functions. It is expected that RMAs will be delineated during project planning and will identify areas of potentially unstable ground for inclusion within RMAs. The RMAs in alternative C would likely be the most protective of unstable areas, as described by Tang and Montgomery (1995). The RMAs defined for alternative D would be the least protective, and may not be as efficient as the RMAs in all other alternatives at preventing sediment delivery to streams or providing for inputs of large organic debris, but may still provide most other functions desired of RMAs.

Key indicator: Number of wetland sites improved

Wetlands in National Forest System lands occur in a variety of settings, not all of which are associated with streams or rivers. Based on maps provided for the National Wetland Inventory (NWI) compiled by the U.S. Fish and Wildlife Service, off-channel and isolated wetlands comprise 20 percent or more in area of all wetlands on the Umatilla National Forest. According to NWI maps, there are potentially more than 1,200 small wetlands on the Umatilla National Forest, although the accuracy of the maps is not yet determined. These wetlands are an important component of the hydrology of watersheds within the national forest but are disproportionately important, relative to their size, as habitat for a variety of plant and animal species, and in some cases include species that occur only in specific wetland types. An objective for improvements to or restoration of a small number of these sites each year is included in each alternative. Potential actions include vegetative restoration, hydrologic restoration, and protection by fencing. The objectives levels for restoration of off-channel and isolated wetlands during the first decade of the plan period are displayed in table 177.

Table 177. Objective for wetland site restoration for the action alternatives for the Umatilla National Forest

Wetland Site Restoration Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Number of sites	25	35	35	40	35

Key Indicator: Riparian and stream channel restoration

Priority watershed on the Umatilla National Forest include an estimated 240 miles of perennial streams, based on an average of 16.3 perennial stream miles in each of 15 subwatersheds. The objectives for riparian restoration range from 150 to 300 miles during the first decade of the plan period, compared to approximately 240 perennial stream miles in priority watersheds within the national forest (see table 178).

Table 178. Objective for riparian area improvement (miles) and percent of priority watershed miles that would be improved for the action alternatives for the Umatilla National Forest

Riparian Area Improvement Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Riparian area improvement in miles	150	300	150	225	210
Percent of riparian miles that would be improved (priority watersheds)	63%	125%	63%	94%	88%

The objective levels in alternative C are higher than the sum of perennial stream miles in priority watersheds by 60 miles. It is assumed that additional riparian habitat would be treated in key watersheds, so some improvement in riparian conditions would occur outside of priority watersheds. Sixty-three to 94 percent of riparian miles would be improved in alternatives A, C, E and F. It is likely that not all riparian habitats are in need of active restoration, so that the objective levels stated for each action alternative may exceed the need in priority watersheds and that improvements could be made through active restoration of riparian conditions outside of priority watersheds.

The objective levels for stream miles improved potentially include activities such as reconnection of floodplain connections, stabilizing stream banks, restoring channel morphology, and addition of large wood in streams. Because channel reconstruction is costly to design and implement, the number of miles completed in any year varies and is usually small. However, there are a variety of actions or methods that could be used place to improve stream channel and aquatic habitat conditions in lieu of channel reconstruction. The objective miles expected to be completed during the first decade of the plan period and the percentage of perennial stream miles in priority watersheds that those objectives represent are displayed in table 179.

Table 179. Objective for stream channel restoration (miles) and percent that would be improved for the action alternatives for the Umatilla National Forest

Stream Channel Restoration Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Stream channel restoration (miles)	30	55	30	45	40
Percent of stream miles that would be improved	13%	23%	13%	19%	17%

It is likely that stream channel restoration will occur through a variety of actions in addition to physical channel reconstruction. Other potential actions include placement of large wood, reconnection of side channels, conversion of water rights to restore or protect instream flows, and reintroduction of beaver to suitable sites. Replacement or removal of culverts that block access to potential habitat is also expected to occur. Redesign of road-stream crossings is also likely to contribute to improved channel and habitat conditions, both upstream and downstream of these sites. The miles displayed in table 179 are much lower than total stream miles in priority watersheds, but it is likely only a small percentage of stream channels are in actual need of this kind of restoration. Improvements to stream channel conditions will also occur in response to expected improvements in upland and riparian conditions, but may take some time to be realized. Active channel restoration is expected to occur in 13 to 19 percent of stream miles in priority

watersheds, if needed, and depending in the alternative selected. The fewest stream miles would be restored under alternatives B and D, and the most in alternatives C and E.

Key indicator: Watershed condition class: number of watersheds in improved condition

The combined effect of vegetation condition, roads, and livestock use intensity are the factors used to represent upslope condition in watersheds. The number of watersheds in each condition class for alternative A at 10 years is used as the baseline condition as forested vegetation conditions are expected to improve regardless of the alternative selected. Improvements to upland conditions will eventually contribute to improved conditions in riparian and aquatic habitats by moderating watershed hydrology, reducing the rate of watershed runoff, and reducing sediment delivery to streams.

The influence of riparian, stream channel and aquatic habitat restoration is not represented in the following tables but is expected to contribute substantially to overall watershed conditions. The influence of these actions on watershed conditions as displayed in the following tables will be described separately.

Table 180. Watershed condition classes and subwatersheds in each class along with subwatersheds improved at year 10 for each alternative for the Umatilla National Forest

Watershed Condition Class	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	32	68	83	78	70	69
2	62	46	36	39	45	45
3	35	15	10	12	14	15
Subwatersheds improved	NA	20	25	23	21	20

Table 181. Watershed condition classes and subwatersheds in each class along with subwatersheds improved at year 20 for each alternative for the Umatilla National Forest

Watershed Condition Class	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	38	76	88	90	80	78
2	66	41	31	29	37	39
3	25	12	10	10	12	12
Subwatersheds improved	NA	23	25	25	23	23

Table 182. Watershed condition classes and priority watersheds in each class along with priority watersheds improved at year 10 for each alternative for the Umatilla National Forest

Watershed Condition Class	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	1	12	15	12	14	13
2	7	3	0	3	1	2
3	7	0	0	0	0	0
Priority watersheds improved	NA	7	7	7	7	7

Table 183. Watershed condition classes and priority watersheds in each class along with priority watersheds improved at year 20 for each alternative for the Umatilla National Forest

Watershed Condition Class	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	1	13	15	14	14	13
2	7	2	0	1	1	2
3	7	0	0	0	0	0
Priority watersheds improved	NA	7	7	7	7	7

The largest change in the number of watersheds in improved condition class and the largest number of watersheds in condition class 1 would occur in alternative C in response to the higher percentage of improvements to the national forest road system in key and priority watersheds and the large reduction in livestock use. The rate of change in the condition of forested vegetation is relatively moderate, but would still result in the addition of 5 to 12 subwatersheds to condition class 1 between years 10 and 20 depending on the alternative. At year 20, the number of watersheds in each condition class would be similar in alternatives C (88) and D (90), and upslope conditions in nearly 70 percent of all subwatersheds would be in condition class 1. About 60 percent of subwatersheds would have upslope conditions in condition class 1 in alternatives B, E, and F.

No priority subwatersheds would have upslope conditions in class 3 at 10 years. Most of this change would result from improvements to the road system in these watersheds. Reductions in livestock grazing in alternative C and increases in alternative D are the main factor that would place more subwatersheds in condition class 1 in alternative C at 10 years (15) compared to alternative D (12). By year 20 there would be little difference between the alternatives in upslope conditions within priority subwatersheds.

Improvements in upslope watershed condition would be moderated by the fact that the area of detrimental soil disturbance during the first decade of the plan period is expected to be greater by nearly 7,000 acres in alternative D than in alternative C because of the levels and types of harvest that are expected to occur (see table 184). Detrimental soil conditions due to future vegetation management actions would be lowest under alternatives A (7,090 acres), F (7,690 acres), and B (7,740 acres) and highest in alternatives D (17,910 acres), E (13,480 acres), and C (11,200). Detrimental soil conditions influence hydrologic conditions in watersheds by soil compaction and loss of ground cover and an increase potential for surface soil erosion. Sites of detrimental soil disturbance represent an increased risk of sediment delivery to streams, if the sites occur near streams or to hydrologically connected roads. Objective levels for improving soil hydrologic function in areas disturbed by management activities would be lower than the acres of new disturbance in all alternatives. Unless additional actions were taken to protect or improve soil conditions, alternatives B, C, D, E, and F would results in increase in the area of detrimental soil conditions of approximately 2,700, 2,200, 13,400, 6,000, and 690 acres, respectively during the first decade of the plan period. The smallest difference in acres disturbed and acres improved would occur in alternative F, and the largest in alternative D.

Table 184. Acres of detrimental soil conditions and acres improved (treated) at year 10 for each alternative for the Umatilla National Forest

Soil Condition	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Area disturbed	8,530	7,490	5,030	22,700	15,230	10,720
Area improved (treated)	NA	4,500	8,000	4,000	6,000	5,400

The consideration of detrimental soil conditions, combined with expected riparian and aquatic habitat restoration supports the conclusion that alternative C would likely result in the greatest improvement in watershed conditions. The influence of detrimental soil conditions in alternative D would result in lower overall watershed conditions than is displayed in table 180 and table 181, but the distribution of watersheds by condition class would still be similar to alternatives B, E, and F.

Difference in grazing use intensity based on differences in allowed AUMs would result in the greatest reductions in livestock use intensity in alternative C. Grazing effects in all other alternatives would be similar to the existing condition, with the exception that grazing effects in alternative D would be higher than at present. The same relative differences in grazing use intensity would occur in upland as well as riparian habitats. Alternatives E and F would have livestock stocking levels as the existing condition but would implement stricter riparian utilization guidelines that are expected to result in greater improvement in the conditions of riparian habitats, including riparian shrubs.

Active restoration of riparian habitats would improve the condition of a higher percentage of riparian habitats under alternative C than in any of the other alternatives. Less improvement would occur in alternatives B and D.

Monitoring data collected for the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (PIBO) appears to show that riparian and aquatic habitat conditions in National Forest System lands in the Blue Mountains has improved since implementation of the aquatic conservation strategies within PACFISH and INFISH. Since the inception of monitoring in 2001, and based on repeat sampling of the sites through 2010, 8 of 13 habitat indicators and 9 of 11 vegetation indicators appear to be showing favorable, or upward, trends in condition. This trend in condition is expected to continue under all alternatives, but would likely be strongest in alternative C, and weakest in alternative D.

Wallowa-Whitman National Forest

Effects of the alternatives are described on the following order:

- Upslope conditions within watersheds are described in terms of expected changes in the condition of forested vegetation, hydrological connectivity of the road system, and grazing use intensity
- Differences between alternatives in the effects of grazing on riparian habitats
- The influence of differences in riparian habitat conservation areas and riparian management areas
- The influence of restoration actions on riparian, stream channel, and aquatic habitat conditions
- The extent of detrimental soil conditions resulting from expected levels of timber harvest

Changes in overall watershed conditions, considering all of the above factors

Key indicator: Vegetation condition

The percent area and average departure of each potential vegetation group on the Wallowa-Whitman National Forest are displayed in table 185. Dry forest occurs within 34 percent of the Wallowa-Whitman National Forest and is the most departed from the historical range of variability (HRV) for the three forested vegetation classes. The combined area of dry forest, cold forest, and moist forest comprises 70 percent of upland vegetation.

Table 185. Percent of national forest and average departure score by potential vegetation group for the Wallowa-Whitman National Forest

Potential Vegetation Group	Percent of WAW	Average Departure Score
Dry forest	34%	56
Moist forest	18%	23
Cold forest	18%	37

From an analysis of vegetation data aggregated for all potential vegetation groups for the Wallowa-Whitman National Forest, 108 of 223 subwatersheds have vegetation that is slightly departed from HRV, 40 subwatersheds have vegetation that is moderately departed from HRV, and vegetation in 75 subwatersheds is highly departed from the HRV. The expected future change in vegetation condition is based on the modeled change in departure scores of the three dominant forest potential vegetation groups, expressed as the change in departure values at 10 years and 20 years from the existing condition. All of the values displayed by alternative in table 186 represent the degree of change towards HRV, or improved vegetation class. Alternative D, for example would result in a 1.8 percent decrease in the departure of forested vegetation for the national forest at year 10, and a 3.5 percent decrease in departure of forested vegetation at year 20. Based on the analysis of forested vegetation, alternative D would result in the greatest improvement in vegetation condition and alternative C the least, although the percent improvement in vegetation conditions in all alternatives is expected to be relatively modest.

Table 186. Percent change in average forested vegetation departure score for each alternative for the Wallowa-Whitman National Forest

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
At year 10	1.1%	1.1%	0.8%	1.8%	1.5%	1.2%
At year 20	2.3%	2.3%	1.7%	3.5%	3.0%	2.4%

Adjusting the departure scores of forested vegetation in each subwatershed on the Wallowa-Whitman National Forest by the values in table 186 results in an improvement in vegetation conditions at 10 years and 20 years as displayed in table 187 and table 188. The tables display the number of subwatersheds in each of three condition classes, by alternative, compared to the existing condition. The change, or improvement, in vegetation departure is applied to all watersheds, and represents the average condition, even though it is likely that actual vegetation conditions will vary throughout the national forest.

Table 187. Forested vegetation condition classes and number of subwatersheds in each class at year 10 for each alternative for the Wallowa-Whitman National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	108	114	114	114	114	114	114
2	40	42	42	42	47	47	47
3	75	67	67	67	62	62	62

Table 188. Forested vegetation condition classes and number of subwatersheds in each class at year 20 for each alternative for the Wallowa-Whitman National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	108	116	116	114	121	121	116
2	40	48	48	47	49	43	48
3	75	59	59	62	53	59	59

At year 10, more watersheds would have vegetation in the least departed condition (condition class 1), but there would be little difference in condition between alternatives. At 20 years, more watersheds would have vegetation in condition class 1 with alternatives D and E (121). Alternative C would have the fewest watersheds in condition class 1 and the most in the most departed state (condition class 3), but difference in vegetation conditions at 20 years between alternatives would remain relatively small due to the relatively slow rate of improvement in vegetation conditions within the national forest.

The condition of forested vegetation in priority watersheds, the watersheds in which restoration actions are expected to be focused, is displayed in table 189 and table 190. Improvements in vegetation conditions at 10 years and 20 years are slight, or no change in the distribution of watersheds by condition class would occur between year 10 and year 20 because the existing condition of vegetation in most priority watersheds is only slightly departed from the historic range. At both year 10 and year 20, 22 of 27 priority watersheds would have vegetation in condition class 1 and only 1 in condition class 3.

Table 189. Forested vegetation condition classes and number of priority watersheds in each class at year 10 for each alternative for the Wallowa-Whitman National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	21	22	22	22	22	22	22
2	5	4	4	4	4	4	4
3	1	1	1	1	1	1	1

Table 190. Forested vegetation condition classes and number of priority watersheds in each class at year 20 for each alternative for the Wallowa-Whitman National Forest

Forested Vegetation Condition Class	Existing Condition	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	21	22	22	22	22	22	22
2	5	4	4	4	4	4	4
3	1	1	1	1	1	1	1

Key indicator: Roads

Two measures of roads, total road density and hydrologically connected roads are used in this analysis. Within the 223 subwatersheds modeled on the Wallowa-Whitman National Forest there are 10,600 miles of existing roads and an average road density of 3.2 miles per square mile. The 27 priority watersheds on the Wallowa-Whitman National Forest contain 2,141 existing road miles and have an average road density of 3.2 miles per square mile. An estimated 4,226 miles of hydrologically connected roads occur within the national forest, of which 829 miles are in priority watersheds. In this analysis, road density is assumed not to change by alternative. Some road decommissioning or obliteration is expected to occur under each of the alternatives, but the miles of road to be decommissioned cannot be predicted at this time. The focus of this analysis is on the treatment of hydrologically connected roads in priority watersheds.

The objectives for road related restoration and the percentage of hydrologically connected roads in priority watersheds that this represents are displayed in table 191.

Table 191. Roads treatment objectives (miles) and percent of hydrologically connected roads that would be treated in priority watersheds for the action alternatives for the Wallowa-Whitman National Forest

Roads Treatment Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Roads that would be treated (miles)	260	450	800	300	270
Percent of priority watersheds	72.6%	125.6%	223.3%	83.7%	75.4%

The emphasis of road-related treatment objectives, as stated in appendix A, is to reduce road-related sedimentation by reducing the hydrological connectivity of the national forest road system. Comparing the objective levels to the estimated 830 miles of hydrologically connected roads, approximately 97 percent would be treated under alternative D, and 48 percent under alternative C, 36 percent would be treated under alternative E, 32 percent in alternative F and 31 percent in alternative A.

The existing road system extends the channel network in priority watersheds by an average 43 percent. Hydrologic extension of the channel network due to national forest roads would be reduced to near zero in alternative D, to 36 percent in alternatives B and F, to 28 percent in alternative C, and to 34 percent in alternative E. The hydrologic connectivity of the road system would be substantially reduced under all alternatives, with the largest changes expected in alternatives D (95 percent) and 64 to 72 percent in all other alternatives). The influence of national forest roads on watershed condition would be similar between alternatives B, E, and F after objectives are met. The influence of the national forest road system on watershed conditions

would be negligible in all 27 priority watersheds in alternative D and 18 of 27 priority watersheds in alternative C. The hydrologic influence of the road system would be small in 9, 11, and 10 subwatersheds, respectively for alternatives B, E, and F (see table 192).

Table 192. Hydrologically connected roads condition classes and number of priority watersheds in each class for the action alternatives for the Wallowa-Whitman National Forest

Hydrologically Connected Roads Condition Class	Existing Condition	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	3	9	18	27	11	10
2	8	10	4	0	9	10
3	16	8	5	0	7	7

Because existing road density in priority watersheds would remain relatively high and is assumed to change very little in this analysis, the road system is still expected to have some effect on watershed conditions as displayed in the distribution of watersheds by condition class in table 193. The largest improvement in condition class would still occur in alternative D, and the next highest in alternative C. Alternatives B, E, and F would still result in improvements in road-related conditions compared to existing conditions.

Table 193. Total roads condition classes and number of priority watersheds in each class for the action alternatives for the Wallowa-Whitman National Forest

Total Roads Condition Class*	Existing Condition	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	1	3	3	5	3	3
2	6	7	13	22	8	8
3	20	17	11	0	16	16

* The total roads condition class is based on both road density and hydrologically connected roads.

Key Indicator: Livestock grazing

Twenty-eight percent of the Wallowa-Whitman National Forest is presently considered suitable for grazing by cattle or sheep. Active allotments currently occur on 55 percent of the national forest. Approximately 433,000 acres of the national forest would be considered suitable for livestock grazing for alternatives A, B, E and F. A total of 447,000 acres would be considered suitable for alternative D (38 percent of the national forest) and 157,000 acres for alternative C (9 percent of the national forest).

Allowable AUMs for cattle and sheep combined are currently 81,500 (alternative A) and would be 77,500 in alternative B; 29,500 with alternative C; 84,500 in alternative D; and 80,500 in alternatives E and F. AUMs would be 74 percent lower in alternative C and 4 percent higher in alternative D than in the other alternatives. The change in AUM levels is used to recalculate relative forage use intensity by alternative and assumed to change in all watersheds for the purpose of this analysis. Average use intensity would be 25 percent in alternative D across all grazed watersheds, but would be 17 percent in priority watersheds. Average use intensity in priority watersheds would be 12 percent in alternatives A, B, E and F and 3 percent in alternative C.

The calculation of forage use in this analysis assumes that all areas of an allotment could be used by domestic livestock but forage production in areas known to be unsuitable is given a nominal value of 50 pounds per acre per year so that most of the use is accounted for by the acres that are suitable for domestic livestock. The resulting average use intensity across all 223 subwatersheds and in priority watersheds only is displayed in table 194. Under existing conditions, 31 of 223 subwatersheds have apparent use intensity higher than 40 percent. Average use levels are expected to be similar in alternatives A, D, E, and F (17 percent), and slightly lower in alternative B (16 percent). Average forage use intensity would be 6 percent in alternative C and two watersheds would potentially have use intensities higher than 40 percent.

Table 194. Average percent forage use intensity in all watersheds and in priority watersheds for each alternative for the Wallowa-Whitman National Forest

Watershed	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
All watersheds	17.0%	16.2%	6.2%	17.6%	17.0%	17.0%
Priority watersheds	12.0%	11.4%	4.3%	12.4%	12.0%	12.0%

Based on livestock use alone, the numbers of watershed on the Wallowa-Whitman National Forest by condition class are displayed in table 195. The number of priority watersheds in each condition class is displayed in table 196.

Table 195. Rangeland condition classes (based on upland forage use intensity) and number of watersheds in each class for each alternative for the Wallowa-Whitman National Forest

Rangeland Condition Class	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	131	131	209	119	131	131
2	40	40	10	33	40	40
3	52	52	4	71	52	52

Table 196. Rangeland condition classes (based on upland forage use intensity) and number of priority watersheds in each class for each alternative for the Wallowa-Whitman National Forest

Rangeland Condition Class	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
1	14	14	27	14	14	14
2	11	11	0	6	11	11
3	2	2	0	7	2	2

The number of subwatersheds with the lowest relative use intensity would be nearly equal in alternatives A, B, E and F (131 of 223). This is true for all watersheds within the national forest as well as for priority watersheds. In alternative C, all priority watersheds and nearly all other watersheds would be expected to be in the highest condition class.

Livestock use of riparian areas is generally believed to be higher than in uplands unless specific measures (herding, off-channel water sources, fencing, etc.) are implemented (Clary and Webster 1990, Fleischner 1994, Bengeyfield 2006). Livestock forage use in riparian areas was estimated for the existing condition but not for each alternative in this analysis. Instead, a comparison is made of allowable forage utilization in riparian areas (see table 154).

Differences in livestock use between alternatives would also be reflected in changes in forage use intensity in riparian areas. The largest relative reduction in livestock use of riparian areas would occur under alternative C due to reductions in stocking levels. Livestock forage use in all other alternatives would be similar to the existing condition except that use intensity would potentially be slightly higher in alternative D than in alternatives B, E, and F.

In alternatives B and D, utilization of woody riparian species and herbaceous vegetation would be limited to 40 percent of annual growth. The same limits would apply in alternatives E and F, with the exception that utilization limits would be lower in watersheds inhabited by bull trout, and alternative F would have slightly lower utilization limits in watersheds inhabited by anadromous fish. The stricter guidelines in alternatives E and F would apply in 53 subwatersheds containing bull trout (640,000 acres, 36 percent of forest area) and 88 subwatersheds inhabited by anadromous salmon or steelhead (905,000 acres, 50 percent of forest area).

Key indicator: Riparian habitat conservation area (RHCA) and riparian management area (RMA) acres

Present management of riparian areas under PACFISH (USDA and USDI 1995) and INFISH (USDA Forest Service 1995) includes the designation of riparian habitat conservation areas (RHCAs). RHCAs are portions or zones of watersheds where riparian-dependent resources receive primary emphasis. The zones have varying widths: 300 feet on either side of fish-bearing streams and permanently flowing non-fish-bearing streams; 150 feet from ponds, lakes, reservoirs and wetlands larger than one acre; and 100 feet if listed fish are present from seasonally flowing streams, wetlands smaller than one acre, landslides, and landslide-prone areas (50 feet if listed fish are not present).

Riparian management areas (RMAs) for alternatives B, E, and F would use the same basic definitions as RHCAs to define extent. RMAs are designated as management areas where specific desired conditions, standards, and guidelines apply. Riparian goals in PACFISH and INFISH are rearticulated as desired conditions for the action alternatives. RMA widths and extent are similar to RHCAs except that a width of 100 feet would apply to all seasonally flowing streams and small wetlands, whether or not the streams are fish bearing. The management of RMAs and RHCAs would be similar in that work within RMAs would have to show progress towards desired conditions, and any management activity conducted within RMAs would have to be designed specifically for the benefit of aquatic and riparian-dependent resources, whereas management of RHCAs currently requires that attainment of riparian management objectives not be retarded (USDA Forest Service 1995).

The acres of RHCAs (alternative A) and RMAs (all action alternatives) and the minimum percent of forest area that each would encompass are displayed in table 197.

Table 197. Acres and percent of national forest area in RMAs for each alternative (RHCAs for alternative A) for the Wallowa-Whitman National Forest

Alt. A RHCAs acres (%)	Alt. B RMAs acres (%)	Alt. C RMAs acres (%)	Alt. D RMAs acres (%)	Alts. E and F RMAs acres (%)
360,123 (20%)	362,520 (20%)	727,527 (40%)	162,932 (9%)	360,123 (20%)

RMA acres would be greatest for alternative C, which would have 300-foot wide buffers for all streams, regardless of class. Alternative D would have the least acres within RMAs because RMA

widths would be the narrowest for streams in all classes. RMA widths in alternative D are based on Oregon Forest Practices guidelines, which do not require RMAs for the smallest non-fish-bearing streams with average annual flow of less than 2 cubic feet per second. A review by the Independent Multidisciplinary Science Team (IMST 1999) of the RMAs required by the Oregon Forest Practices Act found that RMAs required by the act were insufficient to protect aquatic habitats because they were not applied to all streams, and specifically not to non-fish-bearing streams. However, alternative D, as currently designed would still apply RMAs to intermittent and seasonally flowing streams and therefore exceeds the requirements of the Oregon Forest Practices Act.

A discussion of reviews of the effectiveness of riparian buffers is included with discussion of RMAs for the Malheur National Forest and will not be repeated here. Based on these reviews, the RMAs in alternatives B, E, and F should be protective of most riparian functions. It is expected that RMAs will be delineated during project planning and will identify areas of potentially unstable ground for inclusion within RMAs. The RMAs in alternative C would likely be the most protective of unstable areas, as described by Tang and Montgomery (1995). The RMAs defined for alternative D would be the least protective, and may not be as efficient as the RMAs in all other alternatives at preventing sediment delivery to streams or providing for inputs of large organic debris, but may still provide most other functions desired of RMAs.

Key indicator: Number of wetland sites improved

Wetlands in National Forest System lands occur in a variety of settings, not all of which are associated with streams or rivers. Based on maps provided for the National Wetland Inventory compiled by the U.S. Fish and Wildlife Service, off-channel and isolated wetlands comprise 40 percent or more in area of all wetlands on the Wallowa-Whitman National Forest. According to National Wetland Inventory maps, there are potentially 3,000 small wetlands on the Wallowa-Whitman National Forest, although the accuracy of the maps is not yet determined. These wetlands are an important component of the hydrology of watersheds on the forest but are disproportionately important, relative to their size, as habitat for a variety of plant and animal species, and in some cases include species that occur only in specific wetland types. An objective for improvements to or restoration of a small number of these sites each year is included in each alternative. Potential actions include vegetative restoration, hydrologic restoration, and protection by fencing. The objectives levels for restoration of off-channel and isolated wetlands during the first decade of the plan period are displayed in table 198.

Table 198. Objective for wetland site restoration for the action alternatives for the Wallowa-Whitman National Forest

Wetland Site Restoration Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Number of sites	25	35	35	40	35

Key Indicator: Riparian and stream channel restoration

Priority watershed on the Wallowa-Whitman National Forest include an estimated 440 miles of perennial streams, based on an average of 16.3 perennial stream miles in each of 26 subwatersheds. The objectives for riparian restoration range from 250 to 500 miles during the first decade of the plan period, compared to approximately 440 perennial stream miles in priority watersheds within the national forest (see table 199).

Table 199. Objective for riparian area improvement (miles) and percent of priority watershed miles that would be improved for the action alternatives for the Wallowa-Whitman National Forest

Riparian Area Improvement Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Riparian area improvement in miles	250	500	250	375	350
Percent of riparian miles that would be improved (priority watersheds)	57%	114%	57%	85%	80%

The objective levels in alternatives C are higher than the sum of perennial stream miles in priority watersheds by 60 miles. It is assumed that an equivalent number of miles of riparian habitats would be treated in other key watersheds, so some improvement in riparian conditions would occur outside of priority watersheds. It is also likely that not all riparian habitats are in need of active restoration, so that the objective levels stated may exceed the need in priority watersheds and that more restoration work could be accomplished outside of priority watersheds.

The objective levels for stream miles improved potentially include activities such as reconnection of floodplain connections, stabilizing stream banks, restoring channel morphology, and addition of large wood in streams. Because channel reconstruction is costly to design and implement, the number of miles completed in any year varies and is usually small. However, there are a variety of actions or methods that could be used place to improve stream channel and aquatic habitat conditions in lieu of channel reconstruction. The objective miles expected to be completed during the first decade of the plan period and the percentage of perennial stream miles in priority watersheds that those objectives represent are displayed in table 200.

Table 200. Objective for stream channel restoration (miles) and percent that would be improved for the action alternatives for the Wallowa-Whitman National Forest

Stream Channel Restoration Objective (first decade)	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Stream channel restoration (miles)	40	60	40	60	50
Percent of stream miles that would be improved	9%	14%	9%	14%	11%

It is likely that stream channel restoration will occur through a variety of actions in addition to physical channel reconstruction. Other potential actions include placement of large wood, reconnection of side channels, conversion of water rights to restore or protect instream flows, and reintroduction of beaver to suitable sites. Replacement or removal of culverts that block access to potential habitat is also expected to occur. Re-design of road-stream crossings is also likely to contribute to improved channel and habitat conditions, both upstream and downstream of these sites. The miles displayed in table 200 are much lower than total stream miles in priority watersheds, but is likely that only a small percentage of stream channels are in actual need of this kind of restoration. Improvements to stream channel conditions will also occur in response to expected improvements in upland and riparian conditions, but may take some time to be realized. Active channel restoration is expected to occur in 9 to 14 percent of stream miles in priority watersheds, depending in the alternative selected. The fewest stream miles would be restored under alternatives B and D, and the most in alternatives C and E.

Key indicator: Watershed condition class: number of watersheds in improved condition

The combined effect of vegetation condition, roads, and livestock use intensity are the factors used to represent upslope condition in watersheds. For this part of the analysis only, the number of watersheds in each condition class in alternative A at 10 years is used as the baseline condition as forested vegetation conditions are expected to improve regardless of the alternative selected. Improvements to upland conditions will eventually contribute to improved conditions in riparian and aquatic habitats by moderating watershed hydrology, reducing the rate of watershed runoff, and reducing sediment delivery to streams.

The influence of riparian, stream channel and aquatic habitat restoration is not represented in the following tables but is expected to contribute substantially to overall watershed conditions. The influence of these actions on watershed conditions as displayed in the following tables will be described separately.

Table 201. Watershed condition classes and subwatersheds in each class along with subwatersheds improved at year 10 for each alternative for the Wallowa-Whitman National Forest

Watershed Condition Class	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	80	78	87	86	78	78
2	83	89	90	79	90	89
3	60	56	46	58	55	56
Subwatersheds improved	NA	4	14	2	5	4

Table 202. Watershed condition classes and subwatersheds in each class along with subwatersheds improved at year 20 for each alternative for the Wallowa-Whitman National Forest

Watershed Condition Class	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	82	80	87	88	80	80
2	85	89	90	80	91	90
3	56	54	46	55	52	53
Subwatersheds improved	NA	6	14	5	8	7

For watersheds across the forest (table 201) the largest change in the number of watersheds in improved condition class occurs in alternatives C (87) and D (86). The relatively large reduction in grazing intensity in alternative C is offset by the larger reduction in hydrologically connected roads in alternative D and there would be little difference in change in forested vegetation conditions by year 10.

Continued improvements in forested vegetation conditions would result in modest changes in the distribution of watershed conditions by year 20 with small increases in the number of watersheds in condition class 1 in alternatives between year 10 and year 20. The changes are small because the improvement in vegetation would be only 1 to 2 percent in 10 years for any alternative. Alternative C would result in the most watersheds in improved condition, but alternative D would result in more watersheds (88 versus 87) in condition class 1 than would alternative C.

In priority watersheds, alternative D would have the highest number of watersheds in condition class 1 (14) at year 10 and result in the most watersheds in improved condition (8). The

distribution of priority watersheds by condition class would be nearly the same in all other alternatives, with 4 to 6 subwatersheds in condition class 1 and 18 to 19 in condition class 2.

Table 203. Watershed condition classes and priority watersheds in each class along with priority watersheds improved at year 10 for each alternative for the Wallowa-Whitman National Forest

Watershed Condition Class	Alt. A Yr. 10	Alt. B Yr. 10	Alt. C Yr. 10	Alt. D Yr. 10	Alt. E Yr. 10	Alt. F Yr. 10
1	4	5	6	14	5	5
2	15	18	19	13	19	18
3	8	4	2	0	3	4
Priority watersheds improved	NA	4	6	8	5	4

Table 204. Watershed condition classes and priority watersheds in each class along with priority watersheds improved at year 20 for each alternative for the Wallowa-Whitman National Forest

Watershed Condition Class	Alt. A Yr. 20	Alt. B Yr. 20	Alt. C Yr. 20	Alt. D Yr. 20	Alt. E Yr. 20	Alt. F Yr. 20
1	4	5	6	14	5	5
2	17	18	19	13	19	19
3	6	4	2	0	3	3
Priority watersheds improved	NA	4	6	8	5	5

These results need to be tempered by the fact that the area of detrimental soil disturbance during the first decade of the plan period is expected to be greater by 16,000 acres in alternative D than in alternative C because of the levels and types of harvest that are expected to occur (see table 205). Detrimental soil conditions due to future vegetation management actions would be lowest under alternatives C (3,730 acres) and B (7,530 acres), and highest in alternatives D (19,480 acres) and E (12,680 acres). Detrimental soil conditions influence hydrologic conditions in watersheds by soil compaction and loss of ground cover and an increase potential for surface soil erosion. Sites of detrimental soil disturbance represent an increased risk of sediment delivery to streams, if the sites occur near streams or hydrologically connected roads. Objective levels for improving soil hydrologic function in areas disturbed by management activities would be lower than the acres of new disturbance in all alternatives except C. Unless additional actions were taken to protect or improve soil conditions, alternatives B, D, E, and F would results in increase in the area of detrimental soil conditions of approximately 1,000, 14,000, 3,000, and 600 acres, respectively during the first decade of the plan period.

Table 205. Acres of detrimental soil conditions and acres improved (treated) at year 10 for each alternative for the Wallowa-Whitman National Forest

Soil Condition	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Area disturbed	6,740	7,530	3,730	19,480	12,680	9,120
Area improved (treated)	NA	6,500	12,000	6,000	9,500	8,500

The inclusion of detrimental soil conditions, combined with expected riparian and aquatic habitat restoration supports the conclusion that alternative C would likely result in the greatest improvement in watershed conditions and that the least overall improvement in watershed conditions would likely occur under alternative D. Alternatives C, E, and F would all improve a

higher percentage of riparian miles than would alternative D and result in more improvement in aquatic and riparian habitats than either alternative D or B.

Difference in grazing use intensity based on differences in allowed AUMs would result in the greatest reductions in livestock use intensity in alternative C. Grazing effects in all other alternatives would be similar to the existing condition, with the exception that grazing effects in alternative D would be higher than at present. The same relative differences in grazing use intensity would occur in upland as well as riparian habitats. Alternatives E and F would have livestock stocking levels as the existing condition but would implement stricter riparian utilization guidelines that are expected to result in greater improvement in the conditions of riparian habitats, including riparian shrubs.

Monitoring data collected for the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (PIBO) appears to show that riparian and aquatic habitat conditions in National Forest System lands in the Blue Mountains has improved since implementation of the aquatic conservation strategies within PACFISH and INFISH. Since the inception of monitoring in 2001, and based on repeat sampling of the sites through 2010, 8 of 13 habitat indicators and 9 of 11 vegetation indicators appear to be showing favorable, or upward, trends in condition. This trend in condition is expected to continue under all alternatives, but would likely be strongest in alternative C, and weakest in alternative D.

Cumulative Effects

Watershed Condition

For the purpose of assessing cumulative watershed effects, the spatial boundary is the extent of the 25 sub-basins listed in table 131. The temporal boundary is the 10 to 20 year period over which the selected alternative would be implemented.

This analysis has used the results of a model (EMDS, Reynolds 2006; Gecy 2013a) that considers the combined effects of changes in forest vegetation condition, changes in road density and connectivity to channel networks, and differences in grazing practices to assess differences in overall watershed (hillslope) conditions between alternatives. Model output is combined with an assessment of watershed, soil, riparian, and stream channel restoration to assess the overall outcomes of implementing each alternative for each forest at 10 years and 20 years. It is assumed in this analysis that all proposed restoration work, as stated in the objectives, will be implemented in 10 years and that all restoration will be focused in priority watersheds. Further, when that work is completed, it is expected that a new set of priority watersheds will be identified by the forests and needed restoration work will continue.

The modeled values used in this analysis account for 50 percent of overall watershed condition scores. Riparian condition, and stream channel/aquatic habitat conditions for the remaining 50 percent and were only modeled for the existing condition.

In this analysis, road density and hydrologically connected roads account for 60 percent of the model scores presented in this analysis, with road density and miles of hydrologically connected roads weighted equally. Road density is not assumed to change in the model because in recent years few road miles have been officially decommissioned by the three forests. The model results show, and study results (Nelson et al. 2011) support, that treating hydrologically connected roads has a positive effect on watershed condition. Road decommissioning would have a similar positive result on watershed condition with two main differences: (1) existing studies appear to consistently show that a high percentage of road-related sediment is produced by a relatively

small percentage of the road network, making it likely that, mile for mile, road decommissioning will not have as much influence on improving watershed conditions as would focusing on the roads that have the greatest effect; and, (2) road decommissioning, however it is accomplished, is more expensive, per mile, than treating hydrologically connected roads, with cost differences that may be higher by a factor of 10 or more, making it likely that an emphasis on road decommissioning would result in a slower rate of improvement, or less improvement in condition over time. However, both road decommissioning and the treatment of hydrologically connected roads will result in improved watershed condition, watershed function, and water quality resulting from reduced sediment delivery to streams, although there may be benefits to other resources from reducing the size of the forest road network that are not part of this analysis.

Forested vegetation condition, expressed as the percent departure from the historical range of variability, accounts for 27 percent of the model scores used in this analysis. Fire regime condition class departure scores for forested vegetation were calculated using methods described in Barrett et al. 2010) and imported into EMDS. The departure score partially substitutes for an assessment of past land use, fire, insect and disease, and other disturbances because they influence the fire regime condition class results. Vegetation condition is expected to improve in all alternatives, but at varying rates. Improvement in forested vegetation conditions would also contribute to improved riparian conditions resulting in more riparian shade, increased channel stability from higher inputs of large wood, and other effects, although some changes may occur over longer time spans than the expected 10-20 year duration of the proposed plan. A potential mechanism of improved riparian conditions in areas of highly-departed dry forest is moving these stands from existing overstocked, dense stands of younger trees towards open stands of old trees. Liquori and Jackson (2001) have shown that areas that historically had open stands of Ponderosa pine along streams often had willow species in the understory, and that stream reaches with willows had much lower width-depth ratios (narrower channels) than streams lined with dense stands of young Ponderosa pine.

Grazing use intensity accounts for 13 percent of the model scores presented in this analysis and is defined by Holechek et al. (2006) as the percentage of the long-term average forage production that is used by livestock. This analysis is based on an average forage production and it the year-to-year variability of forage production is not known. Holechek et al. (2006) suggest that grazing impacts to forage species may be positive if forage use is less than 40 percent of average production, but recognize that the research in support of this view is limited. This analysis assumes, based on available research, that grazing impacts to riparian vegetation are likely to be higher than to upland vegetation, because riparian sites are preferred by cattle (e.g. Gillen et al. 1984), but that grazing impacts to riparian areas also depend on how individual allotments are managed. The results of this analysis show that alternatives with lower grazing use intensity (alternative C) would have more of a positive effect on watershed and riparian conditions than alternatives with higher grazing use intensity (alternatives B, D, E, F).

Watershed restoration is expected to be focused in 69 selected priority watersheds in National Forest System lands over the next 10 years. The rationale for focusing watershed restoration in a smaller set of watersheds is that restoration work is expected to be more effective at achieving desired conditions if work is focused on smaller areas at one time, rather than spread across whole forests. In addition, 157 watersheds are named as key watersheds, which represent areas with good existing aquatic and riparian habitat conditions and expected to act as anchors of existing good habitat conditions for anadromous and resident fish species. Emphasis in key watersheds is in maintaining or improving existing conditions. Priority watersheds, key watersheds, desired conditions, and standards and guidelines that address the protection and

management of watersheds, riparian areas, and aquatic habitats are part of a region-wide strategy and are expected to be incorporated into the land management plans of all national forests in the Pacific Northwest region as these forests revise their land management plans.

The U.S. Bureau of Land Management (BLM) manages more than 2 million acres of lands in the analysis area. Livestock grazing is the dominant land use of these lands, but BLM lands are also managed for multiple uses including wildlife habitat, recreation, development of energy and mineral resources, and other uses. Within watershed occupied by bull trout and anadromous fish, BLM has management direction for riparian areas that is similar to management direction in National Forest System lands.

A number of other federal, state, tribal, and private agencies or organizations are actively engaged in stream and watershed restoration, or provide funding for watershed-related work, some of which occurs in National Forest System lands, with the rest occurring primarily on private lands downstream of National Forest System lands. These entities include the Bureau of Land Management, the Bonneville Power Administration, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs Indian Reservation, watershed councils, and other local and national organizations. In addition, Federal funding available to the forests is often leveraged with funding from other sources to conduct watershed-related restoration. Watershed councils exist for nearly every subbasin in the Blue Mountains and have defined restoration needs at the sub-basin scale needed to restore aquatic and riparian habitat conditions. The Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation, and Confederated Tribes of the Warm Springs Indian reservation are active partners with the three national forests and conduct habitat-related restoration in the Middle Fork John Day River, Umatilla River, Grande Ronde River, Imnaha River and other locations in the Blue Mountains. The three Native American tribes have active restoration programs in the Blue Mountains that contribute to improved watershed, riparian and aquatic habitat conditions in or adjacent to National Forest System lands.

Watershed-related restoration work by other entities complements work performed by the Forest Service and contributes to improved watershed, riparian, and aquatic habitat conditions. Most of this work is expected to occur in lands or along rivers downstream of National Forest System lands. It is expected that this work will continue regardless of the alternative selected, but alternatives with higher emphasis on watershed restoration of National Forest System lands are more likely to attract partnership funding by entities outside of the Forest Service.

Water Quality and Water Uses

Streams within National Forest System lands in the Blue Mountains that do not meet state water quality criteria are generally listed on state 303d lists due to high stream temperatures or high suspended sediment loads, or both. Within National Forest System lands, it is assumed that improvements in overall watershed condition will contribute to improved water quality of streams within individual forests, and that improvement in forested vegetation condition and decrease of the influence of forest roads will contribute to improved water quality.

Both Oregon Department of Environmental Quality and Washington Department of Ecology base their analyses of Total Maximum Daily Loads (TMDL) on the maintenance of stream shade provided by riparian vegetation. Both agencies acknowledge a number of other factors that contribute to increased stream temperatures, but recognize that improvements to or increases in riparian conditions and stream shade are more likely to result in improvements to water quality.

Downstream of the forests, livestock grazing is the dominant land use on BLM lands, and livestock grazing and irrigated agriculture are the dominant uses of most private lands within the analysis area. Water withdrawals affect stream temperature by reducing the volume of flow and increasing the effect of solar radiation on stream temperature. Water withdrawals affect stream temperature indirectly by decreasing the integrity of riparian vegetation and decreasing bank stability. Based on data for the 1995 water year, water withdrawals from all basins totaled 2.7 million acre-feet, or 38 percent of total runoff (Solley et al. 1998). Consumptive use was 1.3 million acre-feet, or 18 percent of total runoff. Because more than 90 percent of water in the Blue Mountains is used for irrigation, most water is diverted during the growing season with diversion beginning on March 15 or April 1 and ending September 30 or October 15, depending on the basin and state water right duty schedules. Water withdrawals have the greatest effect on water volume at the same time, July and August, when air temperatures and solar radiation are highest. On average, consumptive water use during the growing season is nearly 60 percent of total streamflow from all rivers and exceeds 90 percent in some river basins with the largest areas in irrigated agriculture.

The influence of National Forest System management on downstream water quality varies by river basin, the extent of downstream water use, the season of use, and the volume of flow relative to the flow of receiving waters. Rivers that begin in National Forest System lands in the Blue Mountains drain to the Snake River, Columbia River, or to the Closed Basins of eastern Oregon. The total flow of all rivers that begin in National Forest System lands is about 5.5 percent of the flow of the Columbia River at the Dalles, Oregon. The effect of individual rivers on downstream water quality also varies because they enter the Snake or Columbia rivers at different points; effects are further moderated by management of dams for hydroelectric power and flood control is a dominant effect on flow and sediment regimes of the larger rivers.

The extent of cumulative effects for individual rivers, discussed in upstream to downstream order, is further modified as follows:

- Silver Creek and Silvies River flow into the Harney-Malheur Lakes closed basins. During the summer growing season, much of the flow of both rivers is used for irrigation before entering either lake, though the effect is stronger Silver Creek above Harney Lake. Effects to water quantity and quantity do not extend beyond Malheur Lake because it has no outlet.
- Tributaries of the North Fork Malheur River flow to Warm Springs Reservoir and tributaries of the North Fork Malheur flow to Beulah Reservoir before entering the Snake River. Both reservoirs are used to store water for irrigation. The reservoirs strongly modify any potential water quality (sediment, nutrient, thermal) or quantity effect of upstream waters on the Snake River because the reservoir traps inflowing sediment and the dam regulates downstream flow.
- The North and South Forks of Burnt River flow to Unity Reservoir and the stored water is used for irrigation on private lands along the lower Burnt River. The Burnt River flows through geologic formations containing mercury. Limestone is quarried near Durkee, Oregon for use in cement manufacturing and mercury-laden residue enters the river. The lower 45 miles of Burnt River are not listed as water quality limited due to the presence of mercury by Oregon DEQ, but are of special concern.
- Stream flow in the upper Powder River is stored in Phillips Reservoir and is used for irrigation in Baker Valley. Tributaries to the Powder River that begin in the Elkhorn Mountains flow to the Powder River above Thief Valley Reservoir, which also stores water for irrigation along the lower Powder River. Burnt River, Powder River, and Eagle Creek enter the Snake River above Brownlee Dam. Pine Creek enters the Snake River below

Oxbow Dam. Burnt River contributes mercury to Oxbow reservoir, but there are other sources of mercury to the Snake River, so the effect of water from the Burnt River on water quality is not completely known. Burnt River, Powder River, Eagle Creek, and Pine Creek may have localized effects on water quality at and downstream of the points where they enter the Snake River, but have little effect on water quantity downstream of the Hell's Canyon complex of dams due to the effect that those dams have on downstream flow regulation.

- The upper Wallowa River flows to Wallowa Lake and water is diverted for irrigation at several points along the river, beginning immediately below the outlet of Wallowa Lake. The Imnaha River, all other tributaries of the Grande Ronde River, and Asotin Creek enter the Snake River above Lower Granite Dam. Sediment effects are limited to the pool behind Lower Granite Dam. Thermal water quality effects are limited by the entry to the same reach of the Salmon, Little Salmon, and Clearwater Rivers from the Idaho side of the Snake River. The Lower Granite pool acts as a heat sink that further limits the water temperature effect of the Grande Ronde and Imnaha Rivers, which otherwise provide water that is cooler than the Snake River.
- The Tucannon River enters the Snake River above Lower Monumental Dam. The flow of the Tucannon is small relative to the Snake River, so its effects on both water quantity and quality are limited.
- The Walla Walla and Umatilla Rivers enter the Columbia River downstream of the confluence of the Columbia and Snake Rivers and above McNary dam. Water in both basins is heavily used for irrigation. However, due to a recent water rights exchange, some of the water used for irrigation in the Umatilla basin now comes directly from the Columbia River in order to preserve instream flows for anadromous fish in the Umatilla River.
- Willow Creek and the John Day River enter the Columbia River above the John Day dam. The drainage area and streamflow of Willow Creek are both small. A dam above Heppner, Oregon regulates the flow and most water is used for irrigation lower in the basin. Outflow to the Columbia River is very small and Willow Creek has a negligible effect on either water quantity or quality in the Columbia River. Water from the John Day River is diverted for irrigation use during the growing season. Water temperatures in the lower river exceed 80 degree Fahrenheit in summer months, based on data available from the U.S. Geological Survey. During high flows, a plume of suspended sediment enters the Columbia River from the John Day River that is mostly derived from highly erodible sedimentary and volcaniclastic rocks in the area surrounding the John Day Fossil Beds National Monument. The plume is confined to the south bank of the Columbia River and may extend for a few miles downstream during the highest flow events, but does not extend below the John Day dam.
- Water flowing in the Snake and Columbia Rivers is regulated for hydropower generation and flood control. The reservoirs, or pools, behind each dam act as thermal sinks that have a substantial effect on water temperature and stream ecology. Water in the rivers that emanate from the national forests in the Blue Mountains is generally of high quality, though reaches in each river are listed as water quality limited for stream temperature and some are also listed for sediment. For most of the year, stream temperatures of these rivers are likely cooler than the Columbia or Snake Rivers at the points where they enter. The John Day, Umatilla, Walla Walla, and Malheur rivers all experience high summer water temperatures in their lower reaches that limit, at least seasonally, their ability to provide habitat for cold water fish. Water temperatures are highest when air temperatures are high and streamflow is lowest. Water diverted from these rivers for irrigation exacerbates any existing effect on water temperature

because smaller water volumes warm more quickly. Irrigation return flows also influence water temperature, because the water is warmed after being diverted and before it reenters a given river.

- The influence of the national forests on water temperature depends strongly on stream shade provided by riparian vegetation as well as maintaining channel morphology, which maintains floodplain connections where they exist and contributes to exchange of cooler groundwater with surface streams. Impacts of actions within the national forests and past impacts that have resulted in loss or degraded riparian and aquatic habitats that contribute to elevated stream temperatures could be reversed through restoration actions that restore healthy riparian and aquatic habitats.
- The potential effects of the rivers emanating from the Blue Mountains on high flows is negligible because the flow of the individual rivers is small compared to the rivers they enter, and because flow in the Snake and Columbia Rivers is strongly regulated by dams used for flood control and electric power generation.
- Floods have occurred within individual river basins and will occur again. Maintaining healthy vegetative cover, adequate ground cover, and minimizing the hydrologic connectivity of the forest road system would all contribute to the moderation of high flows, but may not eliminate them.

Effects of Climate Change

Climate change, because it results in changes in the hydrologic cycle due to changes in temperature and precipitation, including the form of precipitation, has the potential to fundamentally alter watershed processes and disturbance regimes over the next several decades. In particular, snowpacks in the Pacific Northwest are expected to be particularly sensitive to warming. April 1 snow water equivalent (SWE) has been declining for the past few decades across the western U.S. There has been an observed 35 percent decline in April 1 SWE in the Blue Mountains since 1970 that is comparable to changes observed elsewhere in the Pacific Northwest (Gecy 2013c). Runoff from snowmelt may occur earlier in the season, and the amount of runoff resulting from snowmelt is expected to decline in response to warming temperatures in coming decades. By the end of this century, late season runoff from snow may be restricted to higher elevations, if it occurs at all. Decreases in snowmelt runoff imply earlier runoff timing and lower summer streamflow for most, if not all streams. Further, climate change is expected to increase the frequency of rain-on-snow floods and winter flood peaks (versus spring snowmelt flood peaks), and increasing temperature is likely to increase drought risk because of reduced water storage for summer use and the long-term variability of dry years and wet years in the Pacific Northwest.

Winter stream flow is expected to become higher and more variable as temperatures increase. Increased stream water temperatures may increase the extent and duration of lethal or sub-lethal stream temperatures for cold-water fish species in lowland rivers, particularly bull trout, but also to cold-water fish species in general.

Changes in temperature and the timing and magnitude of rainfall will influence the distribution and composition of forest and nonforested vegetation. Increased atmospheric carbon dioxide may reduce vegetation water demand, but the magnitude of the effect has been a subject of scientific debate. Over time, increased temperature is expected to result in substantially higher vegetative water requirements due to increased evapotranspiration, and the predicted small increases in precipitation in the region are unlikely to be large enough to compensate for the effect of

increases in temperature. As a consequence of increased vegetative growth, water demand by vegetation is likely to increase and there could also be increased risk of drought mortality, increased insect and disease risk, and greatly increased fire risk.

Cumulative effects on watershed, aquatic, and riparian dependent resources will depend, to a large degree, on the extent to which watershed restoration and vegetation management actions contribute to resilient landscapes. Under all alternatives, the desired conditions for watershed, aquatic, and riparian dependent resources are for the maintenance or restoration of the processes responsible for creating and maintaining healthy and productive watersheds. While some of these conditions may be more difficult to attain under climate change, achieving these conditions is most likely to result in landscapes resilient to expected climate changes, at least for the 10 to 20 year planning period.

National Forest System lands in the Blue Mountains encompass parts of 25 subbasins and 15 river systems. Most of these basins have multiple ownerships with differing management goals. In several river basins, the dominant land use is irrigated agriculture and water use is high relative to available streamflow. Actual streamflow is 10 percent or less of natural streamflow during the growing season in several basins with the highest irrigation water demand. Aquatic habitat connectivity is low, at least seasonally, in these areas. In addition, water supplies are fully appropriated in most, if not all, river basins in the Blue Mountains. The basins in which current water use is highest, relative to water supply, are likely to be the most at risk if expected climate changes are realized, because water demand will increase as temperature increases and water availability is likely to decrease.

Effects from the Alternatives

None of the alternatives would alleviate potential climate change, but all alternatives include or allow for management actions that would improve the ability of national forest resources to adapt to a changing climate. The alternatives vary in the amount of these actions likely to occur. Alternative C places the highest emphasis on active restoration of riparian and aquatic habitats, but some restoration work would occur under all alternatives. Both alternatives C and D would result in the treatment of a high percentage of hydrologically-connected roads, but the increased roads use for alternative D would partially offset benefits from that alternative. Improvements would potentially be smaller for the Malheur National Forest because of existing high road densities in a large number of watersheds, but there would be some benefits in all alternatives. Benefits would be greatest under alternatives C and D. The effect of the Umatilla National Forest road system on sediment delivery and runoff rates could be substantially reduced for all alternatives. The reduction in the hydrologic effects of the Wallowa-Whitman National Forest road system would be reduced the most with alternative D; however, the potential benefits of road-related improvements for alternative D would be at least partially offset by increases in traffic and resulting road surface erosion.

Alternatives C, E, and F would have the highest rates of culvert replacement. Alternative C would make the greatest contribution to improving effective stream shade and aquatic habitat connectivity, partially offsetting rising temperatures. There is some potential that alternative D, through active vegetation management, would result in more resilient forested stands. Alternative C and, to a slightly lesser extent, alternative B would also promote resilience because they would have the most acres where natural disturbance regimes could operate.

All alternatives would foster ongoing community-based watershed restoration partnerships and contribute to an all-lands watershed improvement to some extent. Watersheds with active

partnerships would likely continue in priority watersheds that have shared ownership. Alternative D would have the most variable and uncertain contribution from collaborative restoration partnerships based on greater emphasis on resource utilization. Alternatives A and B would be the same as current contributions. Alternatives C, E, and F, with greater levels of watershed protection and active restoration, would contribute more to overall watershed improvement through community-based watershed restoration.

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United States Department of Agriculture

Draft Environmental Impact Statement

Proposed Revised Land Management Plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests

Volume 2

Forest Service

Pacific Northwest Region

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Introduction

National Forest System lands in the Blue Mountains play an important role in supporting a variety of fish and other aquatic species critical to meeting the needs and values of people residing in the area. More than 30 native and 24 nonnative fish species occur in subbasins wholly or partly within the Blue Mountains national forests (Blue Mountain aquatic species list, project record). Some of these native species spend only a portion of their life cycles in National Forest System lands, others do not naturally occur within National Forest System lands due to absence of suitable habitat. To assess effects to viability of aquatic species within each of the national forests, a suite of aquatic focal species was selected to represent other aquatic species in National Forest System lands with similar distributions or habitat requirements. The set of focal species chosen reflects the diversity of aquatic habitats and species present within each national forest in the planning area.

One factor in selection of a focal species is that the species is recognized as potentially sensitive to management actions (Andelman 2001, Lambeck 1997, Wisdom et al. 2001). Under FSH 1909.14 chapter 43.22d, focal species are to be selected only from among those at-risk species whose habitat could be substantially affected by management of National Forest System lands, and from among species for which we have enough information to evaluate effects of management. The selected focal species in aggregate occupy the full extent of fish-bearing habitat in National Forest System lands in the planning area. Projected effects of alternatives on viability of each focal species will represent projected effects to viability for the group of species represented by that particular focal species. By law and agency policy, however, viability for focal species and any other species of viability concern must be analyzed individually.

Viability analyses consider population conditions for each species and an assessment of the habitat necessary to sustain those populations. Spawning and rearing habitat and access to such habitat are considered the most crucial habitat elements provided by National Forest System lands and the most likely aspects of habitat to be affected by land management activities; therefore, analyses are based on effects to quality, quantity, distribution and access to spawning and rearing habitats. Conclusions regarding effects to viability are drawn at subbasin (population) scale and by forest for each focal species individually. For those few species of conservation concern that are not well represented by one or more of the selected focal species, effects conclusions are based on factors relevant to the species.

Viability assessments for other individual species of conservation concern will follow the analyses for focal species, and will include subsets of focal species, as well as species not selected as focal species. Some species of conservation concern are limited in their distribution to certain subbasins, even though the representative focal species occupies a broader area. The subbasin-scale analysis for each focal species facilitates subsequent assessments of more geographically limited species of conservation concern.

Species subject to a required viability analysis fall into a variety of categories of conservation concern, and some fall into multiple categories. Viability for each species analyzed will be

discussed individually by applicable category as required by law and Forest Service policy. Viability analyses based on category will be presented in the following order:

- focal species
- threatened and endangered species
- Forest Service sensitive species
- management indicator species

Each focal species consists of one or more regional subgroups of the species, termed variously as evolutionarily significant units (ESU), distinct population segments (DPS) or geographic management units (GMU).

"ESU" is used by the National Marine Fisheries Service (NMFS) and refers to regional subgroups of the various Pacific salmon species.

"DPS" is used by the NMFS to refer to regional subgroups of summer steelhead, as well as by the Forest Service Sensitive species list to refer to certain regional subgroups of redband trout. The term "DPS" is also used by the U.S. Fish and Wildlife Service (USFWS) to refer to regional subgroups of bull trout and redband trout, and is the term used in the Endangered Species Act to describe subunits of species that are eligible for listing, or to describe subgroups of species that could be delisted separately by meeting specific recovery objectives identified in a Species Recovery Plan.

"GMU" is used by a regional State, Federal, and private sector working group to refer to regional subgroups of redband trout to facilitate development of a species-wide, multi-state conservation strategy for redband trout.

Each of these terms will be used as relevant for purposes of category discussions and as required by law and regulation in the analyses for individual aquatic species that follow.

For each individual species ESU, DPS, or GMU, the goal for viability is to provide habitat sufficient to support self-sustaining populations in National Forest System lands within inherent capabilities of the landscape. "A self-sustaining population is one that is sufficiently abundant and has appropriate population characteristics to provide for its persistence over many generations" and "focal species populations are sustainable when their habitat is in good ecological condition and when they have access to habitat and other populations" (Reiss et al. 2008, p. 8). For those species not currently listed under the Endangered Species Act, the intent is to provide ecological conditions that would help keep the species from being listed.

The selected focal species or spatially discrete subgroups thereof, are either currently listed as threatened under the Endangered Species Act or are on the Regional Forester's Sensitive Species list, and/or function as management indicator species for the current (1990) forest plans. Individual threatened and endangered species subgroups are non-uniformly distributed across the plan area, and analysis for each species subgroup is limited to the subbasins where spawning and rearing habitat for the individual species is present. The Magnuson-Stevens Act (MSA) requires analysis of effects on all Pacific salmon species, including those not listed under other laws or policies. Table 206 through table 208 list species of conservation concern by national forest and display the relationship to the various species analysis categories described here.

Table 206. Focal species and species of conservation concern documented (D) or suspected (S) within the Malheur National Forest (includes portion of Ochoco National Forest administered by the Malheur National Forest)

Species, ESU/DPS[1]	Scientific Name	Focal Species	Species of Conservation Concern			
			Federally threatened or Endangered	Forest Service Sensitive	Management Indicator[2]	Magnuson -Stevens Act
Steelhead, Middle Columbia River	*Oncorhynchus mykiss*	D	D			
Bull trout, Columbia River Basin	*Salvelinus confluentus*	D	D		D	
Spring Chinook salmon, Middle Columbia River	*Oncorhynchus tshawytscha*	D				D
Redband trout, Interior Columbia River	*Oncorhynchus mykiss*	D			D	
Redband trout, Great Basin (Malheur Lakes)	*Oncorhynchus mykiss*	D		D	D	
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*			D	D	
Harney Basin duskysnail	*Colligyrus depressa*			S		
Western ridged mussel	*Gonidea angulata*			D		
Shortfaced lanx	*Fisherola nuttalli*			S		
Columbia clubtail	*Gomphus lynnae*			S		

1. Evolutionarily significant unit/distinct population segment as defined by NMFS or USFWS
2. Management indicator species selected for the 1990 forest plans. These species are not proposed as management indicator species for any of the action alternatives.

Table 207. Focal species and species of conservation concern documented (D) or suspected (S) within the Umatilla National Forest

Species, ESU/DPS[1]	Scientific Name	Focal Species	Species of Conservation Concern			
			Federally threatened or Endangered	Forest Service Sensitive	Management Indicator[4]	Magnuson -Stevens Act
Steelhead, Snake River Basin	*Oncorhynchus mykiss*	D	D			
Bull trout, Columbia River Basin	*Salvelinus confluentus*	D	D			
Spring Chinook salmon, Middle Columbia River	*Oncorhynchus tshawytscha*	D				D
Spring Chinook salmon, Snake River Basin	*Oncorhynchus tshawytscha*	D	D			D
Fall Chinook salmon, Snake River Basin	*Oncorhynchus tshawytscha*	D	D			D
Redband trout, Columbia River Basin	*Oncorhynchus mykiss*	D			D	
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*			D	D	
Margined sculpin	*Cottus marginatus*			D		
Western Ridged Mussel	*Gonidea angulata*	D		D		
Shortfaced lanx	*Fisherola nuttalli*			S		
Pristine springsnail	*Pristinicola hemphilli*			D[2]		
Columbia clubtail	*Gomphus lynnae*			S[3]		
Steelhead, Snake River Basin	*Oncorhynchus mykiss*	D	D			

1. Evolutionarily significant unit/distinct population segment as defined by NMFS or USFWS
2. Washington sensitive only
3. Oregon sensitive only
4. Management indicator species selected for the 1990 forest plans. These species are not proposed as management indicator species for any of the action alternatives.

Table 208. Focal species and species of conservation concern documented (D) or suspected (S) within the Wallowa-Whitman National Forest

Species, ESU/DPS[1]	Scientific Name	Focal Species	Species of Conservation Concern			
			Federally threatened or Endangered	Forest Service Sensitive	Management Indicator[3]	Magnuson -Stevens Act
Steelhead, Snake River Basin	*Oncorhynchus mykiss*	D	D		D	
Steelhead, Middle Columbia River	*Oncorhynchus mykiss*	D	D		D	
Bull trout, Columbia River Basin	*Salvelinus confluentus*	D	D		D	
Spring Chinook salmon, Middle Columbia River	*Oncorhynchus tshawytscha*	D				D
Spring Chinook salmon, Snake River Basin	*Oncorhynchus tshawytscha*	D	D			D
Fall Chinook salmon, Snake River Basin	*Oncorhynchus tshawytscha*		D			D
Sockeye salmon, Snake River Basin	*Oncorhynchus nerka*		D[2]			
Redband trout, Interior Columbia River	*Oncorhynchus mykiss*	D			D	
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*			D	D	
Resident trout	*Salvelinus* sp. *and Oncorhynchus* sp.			D	D	
Western Ridged Mussel	*Gonidea angulata*			S		
Shortfaced lanx	*Fisherola nuttalli*			D		
Columbia pebblesnail	*Fluminicola fuscus*			D		

1. Evolutionarily significant unit/distinct population segment as defined by NMFS or USFWS
2. Snake River Hells Canyon migratory corridor only
3. Management indicator species selected for the 1990 forest plans. These species are not proposed as management indicator species for any of the action alternatives.

Affected Environment – Aquatic Species Diversity

The affected environment for species diversity consists of all fish habitat and all populations of the selected focal species within the 25 subbasins associated with the planning area. Lands of other ownership within each subbasin were assessed for purposes of cumulative effects analysis for these populations since the populations occupy many land ownerships in these subbasins. The affected environment includes all fish-bearing habitats in National Forest System lands, irrespective of species. Unless otherwise noted, the description of effects is only for fish populations and fish habitat within National Forest System lands in the Blue Mountains national forests planning area (excluding Hells Canyon Natural Recreation Area). Therefore references to the planning area, analysis area, or national forest are to public lands administered by the Forest Service, unless specifically noted otherwise.

The area managed under the Hells Canyon National Recreation Area (HCNRA) Comprehensive Management Plan (CMP) contributes to species diversity. Management direction under the HCNRA CMP will remain unchanged by this plan revision. Species that may be affected by ongoing HCNRA management, but which would not be affected by revisions to the forest plans, will not be analyzed here.

Management direction specific to key and priority watersheds contributes to the maintenance or restoration of viable populations and aquatic species diversity. For PACFISH and INFISH, the immediate purposes for establishing key and priority watersheds were to protect fish habitat and to initiate restoration through natural processes (USDA and USDI 1995 and USDA1995). Under these two strategies, PACFISH and INFISH selection criteria for both key and priority watersheds included watersheds that currently provide high-quality fish habitat and water quality, as well as watersheds with the potential for easy habitat restoration with relatively low capital investment, and the presence of one or more Endangered Species Act-listed species. Table 209 displays the current distribution of PACFISH key watersheds and INFISH priority watersheds among subbasins associated with the Blue Mountains national forests.

As new understanding of landscape-scale disturbance processes has developed during the past 15 years and as budgets for active restoration have become smaller, the need to target restoration more strategically and effectively became widely evident and accepted in the Pacific Northwest region. For example, within the Umatilla National Forest, virtually every subwatershed became a key watershed as defined by PACFISH due to presence of listed anadromous species and/or designated critical habitats. This created challenges in terms of prioritizing watersheds for active restoration, but also ensured that protective management for the benefit of aquatic species was instituted across the majority of watersheds in each forest.

For more than 15 years, key and priority subwatersheds have accordingly all received heightened levels of protection under PACFISH and INFISH. The benefits of protective management are becoming evident, based on landscape scale monitoring of improvements n riparian and aquatic habitats. Riparian and aquatic habitats across the Blue Mountains plan area have begun to exhibit positive responses to passive restoration processes (Archer et al. 2009).

However, as research has increasingly shown since 1995, landscape scale natural processes create shifting subwatershed mosaics through time and space, and watersheds with varying riparian and aquatic habitat conditions. The rich variety of life histories and mobility among members of the salmon and trout family demonstrate that as a group they are adapted to these landscape scale disturbance processes.

Table 209. Current distribution of key (PACFISH) and priority (INFISH) subwatersheds by subbasin for each national forest

National Forest	Subbasin	Subwatersheds Occupied by One or More ESA-listed Focal Species	PACFISH Key Subwatersheds	INFISH Priority Subwatersheds
Malheur	Middle Fork John Day	29	29	0
	Upper John Day	47	47	0
	Upper Malheur	19	0	19
	Silvies	0	0	20
	Silver	0	0	14
	North Fork John Day	4	4	0
	Harney-Malheur	0	0	4
	South Fork Crooked River-Beaver Creek	0	0	7
	Totals	**137**	**80**	**64**
Umatilla	Middle Fork John Day	1	1	0
	North Fork John Day	84	84	0
	Lower John Day	4	4	0
	Willow-Columbia	2	2	0
	Umatilla	15	15	0
	Walla Walla	10	10	0
	Tucannon	7	7	0
	Asotin	6	6	0
	Lower Grande Ronde	25	25	0
	Upper Grande Ronde	9	9	0
	Totals	**163**	**163**	**0**
Wallowa-Whitman	Imnaha	29	29	0
	Lower Grande Ronde	29	29	0
	Upper Grande Ronde	50	50	0
	Lower Snake-Asotin	1	1	0
	North Fork John Day	7	7	0
	Hells Canyon, Brownlee, Salmon	32	20	12
	Powder	30	0	30
	Burnt	0	0	22
	Wallowa	22	22	0
	Totals	**172**	**132**	**64**

Based on the need to incorporate information gained over the past 15 years, the existing regional aquatic conservation strategies were combined and updated to create a new regional Aquatic Restoration and Conservation Strategy, commonly referred to as the ARCS (USDA, 2008). The identification of a new set of key subwatersheds for the Blue Mountain forest plan revision was accomplished under the guidance of the ARCS and the Regional Aquatic Sustainability Model. The selection was based on the assumption that an appropriate distribution of habitat conditions

can be provided on National Forest System lands within this set to support viability for the selected focal species and the other species that share their habitats.

Both Endangered Species Act-listed and non-listed species have been selected as aquatic focal species for analysis of environmental effects for the Blue Mountains forest plan revision habitat. Population conditions for each of the selected focal species were used as the basis for selection of a revised set of key watersheds for the action alternatives (Gecy 2013a). The conditions and trends for focal species in National Forest System lands are particularly influenced by management actions and natural processes within the watersheds they inhabit, as discussed in the regional Aquatic and Riparian Conservation Strategy (ARCS) (USDA Forest Service 2008).

Consistent with guidance provided by the ARCS, key watersheds selected for this Plan Revision are a network of watersheds identified to serve, or which have the potential to serve, as strongholds for important aquatic resources (focal species). They are areas crucial to threatened, endangered, or sensitive fish and aquatic species, and/or areas that provide high quality water important for maintenance of downstream populations. The value of the selected key watersheds to aquatic species was identified through application of the Blue Mountains Plan Revision Sustainability Model for Aquatic Species, and validated through review by fisheries biologists located on the affected forests (Gecy 2013a).

Regional guidance provided by the ARCS indicates that management of these areas is intended to emphasize minimizing risk and maximizing restoration or retention of ecological health (USDA Forest Service 2008). Plan Revision goals, objectives, standards and guidelines for key watersheds were designed with that guidance in mind. The identification of a revised set of key subwatersheds (to include priority subwatersheds for restoration) was based on the assumption that an appropriate distribution of habitat conditions can be provided in National Forest System lands within this set that in the long term, will contribute to sustaining viability for the various populations of the selected focal species and the species of conservation concern they represent.

Affected Environment – Aquatic Species Viability

Focal Species

The four aquatic focal species selected for this analysis are spring Chinook salmon, bull trout, summer steelhead, and redband trout (see table 206 through table 208). These focal species are all native salmonid species and represent broader biotic communities within various subsectors of aquatic habitats: headwaters, small tributaries, large tributaries, and rivers within the plan area. The selected focal species fall into two primary behavioral groups. Anadromous species, salmon and steelhead, breed and spend part of their life in fresh water, then travel to the ocean to feed until maturity, returning to fresh water 1 or more years later, to breed. Resident species, bull trout and redband trout, may migrate long distances seasonally within fresh water habitats but they spend all their lives in fresh water and never migrate to and from ocean habitats.

Each selected focal species reflects adaptation to long term, local ecological characteristics and processes within each subbasin. Although habitats for the selected focal species overlap in places, each species uses a different portion of the wide range of aquatic habitats in National Forest System lands, depending on their life stage and season of the year, their habitat requirements, and current habitat conditions both on and off-forest. Current conditions for aquatic focal species and their habitats on National Forest System lands reflect natural processes and watershed characteristics, along with the effects of past and present land management activities and on the species within the larger river basin landscapes in which those National Forest System lands are

embedded. The ongoing and future influences of long-term climate change in the Pacific Northwest on aquatic focal species are discussed later in this chapter.

Fine-grained differences in habitat patterns of use by each species are described later in this section. Spawning and rearing habitat for one or more of the selected focal species is present in each subbasin in which planning area lands are located. As a group, focal species are well distributed throughout the subbasins within each national forest, but the distribution for individual species or subgroups varies across each forest.

For purposes of this discussion, subbasin-scale populations are connected networks of smaller local populations of each species and are analyzed subbasin by subbasin. Effects to each subbasin population are based on a subwatershed-scale habitat and population condition model for each focal species and are aggregated for each species using a subbasin-scale application of the Blue Mountain aquatic species sustainability model developed by Gecy (2013a). Both models are derivations of a Regional Sustainability Model developed by Reiss et al. (2008). Any strong local populations of any of the focal species that remain within the Blue Mountains national forests are located within subwatersheds currently characterized by very limited management activity and low road density.

Long term viability of each focal species is partially dependent upon availability of sufficient high quality spawning and rearing habitats within subbasins through time, as well as reliant on population and habitat connectivity within and between subbasins. Within National Forest System lands, an assortment of seasonal or year-round barriers currently impacts population connectivity. These barriers include physical barriers, such as culverts in National Forest System roads, barriers created by high water temperatures or low seasonal flow, and/or water diversions within National Forest System lands for beneficial uses outside the stream channel. The extent to which particular types of barriers impact a particular focal species is subwatershed and subbasin specific. Similar barriers in lands downstream of the national forests further impair population connectivity within and between subbasins for each focal species.

All four focal species within the plan area occur as multiple Distinct Population Segments (DPSs) or as multiple Environmentally Significant Units (ESUs) of the species. One or more DPS or ESU of each focal species is present within each national forest. DPSs and ESUs are important spatially- defined regional subgroups within each species. Because component populations of each species are generally described by both U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) at the subbasin scale, except where otherwise noted, current viability status for each DPS and ESU is described in this order: first for each population based on subbasin boundaries, then summarized for each DPS or ESU as they occur within each national forest, followed by a summary for each species where more than one DPS or ESU of the species is present within a national forest.

Focal Species Descriptions

Spring Chinook Salmon

Spring Chinook salmon are able to access intermediate sized tributaries and spawn farther upstream than fall run Chinook salmon and can be found in medium sized river reaches and tributaries within and downstream of national forest boundaries. Their habitat somewhat overlaps with steelhead habitat at the upper end of their distribution and overlaps with fall Chinook salmon habitat in the lower reaches of large rivers at the lower end of their distribution.

Non-native spring Chinook salmon stocks are present in the Umatilla and Walla Walla subbasins, where the original stocks are extinct. Hatchery stocks and wild stocks comingle in the Snake River Basin in subbasins below Hells Canyon Dam that are still accessible to anadromous species. Selection of spring Chinook salmon as a focal species represents the habitat needs of other aquatic species inhabiting lower elevation medium and large sized rivers and larger tributaries within the plan area, in particular, large bodied anadromous species and fall spawners.

Native spring Chinook salmon within the plan area belong to two different Environmentally Significant Units (ESUs) that occur in non-overlapping portions of the plan area: the Middle Columbia River (MCR) spring Chinook salmon ESU and the Snake River Basin (SRB) spring Chinook salmon ESU. SRB spring Chinook salmon are listed as Threatened under the Endangered Species Act; MCR spring Chinook salmon are not listed at this time. The Malheur National Forest provides habitat for populations within the MCR spring Chinook salmon ESU only; whereas the Umatilla and Wallowa-Whitman National Forests provide habitat for populations of both ESUs.

Viability analyses for MCR spring Chinook salmon in the John Day River Basin and reintroduced nonnative stocks in National Forest System lands in other Middle Columbia River subbasins associated with the planning area would serve as surrogates for current viability of other non-Endangered Species Act-listed fall- spawning anadromous species in National Forest System lands (see table 210). The SRB spring Chinook salmon ESU will be analyzed separately from the MCR spring Chinook salmon ESU where they both occur in the same forest to facilitate subsequent Endangered Species Act determinations for effects specific to SRB spring Chinook salmon. Conclusions for spring Chinook salmon as a focal species will be drawn based on review of effects to each individual ESU, for those forests where both ESUs are present, i.e. the Umatilla and Wallowa-Whitman National Forests.

Bull Trout

Bull trout exist as a variety of life history forms, freshwater migratory and headwater resident, within the plan revision area. Migratory bull trout move between their natal streams and larger bodies of freshwater, such as lakes, reservoirs and mainstem rivers where they can grow much larger than the residents that remain in small colder headwaters as adults. The migratory life history is still present in most of the populations associated with Blue Mountains national forests, but some headwater resident populations have been isolated and are very small due to historic land use impacts. Connectivity among such resident populations is no longer provided by migratory individuals and these populations are at heightened risk of long-term extirpation.

Bull trout, like spring Chinook salmon, are fall spawners with eggs that overwinter in the gravels and fry that emerge from redds in late winter and early spring. Bull trout tend to fare best where aquatic habitats provide not only cold water, but also high habitat complexity associated with instream large wood. Bull trout serve as a focal species based on their ability to represent aquatic species with similar habitat preferences and life history characteristics. They represent species present in medium-sized, high-elevation tributaries to headwaters, fall spawners, migratory freshwater species, those species requiring year round high quality cold water and habitat complexity, and those species closely associated with streambeds. Bull trout are noted for their affinity for cold headwaters and high habitat complexity and are an indicator of high quality habitat.

Steelhead

Steelhead spawn and rear in medium and small rivers, tributary streams, and upstream portions of mainstem rivers. In the plan area, steelhead belong to two DPSs that occur in non-overlapping areas: the Middle Columbia River (MCR) steelhead DPS and the Snake River Basin (SRB) steelhead DPS. The Malheur National Forest provides habitat only for MCR steelhead populations whereas the Umatilla and Wallowa-Whitman National Forests provide habitat for populations of both the MCR and SRB steelhead DPSs. Both DPSs are listed under the Endangered Species Act.

Steelhead represent a different range of needs both spatially and temporally than spring Chinook salmon, although both species need good quality spawning and rearing habitat, cool water, and sufficient flow in the migration corridors as well as in spawning and rearing reaches. Steelhead as a focal species represent large- bodied spring- spawning anadromous species using cool mid-elevation large tributaries to headwaters, within accessible portions of the Middle Columbia River and Snake River Basins.

Redband Trout

Redband trout are considered present wherever steelhead are present in the interior Columbia River Basin, including portions of the Snake River Basin downstream of Hells Canyon Dam. The juvenile life stages of the two forms can be very difficult to differentiate where they co-occur, as they are the same species (*Oncorhynchus mykiss*), but express two different life histories, steelhead expressing ocean-going anadromy and redband trout expressing year-round freshwater residency. Redband trout are found throughout the planning area, including subbasins where steelhead have no access.

Redband habitat requirements as a resident freshwater species are similar to those of steelhead juveniles in freshwater, as they are the same species. Redband trout occupy small and medium rivers and streams year round. They spawn and rear in medium and small rivers and tributaries and upstream portions of mainstem rivers from late winter into May. As small-bodied lifelong-resident spring spawners, redband trout represent a different range of needs both spatially and temporally than spring Chinook salmon or steelhead. They spawn at elevations lower than those used by bull trout and tolerate warmer temperatures in their spawning and rearing habitats than bull trout. They are representative of species that preferentially use the middle to upper portions of the water column, as opposed to the streambed affinities displayed by bull trout. Redband trout are analyzed as a focal species based on their ability to represent resident aquatic species with similar habitat preferences and life history characteristics, particularly spring spawners, those requiring year- round good quality water, species inhabiting large tributaries to very small headwaters at middle elevations, and species in watersheds where no other focal species are present.

Current Status of Focal Species

As a basis for determining forest-level effects to viability of each species of conservation concern, current habitat conditions and population status in National Forest System lands in each subbasin, and within the subbasin as a whole, are assessed for each focal species, and by subbasin for each DPS and ESU, using National Forest System stream inventory data, information from other sources including subbasin assessments, and applied through protocols described in the Blue Mountains Aquatic Sustainability Model (Gecy 2013a). Current trends for riparian and aquatic habitats for each aquatic species were assessed in this analysis, using data from regional-scale effectiveness monitoring using protocols developed in response to requirements of

Biological Opinions for the 1990 forest plans as amended by PACFISH and/or INFISH (Gecy 2013a, Archer et al. 2009).

This monitoring is done at a larger scale than the plan area, but includes all portions of the plan area. Implementation of PACFISH and INFISH in their respective areas was designed to forestall any further management- related habitat degradation and to allow for nearly natural rates of habitat recovery. Riparian and aquatic habitat Passive restoration of riparian and aquatic habitats through natural processes appears to be occurring within National Forest System lands based on recent monitoring-based habitat trend analyses (Archer et al. 2009). The Watershed section of chapter 3 discusses these effectiveness monitoring results in greater detail, which will not be repeated here. Instead it will simply be noted that riparian and aquatic habitat conditions are currently trending upward at the scale of the plan area, following 15-plus years of management under the 1990 forest plans as amended by PACFISH and/or INFISH, based on these monitoring results.

Spring Chinook Salmon

Spring Chinook salmon, as a whole, are currently a viable focal species in all three Blue Mountains national forests, based on the analyses and overall subbasin-scale habitat and population conditions in each national forest, which are summarized in table 210. The table identifies populations as either belonging to the MCR or SRB ESUs and/or as nonnative hatchery stock where neither the original MCR or SRB stocks exist any longer. Distinctions are made here to simplify and reduce redundancy of effects analysis and discussion specific to threatened SRB spring Chinook salmon ESU in the section on “Threatened and Endangered Species” that follows. Spawning and rearing habitat for both MCR and SRB spring Chinook salmon in National Forest System lands is in fair to good condition.

Malheur National Forest – Spawning and rearing habitat in National Forest System lands is in fair condition and supports two well- distributed, moderately viable populations in two subbasins.

Current habitat quality, quantity and connectivity of spawning and rearing habitats within the Malheur National Forest indicate that habitat connectivity, quantity and quality for spring Chinook salmon within National Forest System lands are being maintained and continue to contribute to viability of MCR spring Chinook salmon populations.

Umatilla National Forest – The Umatilla National Forest provides habitat for multiple, well-distributed populations within each of the MCR and SRB spring Chinook salmon ESUs. Spawning and rearing habitat for both ESUs throughout National Forest System lands is in fair condition. The few culvert or other barriers in National Forest System lands identified as affecting spring Chinook salmon of either ESU have been progressively replaced or removed over the past ten years. The majority of spawning and rearing habitat for spring Chinook salmon in the Walla Walla and Umatilla River subbasins is located downstream of the national forest, where water withdrawals for irrigation and municipal water supply combine with high summer temperatures to create poor seasonal habitat connectivity lower in the subbasin. National Marine Fisheries Service’s BRT determined that habitat risks were moderate in the Umatilla and Walla Walla subbasins across all lands, which is consistent with fair habitat conditions in National Forest System lands for these populations, which is displayed in table 210. The North Fork John Day population is the only native stock in the Middle Columbia portion of the Umatilla National Forest. NMFS considers this a viable population at the all-lands scale.

Table 210. Affected environment for spring Chinook salmon within the Blue Mountains national forests

Subbasin	Population Name	Population Status and Trend (all lands)[1]	ESU	Spawning and Rearing Habitat Miles and Condition (NFS lands)[2]
Malheur				
Middle Fork John Day	Middle Fork John Day	Viable/unknown	MCR[3]	15 miles/fair
Upper John Day	Upper John Day	Viable/unknown	MCR	1 miles/fair
Designated Critical Habitat	None	N/A	MCR	NA
Umatilla				
North Fork John Day	North Fork John Day	Viable	MCR	60 miles/
Umatilla	Umatilla	Reintroduced (nonnative stock)/ unknown	Hatchery/non native	8 miles/fair
Walla Walla	Walla Walla	Reintroduced (nonnative stock)/ unknown	Hatchery/non native	5 miles/fair
Tucannon	Tucannon	Not viable/increasing	SRB[4]	6 miles/fair
Lower Grande Ronde	Wenaha	Not viable/increasing	SRB	40 miles/fair
Designated Critical Habitats	SRB ESU only	N/A	SRB	284 miles
Wallowa-Whitman				
North Fork John Day	North Fork John Day	Viable/unknown	MCR	70 miles/good
Hells Canyon	Hells Canyon (HCNRA)	Not viable/unknown	SRB	6 miles/poor
Upper Grande Ronde	Upper Grande Ronde/ Catherine Creek	Not viable/increasing	SRB	24 miles/fair
Wallowa	Lostine/Minam	Not viable/increasing	SRB	58 miles/good
Imnaha	Imnaha	Not viable/increasing	SRB	141 miles/fair
Designated Critical Habitats	SRB ESU only	N/A	SRB	1,377 miles

1. NMFS Biological Review Team status and trend conclusions (Ford et al. 2010; Ford et al. 2011).
2. National Forest System conditions based on Blue Mountain Sustainability model outputs, modified by habitat connectivity conditions associated with number and locations of culvert passage concerns in National Forest System lands relative to species habitat distribution.
3. MCR: Middle Columbia River ESU
4. SRB: Snake River Basin ESU

SRB spring Chinook salmon have very little spawning habitat in managed National Forest System lands, other than in the mainstem Grande Ronde River and in the Wenaha River tributary to the Grande Ronde River, which are both managed as Wild and Scenic Rivers. BRT assessments

(USDC-NMFS 2008) concluded that SRB spring Chinook salmon populations in the Grande Ronde and Tucannon subbasins are high risk and not viable, despite very low to moderate habitat risks in these subbasins.

The most recent status and trend assessments by NMFS (Ford et al. 2011) for SRB spring Chinook populations associated with the Umatilla National Forest indicate that their population numbers are increasing.

Wallowa-Whitman National Forest – The Wallowa-Whitman National Forest provides habitat for multiple, well-distributed populations within each of the MCR and SRB spring Chinook salmon ESUs. Spawning and rearing habitat in National Forest System lands for most populations of both ESUs is in fair to good condition.

Culverts impairing fish passage in National Forest System lands are located upstream of reaches used by SRB spring Chinook salmon and do not affect habitat connectivity for this species, based on culvert inventories conducted in 2000 and 2001.

Current habitat quality, quantity and connectivity of spawning and rearing habitats within the Wallowa-Whitman National Forest for multiple populations, when combined with improving habitat trends within National Forest System lands, indicate that habitat connectivity, quantity and quality for spring Chinook salmon within National Forest System lands are being maintained, continue to contribute to viability of MCR spring Chinook salmon, and are contributing to recovery of SRB spring Chinook salmon viability. The most recent status and trend assessments by NMFS (Ford et al. 2011) for SRB spring Chinook populations associated with the Wallowa-Whitman National Forest indicate that their population numbers are increasing.

Bull Trout

Spawning and rearing habitats for bull trout in National Forest System lands range from poor to good condition, depending on the subbasin and national forest. The species is well distributed among multiple subbasins in each national forest. Bull trout local populations in National Forest System lands are moderately connected within most populations, as well as between subbasins and forests. Exceptions will be noted for each forest. Broad scale habitat data analyses indicate improvements are occurring in aquatic and riparian habitats across National Forest System lands throughout the planning area (Archer et al. 2009). Discussions specific to each national forest follow.

Malheur National Forest – Bull trout are present in three subbasins associated with the Malheur National Forest. Within these three subbasins, the majority of bull trout spawning and rearing habitat is located in National Forest System lands and is in variable condition (see table 211). Current habitat quality, quantity and connectivity of spawning and rearing habitats within the Malheur National Forest for multiple bull trout populations, when combined with improving riparian and aquatic habitat trends within National Forest System lands, indicate that habitat connectivity, quantity and quality for bull trout within National Forest System lands are being maintained and are contributing to recovery of bull trout viability. The most recent status and trend assessments by USFWS for bull trout populations associated with the Malheur National Forest indicate that populations in the two John Day subbasins are increasing (USFWS 2008).

Table 211. Affected environment for Columbia River Basin bull trout within the plan area

Subbasin	Population Name	Population Status and Trend (all lands)[2]	Spawning and Rearing Habitat Miles and Condition (NFS lands)[3]
Malheur			
Upper Malheur	Malheur	50-250 adults/declining	76 miles/good
Upper John Day	Upper John Day	0-50 adults/increasing	25 miles/fair
Middle Fork John Day	Middle Fork John Day	Unknown/increasing	19 miles/poor
Designated Critical Habitats	All	N/A	344 miles
Umatilla			
Asotin	Asotin	50-250 adults/unknown	8 miles/fair
Tucannon	Tucannon	2,500-10,000 adults/stable	27 miles/fair
Lower Grande Ronde[1]	Grande Ronde	50-250 adults stable	57 miles/fair
North Fork John Day	North Fork John Day	Unknown/increasing	42 miles/fair
Umatilla	Umatilla	50-250 adults/unknown	8 miles/fair
Walla Walla[1]	Walla Walla	2,500-10,000 adults/stable	37 miles/fair
	Touchet	50-250 adults/stable	18 miles/fair
Designated Critical Habitats	All	N/A	286 miles
Wallowa-Whitman			
Hells Canyon[1]	Sheep Creek	Not viable; unknown/unknown	1 miles/poor
	Granite Creek	Not viable; unknown/unknown	2 miles/poor
Upper Grande	Grande Ronde[1]	Not viable; 50-250 adults/stable	62 miles/fair
Wallowa (excluding Little Minam River)			75 miles/fair
Wallowa	Little Minam	Not viable; 250-1,000 adults/stable	17 miles/fair
North Fork John Day	North Fork John Day	Not viable; unknown/Increasing	42 miles/fair
Imnaha	Imnaha	Not viable;250-1,000 adults/stable	76 miles/fair
Brownlee[1]	Pine, Indian and Wildhorse Creeks	Not viable; 250-1,000 adults/severe decline	33 miles/fair
Powder	Powder	Not viable; 250-1,000 adults/severe decline	21miles/poor
Designated Critical Habitats	All	NA	514 miles

1. Grande Ronde population includes bull trout in the Wallowa subbasin as well as in the Lower Grande Ronde subbasin and portions of the Upper Grande Ronde subbasin; bull trout in the Little Minam River tributary watershed are considered a separate population by USFWS. Bull trout are also split into multiple populations in each of the Walla Walla, Hells Canyon and Brownlee subbasins.
2. From USFWS (2008) status review.
3. National Forest System habitat conditions status based on Blue Mountain Sustainability Model riparian-aquatic "habitat" condition ratings combined with habitat connectivity ratings associated with number and locations of culvert barriers passage concerns on National Forest System lands relative to spawning and rearing habitat distribution.

Umatilla National Forest – Bull trout spawning and rearing habitat within the Umatilla National Forest is in fair condition and supports multiple, well-distributed populations in multiple subbasins, based on species distribution, habitat and local population conditions averaged across National Forest System lands in each subbasin (see table 211). Headwater habitats for bull trout in National Forest System lands in most subbasins are high quality, though the total amount of such habitat varies by subbasin.

An inventory of culverts in National Forest System roads within the Umatilla National Forest in 2000 and 2001 revealed fish passage concerns created by a number of culverts, but very few problems were identified in subwatersheds occupied by bull trout. Current habitat quality, quantity and connectivity of spawning and rearing habitats within the Umatilla National Forest for multiple bull trout populations, when combined with improving riparian and aquatic habitat trends within National Forest System lands, indicate that habitat connectivity, quantity and quality for bull trout within National Forest System lands are being maintained and are contributing to recovery of bull trout viability. The most recent status and trend assessments by USFWS for bull trout populations associated with the Umatilla National Forest indicate that most populations are stable or increasing (USFWS 2005).

Wallowa-Whitman National Forest – Bull trout spawning and rearing habitat within the Wallowa-Whitman National Forest is in fair condition, other than in the Hells Canyon and Powder River subbasins where habitats are extremely limited and fragmented by mainstem dams and reservoirs (table 211). Current habitat quality, quantity and connectivity of spawning and rearing habitats within the Wallowa-Whitman National Forest for bull trout populations, when combined with improving riparian and aquatic habitat trends within National Forest System lands, indicate that habitat quality for bull trout within National Forest System lands is being maintained and is contributing to recovery of bull trout viability. The most recent status and trend assessments by USFWS for bull trout populations associated with the Wallowa-Whitman National Forest indicate that most populations are stable or increasing (USFWS 2005).

Steelhead

Steelhead populations in National Forest System lands comprise portions of larger subbasin-based populations belonging to either the MCR steelhead DPS or the SRB steelhead DPS, both of which are listed independently under the Endangered Species Act as separate “species” for Endangered Species Act purposes. Only the anadromous (steelhead) forms of *O. mykiss* are listed, and effects to each listed steelhead DPS must be analyzed separately under the Endangered Species Act. Steelhead as a whole well distributed among multiple subbasins in each national forest. Habitat conditions for the species in National Forest System lands were considered in each occupied subbasin. Distribution habitat and population conditions, all-lands viability status, and trend were considered for each DPS to aid in assessing focal species conditions within National Forest System lands. All-lands viability analyses for each of these larger steelhead populations were previously conducted by NMFS within each subbasin identified in table 212 (Ford et al. 2011). National Forest System lands were assessed separately for effects to viability from management of National Forest System lands, but considered in the context of these broader, subbasin-based viability analyses. Table 212 provides an overview of steelhead populations across the plan area, their status, trend, and related habitat conditions in National Forest System lands across the Blue Mountains national forests. Discussions specific to each national forest follow.

Table 212. Affected environment for summer steelhead populations within the plan area

Subbasin	Population Name	Population Status and Trend (all lands)[2]	DPS[3,4]	Spawning and Rearing Habitat Miles and Condition (NFS lands)[5]
Malheur				
Middle Fork John Day[1]	Middle Fork John Day	Not viable/declining	MCR	181 miles/good
Upper John Day	Upper John Day	Not viable/declining (South Fork population increasing)	MCR	167 miles/good
Designated critical habitats	MCR DPS only			410 miles
Umatilla				
North Fork John Day	North Fork John Day	Viable/declining	MCR	365 miles/good
Umatilla	Umatilla	Not viable/increasing	MCR	52 miles/good
Walla Walla	Walla Walla	Not viable/increasing	MCR	24 miles/good
	Touchet	Not viable/at risk/stable	MCR	4 miles/fair
Tucannon	Tucannon	Not viable/Unknown	SRB	6 miles/fair
Asotin	Asotin	Not viable/Increasing	SRB	8 miles/fair
Lower Grande Ronde	Lower Grande Ronde	Not viable/maintaining	SRB	104 miles/good
Upper Grande Ronde	Upper Grande Ronde	Not viable/increasing	SRB	204 miles/good
Designated critical habitats	SRB DPS only	N/A	SRB	284 miles
Designated critical habitats	MCR DPS only	N/A	MCR	647 miles
Wallowa-Whitman				
North Fork John Day	North Fork John Day	Viable/declining	MCR	70 miles/good
Asotin	Asotin	Not viable/unknown	SRB	4 miles/good
Hells Canyon	Hells Canyon	Not viable/unknown	SRB	43 miles/fair
Lower Grande Ronde	Joseph	Highly viable/increasing	SRB	181 miles/good
Upper Grande Ronde	Upper Grande Ronde	Not viable/stable	SRB	204 miles/good
Wallowa	Wallowa	Not viable/stable	SRB	86 miles/good
Imnaha	Imnaha	Not viable/stable	SRB	198 miles/good
Designated critical habitats	SRB DPS only	NA	SRB	1,377 miles
Designated critical habitats	MCR DPS only	NA	MCR	76 miles

1. MAL and UMA miles were run through the sustainability model together.
2. NMFS Biological Review Team status and trend conclusions (Ford et al. 2010; Ford et al. 2011).
3, 4. MCR: Middle Columbia River DPS; SRB: Snake River Basin DPS.
5. National Forest System conditions based on model outputs, modified by habitat connectivity conditions associated with number and locations of culvert passage concerns in National Forest System lands relative to species habitat distribution.

Malheur National Forest – Steelhead spawning and rearing habitat in National Forest System lands is in good condition and supports two well- distributed populations in two subbasins. Despite the availability of many miles of good-quality steelhead habitat in National Forest System lands in each subbasin, these populations are declining, according to recent status reviews (Ford et al. 2011), suggesting factors other than habitat quality and quantity on National Forest System lands are affecting these populations.

Current habitat quality, quantity and connectivity of spawning and rearing habitats within the Malheur National Forest for MCR steelhead populations, when combined with improving riparian and aquatic habitat trends within National Forest System lands, indicate that habitat connectivity, quantity and quality for MCR steelhead within National Forest System lands are being maintained or improved, and continue to contribute to restoration of viability for these MCR steelhead populations.

Umatilla National Forest – The Umatilla National Forest provides habitat for steelhead populations within both the Middle Columbia River ESU and the Snake River Basin ESU. Spawning and rearing habitat in National Forest System lands in both basins is in fair to good condition and supports multiple, well-distributed populations in National Forest System lands based on species distribution, habitat and local population conditions averaged across National Forest System lands in each subbasin. The North Fork John Day subbasin population in the MCR steelhead ESU is the only population currently considered viable, however the populations in the main Walla Walla and Umatilla subbasins are considered stable. Population conditions in the Snake River Basin are highly variable between subbasins, but habitat in National Forest System lands is fair to good in all subbasins.

An inventory of fish passage conditions presented by culverts within the Umatilla National Forest in 2000 and 2001 revealed numerous passage concerns created by culverts within the National Forest System roads. Those passage barriers were considered in the habitat condition evaluations. The majority of those concerns are located within the North Fork John Day subbasin. Priority subwatersheds have been identified for restoration in this subbasin. Few barriers were identified in other subbasins.

Current habitat quality, quantity and connectivity of spawning and rearing habitats within the Umatilla National Forest for multiple steelhead populations, when combined with improving habitat trends within National Forest System lands, indicate that habitat connectivity, quantity and quality for steelhead within National Forest System lands are being maintained, and are contributing to recovery of viability for both MCR and SRB steelhead. The most recent status and trend assessments by NMFS (Ford et al. 2011) for MCR and SRB steelhead populations associated with the Umatilla National Forest indicate that their population numbers are maintaining or increasing for the most part. The MCR steelhead population in the North Fork John Day subbasin is viable but declining per the most recent status assessment (Ford et al. 2011), despite good habitat conditions throughout the subbasin.

Wallowa-Whitman National Forest – The Wallowa-Whitman National Forest provides habitat for steelhead populations in both the Middle Columbia River and the Snake River Basin basins. Spawning and rearing habitat in National Forest System lands in both river basins is in fair to good condition, and National Forest System lands support multiple, well-distributed populations in the MCR steelhead DPS and in the SRB steelhead DPS, based on species distribution, habitat and local population conditions averaged across National Forest System land in tributary subbasins. An inventory conducted in National Forest System lands in 2000 and 2001 revealed numerous passage concerns for steelhead created by National Forest System road culverts,

particularly in the Upper and Lower Grande Ronde subbasins and the upper Imnaha subbasin. These concerns were factored into the habitat condition ratings for National Forest System lands in each subbasin.

Current habitat quality, quantity and connectivity of spawning and rearing habitats within the Wallowa-Whitman National Forest for multiple populations, when combined with improving habitat trends within National Forest System lands, indicate that habitat connectivity, quantity and quality for MCR and SRB steelhead within National Forest System lands are being maintained, continue to contribute to viability of MCR steelhead, and are contributing to recovery of SRB steelhead viability. The most recent status and trend assessments by NMFS (Ford et al. 2011) for SRB steelhead populations associated with the Wallowa-Whitman National Forest indicate that their population numbers are generally increasing or stable. Habitat in most subbasins is good, and populations are stable or increasing in most. National Forest System lands support two highly viable populations, one each in the MCR and SRB steelhead DPS. The MCR steelhead population in the North Fork John Day subbasin is viable but declining, per the most recent status assessment (Ford et al. 2011), despite good habitat conditions throughout the subbasin.

Interior Redband Trout

Interagency conservation planning efforts have stratified redband populations in the planning area into spatially discrete conservation populations based on geographic clusters of subbasins (May et al. 2012). Those groups of subbasins are termed Geographical Management Units (GMUs). Redband trout populations will be identified by GMU for the remainder of this focal species analysis for redband, with three exceptions: (1) when referencing the Regional Forester's Sensitive Species described as the Malheur Lakes DPS (aka Oregon Closed Basins GMU) for purposes of Sensitive Species analysis; (2) when used by USFWS (2009) to refer to the Great Basin DPS (Oregon Closed Basins GMU); and (3) when discussing findings in Kostow (2003).

Redband trout populations in National Forest System lands in the interior Columbia River Basin portion of the plan area are members of larger subbasin- based resident redband trout populations. Redband trout populations in the Oregon Closed Basins are not listed and constitute their own GMU, long separated from populations in the interior Columbia River Basin. Table 213 displays an overview of redband trout populations within the plan area, their distribution among various geographically distinct GMUs, and related habitat conditions in National Forest System lands across the Blue Mountains national forests. Discussions specific to each national forest follow.

Malheur National Forest – Spawning and rearing habitat for redband trout in National Forest System lands is in fair condition and supports multiple viable populations in seven subbasins and well distributed among four GMUs (see table 213), based on species distribution, habitat and local population conditions averaged across National Forest System lands in each subbasin. The John Day GMU is the only one where steelhead is present, and the only GMU associated with the national forest, that is not currently targeted specifically for redband conservation efforts (May et al. 2012). The Oregon Closed Basins GMU, is otherwise known as the Great Basin DPS by USFWS and is still considered viable by USFWS (USFWS 2009), but the populations are believed to be declining. Redband trout of the Upper Malheur subbasin are considered viable within the subbasin across all ownerships. Their viability is supported within National Forest System lands primarily due to the amount of good-quality habitat available in wilderness and wild and scenic river management areas.

Table 213. Affected environment for redband trout populations within National Forest System lands in the plan area

Subbasin	Population Name	Population Status and Trend (all lands)[1,2]	GMU[3]	Spawning and Rearing Habitat Miles and Condition (NFS lands)[4]
Malheur				
Upper Malheur	Malheur	Viable/unknown	MS-B[1]	83 miles/good
Upper John Day	Upper John Day	Viable/unknown	JD2	310 miles/good
Middle Fork John Day	Middle Fork John Day	Viable/unknown	JD	276miles/good
North Fork John Day	North Fork John Day	Viable/unknown	JD	15 miles/fair
Silvies	Harney-Malheur Lakes	Viable/declining	Oregon Closed Basins	171 miles
Silver	Harney-Malheur Lakes	Viable/declining	Oregon Closed Basins	72 miles/good
Harney-Malheur Lakes	Harney-Malheur Lakes	Viable/declining	Oregon Closed Basins	14 miles/fair
Total Miles Habitat	All		All	257 miles
Umatilla				
Tucannon	Tucannon	Viable/unknown	LS[3]	6 miles/fair
Asotin	Asotin	Viable/unknown	LS	8 miles/fair
Lower Grande Ronde	Wenaha	Viable/unknown	LS	40 miles/good
Upper Grande Ronde	Upper Grande Ronde	Viable/unknown	LS	204 miles/good
North Fork John Day	North Fork John Day	Viable/unknown	JD	365 miles/good
Umatilla	Umatilla	Viable/unknown	MC[4]	52 miles/good
Walla Walla	Walla Walla	Viable/unknown	MC	30 miles/good
Total Miles Habitat	All		All	535 miles
Wallowa-Whitman				
Asotin	Asotin	Viable/declining	LS	4 miles/good
Hells Canyon	Hells Canyon	Viable/declining	LS	43 miles/fair
Lower Grande Ronde	Grande Ronde	Viable/declining	LS	181 miles/good
Upper Grande Ronde	Upper Grande Ronde	Viable/declining	LS	204 miles/good
Wallowa	Wallowa	Viable/declining	LS	86 miles/good
Imnaha	Imnaha	Viable/declining	LS	198 miles/good
Brownlee	Brownlee	Viable/declining	MS-B	33 miles/fair
Powder	Powder	Viable/declining	MS-P[5]	22 miles/fair
Burnt	Burnt	Viable/declining	MS-P	5 miles/poor
North Fork John Day	North Fork John Day	Viable/declining	JD	70 miles/good
Total Miles habitat				842 miles

1. Thurow et al. 2007.
2. May et al. 2012.
3. MS-B/Middle Snake-Boise Geographic Management Unit (GMU); JD/John Day GMU; LS/Lower Snake GMU; MC/Middle Columbia GMU; MS-P/Middle Snake-Powder GMU.
4. National Forest System conditions based on model outputs, modified by habitat connectivity conditions associated with number and locations of culvert passage concerns in National Forest System lands relative to species habitat distribution.

An inventory of fish passage conditions presented by culverts within the Malheur National Forest in 2000 and 2001 revealed numerous passage concerns created by culverts within the National Forest System roads. Those passage barriers were considered in habitat condition evaluations. Those barriers were common in the Silvies River subbasin. The subbasin has priority subwatersheds identified for restoration.

Current habitat quality and connectivity of spawning and rearing habitats within the Malheur National Forest for multiple populations and GMUs are fair to good, based on modeling results. When combined with improving habitat trends in National Forest System lands, these habitat considerations indicate that habitat quantity and quality for redband trout within National Forest System lands are being maintained and continue to support distribution and viability of redband trout in each of the GMUs.

Umatilla National Forest – The Umatilla National Forest provides habitat for redband trout in portions of the John Day, Middle Columbia, and Lower Snake GMUs. Spawning and rearing habitat in National Forest System lands is predominantly in good condition and supports multiple, well-distributed, viable populations at the subbasin scale, based on species distribution, habitat and local population conditions averaged across National Forest System lands in each GMU (see table 213). Population trends are currently unknown.

An inventory of fish passage conditions presented by culverts within the Umatilla National Forest in 2000 and 2001 revealed numerous passage concerns created by National Forest System road culverts in the North Fork John Day subbasin in particular, but scattered throughout the Snake River Basin portion of the forest as well. Those passage barriers were considered in the habitat condition evaluations. Current habitat quality and connectivity of spawning and rearing habitats within the Umatilla National Forest for multiple populations and GMUs are fair to good, based on modeling results. When combined with improving habitat trends in National Forest System lands, these habitat considerations indicate that habitat quantity and quality for redband trout within National Forest System lands are being maintained and continue to support distribution and viability of redband trout in each of the GMUs.

Wallowa-Whitman National Forest – The Wallowa-Whitman National Forest provides habitat for redband trout in portions of four GMUs (table 213). Spawning and rearing habitat in National Forest System lands is in fair to good condition and supports multiple, well-distributed moderately viable, but declining populations at a subbasin scale, based on species distribution, habitat, and local population conditions averaged across National Forest System lands (see table 214). In subbasins with lands in the HCNRA, the management is highly protective of fish habitat for redband populations belonging to the Lower Snake, Middle Snake-Powder, and Middle Snake-Boise GMUs. The Imnaha subbasin provides high-elevation spawning and rearing habitat that is reasonably well connected within the subbasin. The majority of redband spawning and rearing habitat in the Imnaha subbasin is located within the HCNRA and/or within wilderness. Management direction within the HCNRA helps to support continued viability of the Lower Snake and Middle Snake-Powder GMUs, and contributes to the improving habitat trends that are becoming evident at the broader scale (Archer et al. 2009).

An inventory of fish passage conditions presented by culverts within the Wallowa-Whitman National Forest in 2000 and 2001 revealed numerous passage concerns created by National Forest System road culverts, scattered among several subbasins. Those passage barriers were considered in the habitat condition evaluations. Current habitat quality and connectivity of spawning and rearing habitats within the Wallowa-Whitman National Forest for multiple populations and GMUs are fair to good, based on modeling results. When combined with improving habitat trends

on National Forest System lands, these habitat considerations indicate that habitat quantity and quality for redband trout within National Forest System lands are being maintained and continue to support distribution and viability of redband trout in each of the GMUs.

Threatened and Endangered Species

Important population segments of individual species have been listed separately as ESUs or DPSs. This analysis therefore considers Endangered Species Act-listed species at the DPS or ESU scale, together with their designated critical habitats. Table 206 through table 208 display listed species present within each national forest in the plan area. Table 210 through table 213 display the status of individual populations of each listed DPS or ESU associated with each of the national forests, the distribution of each species, the total amount of designated critical habitat within each national forest, and current habitat conditions within National Forest System lands. That information will not be repeated in this section.

The most recent status review for listed anadromous species was based on the criterion of self-sustainability (Ford 2010). The majority of the biological review team (BRT) members concluded that the SRB fall Chinook salmon, Snake River spring/summer Chinook salmon, and SRB steelhead are still high risk and "likely to become endangered in the foreseeable future." The Middle Columbia River steelhead DPS remains listed as threatened. Although most listed spring Chinook salmon and summer steelhead populations are still considered nonviable when all lands are considered in each subbasin, indications are that populations are generally increasing. NMFS describes and monitors population viability for anadromous fish populations and major population groups at different scales: by subbasin, by major tributary watershed, and/or by groups of adjoining subbasins, depending on the population of interest.

Salmon

Sockeye Salmon (Snake River Basin ESU)

Snake River Basin (SRB) sockeye salmon are only present within the Wallowa-Whitman National Forest. They use the mainstem Columbia and Snake Rivers as a migration corridor to reach their spawning areas in Idaho, outside the plan area. For purposes of this analysis, they are considered present only in the Hells Canyon National Recreation Area (HCNRA) for the Wallowa-Whitman National Forest, which is managed under the HCNRA comprehensive management plan (CMP). No revisions to the CMP are proposed. National Forest System lands within the plan area provide no spawning habitat and no early rearing habitat outside the mainstem Snake River. Management strategies and activities analyzed herein for the revised plans for the Blue Mountains national forests would have no effect on this species outside of effects previously considered and consulted for the HCNRA CMP and would not be discussed further in this analysis.

Fall Chinook Salmon (Snake River Basin ESU)

Snake River Basin fall Chinook salmon is listed separately as threatened under the Endangered Species Act and is considered a separate ESU, the equivalent of a species under Endangered Species Act. Their spawning habitat is the Snake River and the lower ends of large tributaries downstream of National Forest System lands in the Snake River Basin. Viability of SRB fall Chinook salmon is primarily influenced by factors outside Forest Service control: mortality associated with upstream and downstream passage over multiple mainstem dams in the Snake and Columbia Rivers, cyclical ocean conditions, commercial, tribal and recreational harvest, and interbreeding with nonnative hatchery stock. Indirect effects to SRB fall Chinook salmon would

be determined based on effects to SRB spring Chinook salmon viability as an approximate surrogate.

Spring Chinook Salmon (Snake River Basin ESU)

Snake River Basin spring Chinook salmon are found in the Tucannon, Grande Ronde, Wallowa, Imnaha, and Snake River/Hells Canyon subbasins within the Umatilla and Wallowa-Whitman National Forests. Characteristics of the species were discussed in the earlier section on focal species.

Steelhead

Two Endangered Species Act-listed DPS (Middle Columbia River and Snake River Basin) are located within the plan revision area.[1] The Middle Columbia River DPS consists of steelhead populations in the John Day, Walla Walla, and Umatilla River subbasins. The Snake River Basin DPS includes steelhead in the Tucannon, Asotin, Wallowa, Lower and Upper Grande Ronde, Imnaha, and Snake River/Hells Canyon subbasins. For purposes of Endangered Species Act listing, each DPS is considered a separate species, with recovery goals for component populations at the subbasin scale or comparable scales; therefore, viability for steelhead is described by DPS and by subbasin.

Middle Columbia River Steelhead DPS

Middle Columbia River (MCR) steelhead and designated critical habitats are present in all three Blue Mountains national forests. in the North Fork John Day subbasin, the Forest Service (Umatilla and Wallowa-Whitman National Forests) administers separate, but adjoining, portions of MCR steelhead habitat in the subbasin.

Snake River Basin Steelhead DPS

Snake River Basin (SRB) steelhead and designated critical habitats are present within two of the three Blue Mountains national forests. The Malheur National Forest provides no habitat for SRB steelhead. The Umatilla National Forest provides the majority of habitat in National Forest System lands for some populations (e.g., the Tucannon subbasin). The entire Imnaha subbasin is within the Wallowa-Whitman National Forest. The Umatilla and Wallowa-Whitman National Forests provide approximately equal portions of other subbasins. In the lower Grande Ronde subbasin, the Umatilla National Forest includes lands draining the west side of the subbasin (Wenaha River watershed), and the Wallowa-Whitman National Forest includes lands draining the east side of the subbasin (Joseph Creek watershed), which support two different populations of SRB steelhead within the subbasin.

Bull Trout (Columbia River Basin DPS)

Columbia River Basin (CRB) bull trout are found in all the plan area subbasins except for the Burnt River (NWPPC 2004a), the Oregon Closed Basins, and the South Fork Crooked River subbasin in the south end of the plan area. Bull trout core populations (Whitsell et al. 2004) have been generally identified at the subbasin level. Core populations in all of these subbasins are part of the Columbia River Basin DPS, which is listed under the Endangered Species Act as threatened. For the remainder of this analysis, CRB bull trout will be referred to simply as “bull trout.”

[1] http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Steelhead/Index.cfm

Sensitive Species

The Regional Forester's Sensitive Species list identifies fish and aquatic invertebrate species for which viability is a concern as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2670.5). These species have not yet reached a threshold for listing under the Endangered Species Act. Table 206 through table 208 include sensitive aquatic species with documented or suspected presence in each of the Blue Mountains national forests, based on the current (2011) Regional Forester's Sensitive Species list.

Aquatic invertebrate species listed as sensitive for one or more national forests in the Blue Mountains plan revision area include the shortfaced lanx, Columbia pebblesnail, the pristine springsnail, the Harney Basin dusky snail, and the Western Ridged Mussel (table 206 through table 208).

Some of these species are found in fast flowing streams or rivers of various sizes, others are found in slow-moving, spring-fed waters. All are known or suspected to occur in high-quality aquatic habitats associated with good condition riparian areas. Small aquatic snails inhabiting springs and spring-fed channels have not been found in the Blue Mountains where springs have been previously developed (Frest and Johannes 1995), but have been found in undeveloped springs and spring runs with high water quality.

Riverine Mollusks

The **shortfaced lanx** is a freshwater limpet that attaches to large, clean, cobble-boulder substrate in large, fast, relatively warm rivers, such as the Snake River below Hells Canyon Dam.

The **western ridged mussel**, in its adult form, is a large, long-lived bivalve mollusk found in clean, gravel-cobble substrates in streams and rivers of the Blue Mountains, typically at higher elevations than other mussel varieties in the interior Columbia River Basin. Once they become local streambed residents, Western Ridged Mussels may live for decades so long as their habitat remains characterized by good water quality and low sediment conditions.

The **Columbia pebblesnail** is an aquatic snail found in large rivers of the Pacific Northwest, including the lower Snake River, the lower Grande Ronde River ten miles or more downstream of the town of Troy, Oregon, and in middle reaches of the Columbia River downstream of the Umatilla National Forest. In National Forest System lands, Columbia pebblesnails have only been documented in portions of the Snake and Salmon Rivers managed by the Wallowa-Whitman National Forest in the HCNRA and are not suspected elsewhere within the Blue Mountains national forests.

Redband Trout, Great Basin/Malheur Lakes DPS (aka Malheur Lakes GMU)

Basic species information and current conditions of population viability and habitat conditions for the Malheur Lakes DPS of redband trout populations are presented in the section on focal species and will not be repeated here.

Spring-dependent Snails

Species dependent upon microhabitats, such as high-quality springs and spring-fed riparian habitats, are not well represented by conditions and trends in habitats for the selected group of focal species. Their viability is much more closely related to conditions and trends in spring fed riparian areas. Conditions and trends for these limited habitats will be used as an indicator of

viability for spring- dependent species not otherwise represented by aquatic vertebrate focal species or their habitats.

Based on surveys conducted within the Umatilla National Forest by Forest Service biologists, the **pristine springsnail**, a small aquatic snail, is found only in clear, cold, undeveloped springs and spring creeks within the Walla Walla and Umatilla River basins.

A recent addition to the Regional Forester's Sensitive Species list, the **Harney Basin dusky snail**, is only known to be in one location in the Harney Basin (one of the Oregon Closed Basins), and has not yet been found in National Forest System lands. It is suspected to be present within the Malheur and Ochoco National Forests in the Oregon Closed Basins and Upper Malheur River subbasin portions of those forests, due to their presence in the Harney Basin. Little is known about this small, freshwater snail, other than that it has been found in habitat characterized as cold springs and associated spring channels.

Westslope Cutthroat Trout

Westslope cutthroat trout are a localized endemic of the Upper John Day subbasin within the Malheur National Forest. The species is considered an introduced species in headwaters of subbasins within the Umatilla and Wallowa-Whitman National Forests. Westslope cutthroat trout inhabit high elevation headwater tributaries and typically occur higher in the tributaries than do redband trout, to which they are closely related. Both redband trout and bull trout in the North Fork John Day and Upper John Day subbasins function as focal species surrogates for westslope cutthroat trout because pure cutthroat inhabit higher elevation tributaries than redband trout, and share cold headwater habitats with bull trout. Viability of westslope cutthroat in the Umatilla and Malheur National Forests is uncertain, due to hybridization, the presence of fair to good habitat conditions in the North Fork and Upper John Day subbasins, when considered with the status of steelhead and redband trout populations in those subbasins and the status of bull trout populations in those same subbasins.

Margined Sculpin

Margined sculpin are a small fish requiring clean cool water and clean streambed substrate without much fine-sediment. They are only known to occur in three subbasins, all associated with the Umatilla National Forest: the Tucannon, Walla Walla, and Umatilla. Margined sculpin are known to be present in the mainstem Tucannon River, which is a medium-large river supporting both spring Chinook salmon and steelhead, and are also known to be present in at least one tributary to the Tucannon River that was also occupied by bull trout. Their small size and productivity relative to the amount and quality of available habitat available suggests sculpin populations are viable, however monitoring population trends for this species is difficult because other sculpin species in the Blue Mountains are similar in appearance and accurate identification to the species level during field surveys is difficult for seasonal surveyors less familiar with the species.

Management Indicator Species

A number of aquatic management indicator species were selected for the 1990 plans (see table 206 through table 208). The 1982 Planning Rule required that certain vertebrate and/or invertebrate species present in the area be identified and selected as management indicator species and the reasons for their selection stated. The species chosen as management indicator species for the 1990 forest plans were selected because their population changes were believed to indicate the effects of management activities within National Forest System lands.

Five species or groups of species from the trout and salmon family of fish (salmonids) were selected to serve as management indicator species in the 1990 plans because their habitat requirements encompassed a broad range of aquatic habitat conditions characteristic of the three national forests. In the 1990 forest plans, there was one general objective for management indicator species: to manage National Forest System lands to maintain viable populations of those selected species. However, the 1982 NFMA regulations did not make a direct link between management indicator species and broad-scale species diversity. Population trends of management indicator species were not expected to represent trends in viability for other species.

Each of the 1990 plans addressed monitoring for management indicator species populations at the forest scale in somewhat different ways. The Umatilla National Forest 1990 forest plan intended to monitor populations of redband trout and steelhead populations; the Malheur National Forest 1990 forest plan intended to monitor habitat for redband trout, westslope cutthroat trout, and bull trout; and the Wallowa-Whitman National Forest 1990 forest plan intended to monitor management indicator species populations indirectly based on population data collected by state agencies for resident trout and steelhead. The Ochoco National Forest 1989 forest plan intended to monitor resident trout, including nonnative brook trout where they occurred, as well as native redband trout and steelhead. Only native redband trout are present in the portion of the Ochoco National Forest administered by the Malheur National Forest and analyzed as part of the plan area. Non-native brook trout populations were introduced as desirable game fish in times past and are present in scattered watersheds in the Wallowa-Whitman, but their current status is unknown.

The purpose of management indicator species monitoring is to evaluate the effectiveness of Forest Service management in maintaining habitat for the selected management indicator species; however, several of the management indicator species selected for the 1990 forest plans are significantly affected by human influences outside the management prerogative of the Forest Service. Indicators should be chosen for specific habitats identified as being at risk, where there is a high level of management actions anticipated, and where there is reasonable certainty that management indicator species population changes can be monitored and attributed to Forest Service activities (Hayward et al. 2004). It is this last criterion that the species previously selected and/or considered for continued use as management indicator species, fall farthest from meeting. Population changes in these species have proven difficult to tie specifically to management of National Forest System lands for reasons specific to each of the selected species, as discussed in this section.

None of the chosen aquatic management indicator species was Endangered Species Act-listed at the time the Blue Mountains forest plans were signed in 1990. Several steelhead and bull trout DPS, were subsequently Endangered Species Act-listed as Threatened between 1998 and 2010, along with their designated critical habitats, indicating a loss of viability at the DPS or species scale. Reasons for those listings are provided in the various Federal Registers that announced the listings. No other aquatic management indicator species in the planning area have been listed as Threatened or Endangered since 2010. Redband trout and westslope cutthroat trout are the only remaining native aquatic management indicator species from the 1990 forest plans that are not currently listed under the Endangered Species Act.

Other aquatic species known present in the planning area were considered as candidates for management indicator species, but were not selected for a variety of reasons including lack of information on distribution or biology or current population conditions for the species. Most nongame species are believed to be less sensitive to effects of land management than are coldwater salmonids, particularly water temperatures and sediment levels in streambeds. Other

species are anadromous similar to salmon and steelhead and are affected by similar impacts to their populations in the migratory corridors downstream of National Forest System lands.

Other species prefer warmer and/or larger slower waters downstream of National Forest System lands, or may be species which would potentially benefit from land management impacts that would be considered detrimental to listed and Sensitive coldwater species. Other species considered are strongly affected by management of lands downstream of National Forest System lands or are species for which there are no current concerns for viability and not expected to be detrimentally affected by forest management activities. Salmonid species are believed to be more sensitive to the types of land management activities likely to occur on National Forest System lands.

For reasons previously discussed, of the current management indicator species, only bull trout and redband trout were seriously considered as possibilities for carrying forward as management indicator species in the new plan revisions. Redband trout are distributed only partially in subbasins outside the range of steelhead, and are affected by management on both federal and non-federal lands in the subbasins where they are resident, they were not considered a good indicator of management effects. For those reasons, redband trout were not selected to carry forward as management indicator species for the plan action alternatives. Bull trout are high-elevation species and use spawning and rearing habitats in upper watersheds with limited commercial timber management, infrequent high-intensity wildfires as a natural occurrence, limited forage production and suitability for livestock grazing. Most of their spawning and rearing habitat is located in areas predominantly allocated to Wilderness and other low-roaded Management Area allocations. For these reasons bull trout were not considered to be a good indicator of management effects.

The biology and legal status of anadromous steelhead and spring Chinook salmon in the Middle Columbia and Snake River basins demonstrates that anadromous populations are heavily influenced by many factors outside and downstream of National Forest System lands. Steelhead and Chinook salmon both are highly migratory and spend a large portion of their lives in large rivers and oceans downstream of National Forest System lands. They are strongly affected by land and population management factors outside of National Forest System lands, all of which are beyond the management purview of the Forest Service.

Those factors include competition and interbreeding with hatchery stocks; tribal, recreational and commercial harvest; habitat conditions including water quality in the migratory river corridors and estuaries; and impacts of passing through multiple, mainstem hydropower dam operations during both emigration downriver to the ocean as subadults and as adults returning upriver to spawn in their natal streams. These population and ESU/DPS level impacts are described in multiple documents, including the Middle Columbia River Steelhead Recovery Plan (NMFS 2008) and subbasin plans for the Middle Columbia River and Lower Snake River subbasins associated with the plan area (NWPCC 2004[2]).

Steelhead and redband trout juveniles are indistinguishable visually, and their spawning and rearing habitats overlap on National Forest System lands in year-round habitats. In addition, where they co-occur, offspring of female steelhead may mature into resident redband trout, and offspring of female redband trout may ultimately out-migrate to the ocean and return to National Forest System streams as adult steelhead (Carmichael et al. 2005). This uncertainty in adult development further limits reliability of viability assessments for steelhead and redband

[2] http://www.nwcouncil.org/fw/subbasinplanning/home/

populations in National Forest System lands where steelhead and redband juveniles are both present year-round and cannot be distinguished from one another visually.

Conclusions regarding effects of forest management on populations of either steelhead or co-curring redband trout as separate management indicator species from field surveys of spawning and rearing habitats on National Forest System lands, become highly unreliable. Monitoring to detect population trends for the resident life history where steelhead are present is difficult to conduct without conducting expensive and extensive genetic testing of both juveniles and adults of both life histories throughout National Forest System lands, which has not been done for purposes of monitoring effects of forest management on either steelhead or redband populations as management indicator species.

For these reasons, changes in populations of either redband trout or steelhead at subbasin-scale do not necessarily reflect consequences of Forest Service management on either species/life history individually. The fact that redband and steelhead are known to interbreed may support population viability for both life histories where they co-occur, but the extent to which this occurs or the extent to which each life history supports viability of the other, is unknown.

Local populations (subwatershed scale) of interior redband trout across the Blue Mountains national forests are considered depressed, with low numbers, or of unknown status (Thurow et al. 2007; subwatershed-scale population assessment data for the selected focal species; project record). Redband populations within the current range of steelhead are also affected by habitat conditions outside the national forests. They can be seasonally migratory within the subbasin-scale freshwater networks and may winter in larger streams in National Forest System lands and downstream in private and state lands, and are likely impacted by habitat fragmentation across ownerships. Redband trout are presumed present in all Columbia and Lower Snake River subbasins where steelhead are present.

Redband trout populations in subbasins outside the current range of steelhead are heavily impacted by agricultural and urban development in migratory corridors downstream of National Forest System lands, and their habitats are naturally fragmented in the Oregon Closed Basins, and are fragmented by mainstem dams and water diversions in the Upper Malheur, Powder, and Burnt River subbasins downstream of National Forest System lands. The fact that redband trout populations are known to use habitats within National Forest System lands as well as habitats downstream of National Forest System lands, complicates monitoring efforts to detect effects of land management activities within National Forest System lands on these populations as a management indicator species, even in river systems where steelhead co-occurrence is not a confounding factor. Rieman et al. (2000) noted the extreme population fragmentation and related impacts of land management downstream of National Forest System lands in these subbasins, based on analyses conducted for the Interior Columbia Basin Ecosystem Management Project (ICBEMP).

Westslope cutthroat trout are a native species with limited presence in eastern Oregon and Washington, where they are on the outer limits of their natural distribution which is centered in northern Idaho and western Montana. Westslope cutthroat are known to be present within the North Fork John Day and Upper John Day subbasins. Their population numbers within the plan area are unknown, but are likely similar to those of redband and bull trout populations in shared watersheds as their habitat requirements are similar.

Westslope cutthroat, although a true separate species, are closely related genetically to redband trout and steelhead and are known to experience hybridization zones where they overlap with

redband trout and steelhead. Hybridization confounds efforts to detect effects of Forest Service management on westslope cutthroat trout as a standalone species. Similar problems may occur where brook trout have been introduced into bull trout streams.

Non-native brook trout are limited to a very few watersheds within the plan area and are not a management indicator species except where noted previously for the Ochoco and Wallowa-Whitman National Forests in tables AS1 and AS3. Current population numbers are unknown, but local populations are suspected to be increasing wherever they occur. Non-native brook trout impact bull trout populations, in particular, through interbreeding which results in sterile hybrids and/or through relatively high reproductive rates which, leads to competitive displacement of bull trout that exhibit much lower reproductive rates. Brook trout also tend to out-compete westslope cutthroat trout for space and food supply where they co-occur. Their presence makes it much more difficult to detect correlations with land management for either bull trout or westslope cutthroat.

Although nonnative brook trout were included in the “resident trout” management indicator species group in the Wallowa-Whitman forest plan in 1990, brook trout are currently considered an undesirable nonnative introduced species in the Wallowa-Whitman National Forest due to their negative impacts on native bull trout and/or westslope cutthroat populations where brook trout co-occur with either of the other two species. Based on the hybridization and competition concerns for Threatened bull trout and Sensitive westslope cutthroat, brook trout are no longer considered a desirable nonnative species suitable for use as a management indicator species for any of the Blue Mountain National Forests for purposes of monitoring population effects of land management on National Forest System lands.

Bull trout populations are a mix of resident and migratory individuals. This mix of life histories is an adaptation to infrequent but catastrophic natural disturbances in their high-elevation habitats. The benefits of such disturbances are that they tend to deliver pulses of large wood and streambed material that provide new spawning gravels and increase habitat complexity, providing for resting places and cover to shelter them from predators and reduce energy demands imposed by fast streamflow. A fresh assortment of large streambed substrate provides spaces in the streambed where juveniles can hide from predators.

The majority of resident bull trout populations and spawning habitats are located in high-elevation habitats limited management is likely to occur, in that these areas are mostly allocated to wilderness, wild and scenic rivers corridors, municipal watersheds, backcountry nonmotorized use where timber harvest, livestock grazing and roaded access are limited. Natural disturbance processes in spawning areas are predominantly operating at natural frequencies, magnitudes and rates to which the species has adapted over centuries. Attempts to monitor bull trout populations are extremely difficult due to difficult access to remote headwater habitats, complex life histories and population networks interacting with large disturbance-prone landscapes to which the species is adapted. The remoteness of their headwater habitats, natural life history complexity of the species and the limited types of land uses in their habitats were some of the combined reasons why bull trout were not chosen for continuation as a management indicator species for the effects of forest management. Other reasons are summarized below.

Bull trout, redband trout, and steelhead populations in and downstream of National Forest System lands have become highly fragmented due to loss of access to migratory corridors and wintering habitats downstream of National Forest System lands through conditions created by impassible dams on main rivers, together with impacts of hybridization and competition with related, introduced species and nonnative hatchery stocks. Subbasin plans and recovery plans indicate that

spawning and rearing habitats for Endangered Species Act-listed DPS and ESUs in lands downstream of National Forest System lands are also degraded by past land use and/or accessibility within and among spawning and rearing habitat. The degree to which these species have been affected varies by subbasin and associated population. The cumulative impacts of historic and ongoing management in National Forest System and other lands are represented in the current habitat and population conditions and trends presented in table 210 through table 213.

Both anadromous and resident aquatic species considered here for use as management indicator species are affected by mainstem hydropower dam construction and operation, hatchery management, fishing regulation, (harvest), mining, timber harvest, road building, water development and ongoing water uses in other ownerships downstream of National Forest System lands, as well as by ongoing and legacy habitat impacts of past management in National Forest System lands, particularly management in terms of mining, timber harvest, livestock grazing and road construction. Current population, habitat conditions, and trends both within and outside of National Forest System lands reflect those cumulative impacts to those species and their habitats, and are discussed in Federal Register listings for each Threatened DPS and ESU. They are also described in greater detail in Subbasin Plans for each planning area subbasin and in agency Status Reviews, Recovery Plans and draft Recovery Plans for listed ESUs and DPSs.

Over the years since 1990, in consideration of the numerous Endangered Species Act-listings for populations that operate at scales that extend well beyond NFs lands, state and federal biologists from many agencies have come to recognize that federal land management alone cannot ensure viability for species of conservation concern will not be lost due to factors outside national forest boundaries or beyond agency management authority, even if adequate habitat quality and quantity are available in National Forest System lands. Thus, the management indicator species concept and aquatic species selected as management indicator species have not served their intended management indicator species function well over the years. For the reasons discussed above, no aquatic Management Indicator Species were chosen for any of the Plan Revision action alternatives. Effects to management indicator species will be discussed for alternative A only, in the section titled “Environmental Consequences to Management Indicator Species.”

Management Indicator Species Habitat

Repeatable riparian and stream habitat surveys designed for detecting habitat trends, as required by forest plan biological opinions for listed steelhead, spring Chinook salmon, and bull trout, have been ongoing throughout the Blue Mountains planning area since 2000. The survey areas include watersheds in which only non-listed redband trout are present. Those monitoring surveys are repeated on a five-year schedule, and enough repeat surveys have been completed during the past five years to allow for early indications of trend across the plan area for both riparian and aquatic conditions (Archer et al. 2009). Early results display improving trends in riparian vegetation conditions, with improving trends in physical aquatic habitat conditions following more slowly, as would be expected though indirect effects of natural processes and interactions between vegetation conditions in riparian zones and stream channels indirectly influenced by those conditions.

Environmental Consequences – Aquatic Species Viability

Species Viability – Overview

Management of National Forest System lands affects viability of aquatic species in two ways. The first way is through the effects of active land management to restore riparian and aquatic

habitat function and habitat quality. The second way is the extent to which aquatic and riparian habitats and species are protected from detrimental effects of active land management, particularly from long-term detrimental effects of timber production, livestock grazing and/or road construction and motorized access. When riparian areas and aquatic habitats are protected from chronic impacts of these activities, they can typically recover without additional assistance from active restoration, but slowly.

Some types of active restoration that contribute to restoring viability of aquatic species, take place in or near the stream channel, example, restoration of fish passage by removing or upgrading a culvert barrier at a road-stream crossing, or replanting riparian shrubs to restore stream shade to provide cooler water and improve streambank stability to reduce sediment inputs that clog spawning gravels. Such actions contribute to improved viability of aquatic species relatively quickly. The comparison of alternatives for these activities is available in the Watershed section, and these comparisons also apply in terms of benefits to focal species as a group. Other activities to restore watershed function and processes take place in the uplands, and improve species viability less directly and more slowly, when focal species are considered as a group. The preceding section on Watershed Function and Water Quality discloses the effects of alternatives in terms of number of watersheds with improved (upland) condition through combined active restoration of existing roads to reduce impacts, and reduced risks from livestock grazing in uplands. Those effects will not be repeated here. Additional supporting comparisons of discussions of livestock effects on riparian vegetation is provided in the botany and range sections. Effects to riparian areas and aquatic habitats from livestock depend primarily on utilization standard. Relative effects to focal species and their habitats overall, are consistent with the comparison of alternatives for overall improved watershed condition and riparian and aquatic habitats. Those effects are incorporated by reference, with an acknowledgement that active restoration of upland portions of watersheds, particularly of priority watersheds, when combined with active restoration of riparian and aquatic habitats in those same priority watersheds, is expected to contribute long-term to viability of aquatic species of conservation concern within the planning area.

Active restoration of riparian and aquatic habitat, discussed in the Watershed Section, is assumed to complement upland restoration in the same priority watersheds. The greater the number of priority watersheds restored, the greater the benefits of the alternative to viability of aquatic species overall, in terms of active restoration. However, the extent to which active restoration of priority watersheds under any alternative will benefit any particular aquatic focal species is unknown. There is no way to predict exactly which priority watersheds will be selected for active restoration in future under the various alternatives, and the various focal species are non-uniformly distributed among the priority watersheds (table 214). Thus additional analysis is required, to assess how well the Plan alternatives would support viability for each aquatic focal species and ultimately help to maintain a diversity of aquatic species in the plan area.

Protection from detrimental effects from land management activities is as critical to maintaining and restoring viability of individual focal species as is active restoration. These two aspects of restoration can complement one another on the same piece of ground, or may complement each other through application to non-overlapping acreages. Management Area allocations and suitability determinations provide protection through acreages determined not Suitable for uses (roads, grazing, timber production) that present potential risk to aquatic and riparian habitats and aquatic species. Protection on lands determined to be suitable for these uses, is provided through desired conditions, standards and guidelines and monitoring.

Table 214. Distribution of key subwatersheds (KWS) (priority subwatersheds in parenthesis) relative to focal species habitats within the Blue Mountains national forests

Subbasin	Bull Trout	Chinook salmon	Steelhead	Redband Trout[3]	Total KWS[1]	Current KWS** (alternative A)[2]
Malheur National Forest						
Middle Fork John Day	6 (6)	13 (13)	15 (15)	8 (8)	15 (15)	29 (15)
Upper John Day	3 (0)	1 (0)	15 (0)	15 (0)	16 (0)	47 (0)
Upper Malheur	8 (2)	NA	NA	11 (7)	15 (7)	19 (7)
Silvies	NA	NA	NA	8 (0)	9 (0)	0
Silver	NA	NA	NA	4 (4)	4 (4)	0 (4)
North Fork John Day	0	0	0	0	0	4 (0)
Harney-Malheur	NA	NA	NA	0	0	0
South Fork Crooked River-Beaver Creek	NA	NA	NA	0	0	0
Malheur National Forest Totals	17 (8)	14 (13)	30 (15)	46 (19)	59 (26)	99 (26)
Umatilla National Forest						
Middle Fork John Day	NA	NA	0	0	0	1 (0)
North Fork John Day	5 (5)	9 (4)	21 (12)	21 (12)	21 (12)	84 (12)
Lower John Day	0	NA	0	0	0	4 (0)
Willow-Columbia	NA	NA	NA	0	0	2 (0)
Umatilla	5 (0)	4 (0)	6 (0)	6 (0)	6 (0)	15(0)
Walla Walla	5 (0)	2 (0)	4 (0)	4 (0)	4 (0)	10 0)
Tucannon	4 (4)	2 (2)	4 (4)	4 (4)	4 (4)	7 (4)
Asotin	3 (0)	NA	3 (0)	3 (0)	5 (0)	6 (0)
Lower Grande Ronde	11(0)	7 (0)	10 (0)	10 (0)	12 (0)	25 (0)
Upper Grande Ronde	1(0)	NA	1 (0)	1 (0)	1 (0)	9 (0)
Umatilla National Forest Totals	34 (9)	21 (6)	49 (16)	49	53 (16)	163
Wallowa-Whitman National Forest						
Imnaha	15 (4)	18 (4)	23 (4)	22 (4)	27 (4)	27 (4)
Lower Grande Ronde	0	0	15 (0)	15 (0)	15 (0)	23 (0)
Upper Grande Ronde	10 (10)	11 (11)	23 (13)	23 (13)	27 (15)	27 (15)
Lower Snake-Asotin	0	0	0	0	0	1 (0)
North Fork John Day	5 (3)	6 (3)	10 (3)	10 (3)	10 (3)	10 (3)
Brownlee (in the HCNRA)	4 (4)	NA	NA	4 (4)	7 (4)	7 (4)
Powder	7 (0)	NA	NA	0	7 (0)	7 (0)
Burnt	11(0)	NA	NA	11 (0)	11 (0)	0
Wallowa	14 (0)	11 (0)	10 (0)	10 (0)	16 (0)	16 (0)
Totals	66 (21)	44 (18)	81 (20)	95 (24)	112 (26)	292 (26) (Hells Canyon not included)

1. Includes priority (key) watersheds for active restoration as defined for action alternatives. Subwatersheds with multiple species are only counted once for purposes of total KWS count. Totals do not represent sum of KWS for individual focal species.
2. Represents current combined set of key and priority subwatersheds as defined by PACFISH and INFISH criteria.
3. Redband trout are presumed present wherever steelhead are present.

The Blue Mountains Aquatic Species Sustainability Model (Gecy 2013a) assesses alternatives from the perspective of providing protection and reduction of risk of combined effects to fish and their habitats from timber production, livestock grazing and roaded access through land allocations and suitability determinations. The model was designed to assess risk to viability for each of the individual focal species, by alternative, based on the mix of land allocations and suitability for these uses, in each subbasin occupied by the species. Model outputs are described in terms of likelihood that aquatic habitats would be protected, in each subbasin. Protection facilitates passive restoration of aquatic habitats and species through natural processes.

Table 214 displays how key and priority watersheds are distributed by species in each subbasin, however the Model does not take their presence into account as a special consideration as they are not allocations. Each key and priority watershed contains multiple management areas and related suitabilities for timber production, roads and livestock grazing. The allocations within each key and priority watershed vary by alternative. Relative degrees of protection for each focal species is aggregated to the subbasin scale based on the mix of allocations and land use suitabilities within each subbasin.

Assumptions for Species Viability

- PACFISH and INFISH were designed as conservation strategies to prevent further habitat degradation and initiate habitat restoration through natural processes. Protection scores calculated for alternative A are accordingly assumed to represent a baseline of no degradation from existing condition on a species-by-species basis, for purposes of comparison of alternatives.
- A further assumption is that near-natural rates of recovery through natural processes are in progress and would continue under alternative A, considering that PACFISH and INFISH have been implemented since 1995. Protection scores for action alternatives are assumed to represent slightly faster or slower rates of recovery through natural processes, depending on the degree of difference from protection scores for alternative A.
- Viability analyses for focal species or subgroups that are of conservation concern represent effects to viability for other species of conservation concern where the habitats requirements and/or geographic distributions are similar.
- Multiple scale analysis would be conducted to identify and prioritize active restoration needs for priority watersheds.

Environmental Consequences to Species Viability Common to All Alternatives

All alternatives incorporate, to varying degrees, the plan components essential to assuring viability for focal species and other species of conservation concern in National Forest System lands. These plan components include:

- Desired conditions and objectives for watershed condition and function
- Allocation of lands (management areas) considered either Suitable or Not Suitable for grazing, timber management, and/or roaded access, including new road construction
- An emphasis on active restoration of watersheds, riparian, and aquatic habitats
- Watershed, riparian, and aquatic habitat protections provided by standards and guidelines
- Forest plan scale monitoring strategy for riparian and aquatic conditions

All of these components would be in place for all the action alternatives, therefore management of National Forest System lands can be expected to contribute to viability of the various focal species that spawn and rear in National Forest System lands. The action alternatives are strengthened further by establishment of riparian management areas as a land allocation and by standards and guidelines such as ones that ensure redds of listed fish would be protected from trampling by grazing livestock for all alternatives.

The suite of protections provided by desired conditions, standards and guidelines, and suitability determinations for timber production, grazing and road access tailored to each management area would facilitate passive restoration through natural processes, for aquatic and riparian habitats.

Under alternatives B through F, additional protections related to construction of new roads would be provided by additional desired conditions, goals, standards, and guidelines specific to key watersheds. Under alternative A, PACFISH and INFISH direction for key and priority watersheds would continue to apply to all subwatersheds where listed fish are present, as shown in table 214. Protective effects from the alternatives are represented by protection scores, which were calculated through application of the Blue Mountain Aquatic Sustainability Model. The model assumptions and calculations are described in Gecy (2013a).

Relative protection levels for each species are presented by protection scores for that species. Habitat protections integrated into the alternatives through suitability determinations for the various management areas in each subbasin are represented by protection scores calculated through the model. and were based on

- Acres allocated to the various management areas, and their distribution within each subbasin where a species is present
- Standards and guidelines, especially those pertaining to key watersheds and livestock grazing

Brief interpretations of the protection scores are provided by alternative in the tables that follow for each species. Passive restoration is considered to occur when protection scores are the same or greater than protection scores for alternative A, because Alternative A is currently supporting ongoing passive restoration processes at nearly natural rates.

Active Restoration-Effects Common to All Alternatives

The degree to which alternatives would result in watershed and riparian improvements through reduced livestock grazing in both riparian areas and uplands, and active restoration of roads and upland vegetation, will likely benefit aquatic species and their habitats through improved watershed function and natural disturbance processes that are closer to the long-term natural range of variation to which these species are adapted. Active restoration of riparian and aquatic habitats and improved connectivity through removal of passage barriers will result in more immediate benefits than work in uplands. All these activities are assumed to occur in priority watersheds, the aquatic species focal species inhabiting those watersheds will all benefit long term from whole-watershed restoration in these watersheds.

Accelerated restoration in priority would contribute to creating larger connected habitats within the larger landscape. Larger areas of connected key watersheds and habitats would be well distributed among most subbasins and for all focal species in subbasins containing priority watersheds. This long-term improvement in habitat conditions in targeted areas would help offset any short-term detrimental effects from natural disturbances or management activities within those subbasins, by providing refugia from thee disturbances. The more priority watersheds that are restored, the more resilient the networks of habitat and populations will be in the face of

natural disturbance, and the more likely that plan activities will contribute to maintaining or restoring viability for focal species as a group.

Actions that would improve quality within and connectivity between spawning reaches are likely to be among the more effective restoration activities that could be undertaken near term in habitat for Chinook salmon and other focal species In watersheds that have been fragmented by man-made modifications, connectivity could be increased by removing barriers associated with road crossings and diversion structures (Steel et al. 2004) or possibly by alleviating high stream temperatures that can act as thermal barriers (Torgersen et al. 1999).

Watershed action plans have been completed for all 14 priority subwatersheds in the Granite and Wall Creek watersheds within the Umatilla National Forest, and for all 8 priority subwatersheds in the Camp Creek watershed within the Malheur National Forest. They have not yet been completed for other watersheds or for other priority subwatersheds within the plan area. The degree of active restoration benefits to individual focal species will depend on which priority watersheds are restored under the selected alternative and the species present in those watersheds. The specific set of priority watersheds that would be restored under each alternative is unknown at this time. Thus the influence of active restoration on viability for any individual focal species is unknown at this time.

Environmental Consequences to Focal Species Viability

Passive Restoration

Effects to individual species for viability are required by law and policy. Active restoration occurs in priority watersheds, and is expected to benefit aquatic species in the long-term, but the extent to which viability of each species is benefited is unknown, due to uncertainty as to which priority watersheds would be restored over the life of the plan. Effects to focal species in general from active restoration parallel the effects to priority watersheds, riparian and aquatic habitats, as disclosed in the preceding section on Watershed Function and Water Quality, as these are the factors that influence riparian and fish habitat quantity, quality and connectivity. These in turn affect viability of aquatic species populations in National Forest System lands.

The Blue Mountain Aquatic Sustainability Model provides a means by which to assess effects of alternatives to viability for individual species, and is consistent with regional direction for analyzing effects to viability for individual species. This model is based on the assumption that the level of risk of habitat degradation implied by land allocations considered suitable for livestock grazing, timber production and/or roaded access is counterbalanced by management allocations where these uses are considered unsuitable. The degree to which allocations within a subbasin are unsuitable for these uses, is the degree to which the model considers aquatic habitat protected in that subbasin. The degree of protection represented by model protection scores is rated on a scale of 0-1.0, with 1.0 being the highest level of protection from these land uses, which have degraded aquatic habitats in decades past.

Methods by which protection scores for each subbasin were calculated are described in Gecy 2013a. This section uses protection score outputs from the Blue Mountain Aquatic Sustainability Model (Gecy 2013a) to discuss effects to individual focal species, and is the only systematic tool used in this revision capable of displaying effects to individual focal species or other species of conservation concern. These species are geographically limited to specific portions of each forest and limited to specific drainages.

Table 215 through table 226 display the relative effects of alternatives on individual species within the Blue Mountains national forests. Environmental consequences to viability of individual focal species are summarized and the effects interpreted for populations in each subbasin in which the national forest is located.

As displayed in table 215 through table 226, the greatest differences in National Forest System management protective effects on viability would be between national forests and by species and/or by major river basin (MCR versus SRB versus Oregon Closed Basins). In some cases, relative effects of alternatives may vary by DPS, ESU and/or by GMU in the same forest and relative effects of the alternatives on each species may be more related to whether the species occurs in the Snake River Basin or in the Middle Columbia River basin. These differences reflect different overall balances of land uses within each major river basin. In all cases, it is the mix of land allocations and balance of risk from timber production, livestock grazing and roaded access posed by alternatives, subbasin by subbasin, that creates relative differences in terms of protection and degree of risk from active management, for each species.

The following observations hold throughout the remainder of the analysis for species viability for each forest and for each individual focal species and each species of concern, including individual DPS, ESU and/or GMU:

- Based on relative differences between protection scores among alternatives, alternative C provides the greatest degree of protection, lowest risk of management effects to species viability from roads, grazing and timber production, and likely provides the most opportunity for natural processes to restore riparian and aquatic habitats throughout the range of each species. This alternative also poses the greatest risk of impacts from wildfire by allowing unnatural fuel conditions to continue to build in dry forest landscapes, relative to other alternatives.
- Based on relative differences between protection scores among alternatives, alternative D poses the greatest degree of aggregate risk to riparian and aquatic habitats throughout the range of each species. This is based on differences between alternatives for levels of timber production, grazing and road construction/access based on suitability for those uses among the various management area allocations.
- As reflected in table 215 through table 226, relative habitat protections provided by alternatives vary by Forest and can also vary by ESU, DPS or GMU for the chosen focal species. The relationship between these alternatives may vary by forest, by individual species and/or by major drainage basin (e.g., Lower Snake River, Middle Snake River, Middle Columbia River, Oregon Closed Basins) within a forest. Alternative C consistently provides the highest levels of protection and support to viability among alternatives for each forest for spring Chinook salmon throughout their range.
- The relative protective differences between alternatives A, B, E and F based on protection scores would generally be small and show little risk of impact on viability for any of the species due to strong protections in place under each of those alternatives. The reduced levels of riparian vegetation use under Alternatives E and F add protections that are not reflected in Model protection scores for anadromous species and bull trout. Where protection scores suggest that Alternative E and F protective benefits are similar or less than benefits of Alternatives A or B, these additional protective benefits likely result in alternatives E and F providing similar or greater benefits than alternatives A and B, but those benefits have not been quantified through application of the Blue Mountain Sustainability Model.

- PIBO monitoring results show habitat recovery through natural processes under current PACFISH and INFISH management directions and additional protections provided by project-level Endangered Species Act consultations for grazing and other management activities (Alternative A).
- Replacement or removal of culverts currently creating problems for fish passage will also reduce hydrologic connectivity and reduce the risk of future sediment inputs from failures at stream crossings and improve habitat and population connectivity as well as connectivity within and between populations of the various focal species where they are present. The relative degree of active restoration for fish passage and other actions taken to increase habitat quantity and connectivity between stronghold watersheds for focal species, which would be anticipated under the alternatives in priority watersheds is described in appendix A for each forest (table A52 through A54, sections 1.1 and 1.2) . The extent of fish passage restoration and increased habitat quantity and connectivity varies by alternative.
- Improvements in aquatic habitat connectivity will benefit one or more focal species wherever these activities are conducted. The extent to which any particular species will benefit, which is unknown at this time. Benefits to any particular species will depend on which priority watersheds receive these improvements and whether the location of such improvements occurs in locations the species is either expected or known to use.
- Active restoration for stream shade, water quality, flow volume and riparian habitat are discussed in the Watershed section. Improvements in all these elements will benefit focal species wherever these activities are conducted. The extent to which any particular species will benefit, will depend on which priority watersheds receive these improvements, which is unknown at this time.

Spring Chinook Salmon

As shown in table 215 through table 218, relative effects of alternatives for spring Chinook salmon from habitat protections vary by Forest and also depend on the spring Chinook salmon ESU in question.

Malheur National Forest – Passive Restoration: As reflected in the protection scores and interpretation shown in table 215, alternatives B, E and F provide intermediate levels of protection and support for passive restoration through landscape-scale natural processes.

A greater number of acres are allocated under alternatives E and F, to management allocations considered suitable for one or more of the primary land uses in subbasins occupied by spring Chinook salmon, thereby increasing the risk of management effects to their habitat from E and F relative to B. Because the model integrates multiple Plan components (suitabilities and allocations) and produces a protection score that integrates the associated management risks from all those factors at subbasin-scale, it is uncertain as to specifically which or how many aspects of Alternatives E and F are outweighed by a corresponding aspect of alternative B.

Alternatives E and F would likely maintain or improve existing conditions and prevent further degradation of MCR Chinook salmon habitat. These two alternatives would provide additional levels of grazing protection to riparian management areas, based on riparian utilization guidelines for anadromous and bull trout watersheds, specific to those two alternatives. Existing project-level biological opinions for grazing in the Malheur National Forest currently require even greater reductions in riparian utilization and bank alternation under certain conditions than the guidelines given for alternatives E and F.

Table 215. Malheur National Forest protection scores, anticipated habitat trends and relative restoration rates through natural processes for spring Chinook salmon, Middle Columbia River ESU

Subbasin	Chinook Salmon Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Upper John Day	Upper John Day	0.62	0.69	0.78	0.55	0.66	0.66
Middle Fork John Day	Middle Fork John Day	0.53	0.54	0.58	0.49	0.53	0.53
Overall NFS trend and relative rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Umatilla National Forest – Passive Restoration: In the Umatilla National Forest, both alternatives E and F may provide equal or greater protections overall than alternative B, as reflected in the protection scores and interpretation shown in table 216.

Both alternatives E and F would support stronger protections and support for MCR spring Chinook salmon viability relative to alternatives A, B, and D, but results for SRB spring Chinook vary slightly in that alternative B would provide stronger protections than alternatives E and F. The relationship between alternatives would be similar for both ESUs when considering alternatives A, C, and D.

Table 216. Umatilla National Forest protection scores, anticipated habitat trends, and relative restoration rates through natural processes for spring Chinook salmon, Middle Columbia River and Snake River Basin ESUs

Subbasin	Chinook Salmon Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Middle Columbia Basin ESU							
North Fork John Day	North Fork John Day	0.62	0.75	0.84	0.67	0.77	0.77
Umatilla	Umatilla	0.70	0.72	0.83	0.60	0.73	0.73
Walla Walla	Walla Walla	0.62	0.75	0.84	0.67	0.77	0.77
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than A	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than B	Upward trend faster than B
Snake River Basin ESU							
Tucannon	Tucannon	0.68	0.72	0.81	0.64	0.72	0.72
Lower Grande Ronde	Wenaha	0.82	0.82	0.84	0.77	0.81	0.81
Upper Grande Ronde	Upper Grande Ronde	0.61	0.63	0.74	0.46	0.60	0.60
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E,F	Fastest upward trend	Slowest; possibly no trend	Upward trend slower than A	Upward trend slower than A

Wallowa-Whitman National Forest – Passive Restoration: The relative effects of alternatives vary between ESUs in the Wallowa-Whitman National Forest, based on protection scores and interpretation displayed in table 218. Alternatives C and A would provide the stronger protections and associated rates of passive restoration for MCR spring Chinook salmon, which may be attributable to little or no allocations to acres suitable to timber production or motorized access (MA4A and MA 3B) relative to other alternatives. Alternative D would provide the lowest level of protection and would potentially slow rates of restoration through natural processes when compared to alternative A. Protection scores for alternatives B, E and F suggest moderately increased risks to MCR spring Chinook salmon protections compared to alternative A.

In contrast to results for MCR spring Chinook salmon where alternative A provides stronger protections than alternatives B, E and F, for SRB spring Chinook alternative B would provide stronger protections than alternatives A, E and F. The protection score differences may reflect increased allocations to riparian management areas (MA4B) in the Upper and Lower Grande Ronde subbasins and more backcountry motorized (MA3B), which would limit timber production, and maintain limited roaded access. For both ESUs, alternative D would provide the lowest degree of protection of all the alternatives and represents the greatest degree of risk to viability from active management.

Table 217. Wallowa-Whitman National Forest protection scores, anticipated habitat trends, and relative restoration rates through natural processes for spring Chinook salmon, Middle Columbia River and Snake River Basin ESUs

Subbasin	Chinook Salmon Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Middle Columbia River ESU							
North Fork John Day	North Fork John Day	0.72	0.66	0.73	0.52	0.63	0.63
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend slower than A	Fastest upward trend	Slowest; possibly no trend	Upward trend slower than B	Upward trend slower than B
Snake River Basin ESU							
Upper Grande Ronde	Upper Grande Ronde/ Catherine Creek	0.59	0.65	0.75	0.51	0.62	0.62
Lower Grande Ronde	Joseph	0.58	0.67	0.79	0.53	0.64	0.64
Wallowa	Wallowa/ Minam	0.87	0.88	0.89	0.86	0.88	0.88
Imnaha	Imnaha	0.90	0.90	0.90	0.90	0.90	0.90
Hells Canyon	Hells Canyon	0.90	0.90	0.90	0.90	0.90	0.90
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Bull Trout Viability (Columbia River Basin DPS)

Malheur National Forest – Passive Restoration: Based on protection scores shown in table 218 for bull trout in the Malheur National Forest, alternative A would maintain ongoing passive restoration through natural processes. Alternatives E and F would likely result in slight improvements in restoration rates achieved through natural processes due to fewer acres subject to ground disturbance compared to alternative A. The lower protection score for alternative D reflects potential reductions in riparian and aquatic habitat conditions and habitat recovery rates when compared to alternative A.

Restoration through natural processes would likely happen fastest for alternative C, overall, due to the fewest acres exposed to ground disturbing activities, with alternative B providing the second highest rates of restoration through natural processes. Interpretation of the protection scores expects that alternative C would provide the fastest upward trend in passive restoration. Alternatives E and F would provide stronger protections for bull trout viability relative to alternatives A and D and would enable passive restoration to continue through natural processes, potentially at faster rates than would occur under alternative A.

Table 218. Malheur National Forest protection scores, habitat trends, and relative restoration rates for Columbia River Basin bull trout

Subbasin	Bull Trout Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Malheur	Upper Malheur	0.57	0.63	0.73	0.49	0.59	0.59
Upper John Day	Upper John Day	0.62	0.69	0.78	0.55	0.66	0.66
Middle Fork John Day	Middle Fork John Day	0.53	0.54	0.58	0.49	0.53	0.53
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Umatilla National Forest – Passive Restoration: Based on protection for bull trout shown in table 219 for the Umatilla National Forest, most of the alternatives generally provide stronger protections and a moderately positive influence on viability from plan protections, when compared to alternative A. Alternative D in the Upper Grande Ronde would be an exception and suggests risks to the Grande Ronde population in terms of slowing progress currently being achieved through passive restoration under PACFISH, as reflected in the lower protection score than shown for alternative A in that subbasin.

Overall, protection scores for alternatives E and F suggest marginally less protections than for alternative B, primarily due to the difference in management allocations between the alternatives along with differing degrees of suitability for timber production, grazing, and roads. However, the stronger standards for riparian grazing utilization would provide greater protections for bull trout under alternatives E and F. Alternative C would contribute the most to improved viability. Alternative D would provide the lowest degree of protection and support to viability, in general terms.

Table 219. Umatilla National Forest protection scores, anticipated habitat trends and relative restoration rates through natural processes for bull trout, Columbia River Basin DPS

Subbasin	Bull Trout Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
North Fork John Day	North Fork John Day	0.62	0.69	0.78	0.55	0.66	0.66
Umatilla	Umatilla	0.61	0.61	0.65	0.57	0.62	0.62
Walla Walla	Walla Walla	0.62	0.75	0.84	0.67	0.77	0.77
Walla Walla	Touchet	0.62	0.75	0.84	0.67	0.77	0.77
Tucannon	Tucannon	0.69	0.70	0.73	0.68	0.70	0.70
Asotin	Asotin	0.62	0.62	0.64	0.57	0.60	0.60
Lower Grande Ronde	Grande Ronde[1]	0.75	0.75	0.76	0.74	0.75	0.75
Upper Grande Ronde	Grande Ronde[1]	0.61	0.63	0.74	0.46	0.60	0.60
North Fork John Day	North Fork John Day	0.62	0.69	0.78	0.55	0.66	0.66
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

1. Grande Ronde bull trout population spans both upper and lower Grande Ronde subbasins.

Wallowa-Whitman National Forest – Passive Restoration: Based on protection scores for bull trout shown in table 220, alternatives E and F would provide stronger protections and greater support for more passive restoration processes in bull trout habitat than alternatives A and D, and only slightly less than alternative B. Alternative C would contribute the most protections and support to improved viability through natural processes for bull trout within the Wallowa-Whitman National Forest. Alternatives A and D both would provide lower protection levels than alternatives B, E, and F, primarily due to differences in management area allocations and suitability for timber production, grazing, and roads.

Steelhead Viability (Middle Columbia River DPS)

Malheur National Forest – Passive Restoration: Effects to steelhead parallel effects to spring Chinook salmon discussed earlier, as these species use the same subbasins and will be affected by the same balances of land uses in the subbasin. The protection scores for alternatives B, E and F indicate stronger support for steelhead viability relative to alternatives A and D. The more restrictive riparian utilization guidelines for bull trout and anadromous watersheds in alternatives E and F would further strengthen the protections indicated by protection scores in table 221, and may result in protections as strong or stronger than provided by alternative B.

Table 220. Wallowa-Whitman National Forest protection scores, anticipated habitat trend based on passive restoration through natural processes for bull trout, Columbia River Basin DPS

Subbasin	Bull Trout Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
North Fork John Day	North Fork John Day	0.55	0.58	0.61	0.55	0.59	0.59
Upper Grande Ronde	Upper Grande Ronde	0.34	0.36	0.40	0.32	0.35	0.35
Wallowa	Wallowa	0.69	0.70	0.70	0.69	0.70	0.70
Imnaha	Imnaha	0.65	0.65	0.65	0.65	0.65	0.65
Hells Canyon	Hells Canyon	0.61	0.61	0.61	0.61	0.61	0.61
Brownlee	Brownlee	0.60	0.61	0.63	0.59	0.60	0.60
Powder	Powder	0.58	0.60	0.63	0.56	0.60	0.60
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Table 221. Malheur National Forest passive restoration scores and relative habitat trends for steelhead populations, Middle Columbia River DPS

Subbasin	Steelhead Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Middle Fork John Day	Middle Fork John Day	0.56	0.60	0.70	0.44	0.56	0.56
Upper John Day	Upper John Day	0.62	0.69	0.78	0.55	0.66	0.66
Overall NFS trend and relative rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Umatilla National Forest – Passive Restoration: Effects to steelhead parallel effects to spring Chinook salmon discussed earlier, as these species use the same subbasins and will be affected by the same balances of land uses in the subbasin. The protection scores for alternatives B, E and F indicate stronger support for steelhead viability relative to alternatives A and D. The more restrictive riparian utilization guidelines for bull trout and anadromous watersheds in alternatives E and F would further strengthen the protections indicated by protection scores in table 222, and may result in protections as strong or stronger than provided by alternative B. In subbasin-specific cases, alternative D would provide stronger protections than alternative A, in the Walla Walla subbasin and in the North Fork John Day subbasin. The reason for alternative D outweighing alternative A in the model protection scores may reflect increased acres allocated to Municipal Watershed management area (2J), which receives extremely high protections from active management to conserve drinking water quality for the city of Walla Walla and surrounding area. For the DPS as a whole, alternative A would provide marginally stronger protections than alternative D when model scores are summed across subbasins for the DPS.

Protection scores in table 222 show a different pattern when comparing alternatives B, E, and F than for MCR steelhead. Alternative B would provide stronger protections than alternatives E and F for the SRB steelhead DPS, which may be explained by the shifting balance of land allocations in the Lower Grande Ronde subbasin in terms of more acres in riparian management areas under alternative D. When comparing protection scores for alternatives D and A, protections for alternative A would be consistently stronger than those provided under alternative D when summed for all subbasins, primarily due to a balance of allocations that would reduce risks from roads and timber production.

Table 222. Umatilla National Forest protection scores, anticipated habitat trends and relative restoration rates through natural processes for steelhead populations, Middle Columbia River and Snake River Basin DPS

Subbasin	Steelhead Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Middle Columbia River DPS							
North Fork John Day	North Fork John Day	0.62	0.75	0.84	0.67	0.77	0.77
Middle Fork John Day	Middle Fork John Day	0.56	0.60	0.70	0.44	0.56	0.56
Umatilla	Umatilla	0.70	0.72	0.83	0.60	0.73	0.73
Walla Walla	Walla Walla	0.62	0.75	0.84	0.67	0.77	0.77
Walla Walla	Touchet	0.62	0.75	0.84	0.67	0.77	0.77
Overall NFS trend and rate (interpretation of protection scores)	MCR	Upward trend continues	Upward trend faster than A	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than B	Upward trend
Snake River Basin DPS							
Tucannon	Tucannon	0.68	0.72	0.81	0.64	0.72	0.72
Asotin	Asotin	0.67	0.64	0.73	0.50	0.61	0.61
Lower Grande Ronde	Wenaha	0.82	0.82	0.84	0.77	0.81	0.81
Upper Grande Ronde	Upper Grande Ronde	0.61	0.63	0.74	0.46	0.60	0.60
Overall NFS trend and rate (interpretation of protection scores)	SRB	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Wallowa-Whitman National Forest – Passive Restoration: Discussions for MCR steelhead and SRB steelhead parallel previous discussions for MCR and SRB spring Chinook salmon, as these DPS each the same set of subbasins respectively and protective effects of the allocations will affect aquatic habitats at subbasin scale (table 223).

Table 223. Wallowa-Whitman National Forest protection scores, anticipated habitat trends and relative restoration rates through natural processes for steelhead, Middle Columbia River and Snake River Basin DPS

Subbasin	Steelhead Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Middle Columbia River DPS							
North Fork John Day	North Fork John Day	0.72	0.66	0.73	0.52	0.63	0.63
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend slower than A	Fastest upward trend	Slowest; possibly no trend	Upward trend slower than B	Upward trend slower than B
Snake River Basin DPS							
Hells Canyon	Hells Canyon	0.90	0.90	0.90	0.90	0.90	0.90
Lower Grande Ronde	Joseph	0.58	0.67	0.79	0.53	0.64	0.64
Upper Grande Ronde	Upper Grande Ronde/ Catherine Creek	0.59	0.65	0.75	0.51	0.62	0.62
Wallowa	Wallowa/ Minam	0.87	0.88	0.89	0.86	0.88	0.88
Imnaha	Imnaha	0.90	0.90	0.90	0.90	0.90	0.90
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Redband Trout

Malheur National Forest – Passive Restoration: As reflected in the protection scores for redband trout and interpretations displayed in table 224 for the Malheur National Forest, alternative B would provide stronger protections for all GMUs compared to alternatives E and F. Alternative D would consistently provide the fewest protections for all GMUs and may slow rates of passive restoration that are ongoing under current management. Alternative C would consistently provide the strongest protections for all GMUs. Alternative B would provide the second highest rates of restoration through protections provided by alternative components.

Alternatives E and F would provide intermediate levels of grazing protection for populations throughout the Middle Columbia River (MCR), Malheur Lakes (ML) and Middle Snake River Basin (MSRB) GMUs since redband habitats in those subbasins overlap habitats occupied by steelhead and bull trout, and the more stringent riparian utilization guidelines for those species would apply.

Redband trout in the South Fork Crooked River/Beaver Creek population are members of the Deschutes geographic management unit (GMU). Although not evaluated through the model due to extremely limited habitat, this population is expected to receive relative benefits to viability from each alternative similar to the relative benefits under each alternative as are anticipated for the Middle Snake GMU. There are similar habitats and similar loss of connectivity to steelhead due to dam construction in the 20th century, but to a lesser degree, as none of the subwatersheds

supporting this population have been designated as priority watersheds for investment in active restoration.

Table 224. Malheur National Forest protection scores, anticipated habitat trends, and relative restoration rates for interior redband trout, Middle Columbia River, Deschutes, Middle Snake, Oregon Closed Basins GMUs

Subbasin	Redband Trout Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Columbia River GMU							
Upper John Day		0.62	0.69	0.78	0.55	0.66	0.66
Middle Fork John Day		0.56	0.60	0.70	0.44	0.56	0.56
Overall NFS trend and rate (interpretation of protection scores)	GMU	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A
Deschutes GMU							
South Fork Crooked River/Beaver Creek (NFS)		Not Rated	Not Rated	Not Rated	Not Rated	Not Rated	Not Rated
Middle Snake River Basin GMU							
Upper Malheur		0.61	0.68	0.77	0.55	0.66	0.66
Overall NFS trend and rate (interpretation of protection scores)	GMU	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A
Oregon Closed Basins GMU							
Silvies	Silvies	0.49	0.59	0.66	0.42	0.52	0.52
Silver	Silver	0.53	0.59	0.68	0.43	0.56	0.56
Harney-Malheur Lakes	Harney-Malheur Lakes	0.57	0.57	0.69	0.40	0.52	0.52
Overall NFS trend and rate (interpretation of protection scores)	GMU	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Umatilla National Forest – Passive Restoration: For the Middle Columbia River GMU, effects to redband parallel earlier discussions for MCR steelhead in these same subbasins. For redband in the Lower Snake River GMU, protective effects of each alternative parallel the protective effects to SRB steelhead in these subbasins (table 225).

Table 225. Umatilla National Forest protection scores, anticipated habitat trends and relative restoration rates through natural processes for interior redband trout, Middle Columbia River and Lower Snake GMUs

Subbasin	Redband Trout Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Middle Columbia River GMU							
North Fork John Day	North Fork John Day	0.62	0.75	0.84	0.67	0.77	0.77
Umatilla	Umatilla	0.70	0.72	0.83	0.60	0.73	0.73
Walla Walla	Walla Walla	0.62	0.75	0.84	0.67	0.77	0.77
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than A, D	Fastest upward trend	Upward trend continues	Upward trend faster than B	Upward trend faster than B
Lower Snake River GMU							
Tucannon	Tucannon	0.68	0.72	0.81	0.64	0.72	0.72
Asotin	Asotin	0.67	0.64	0.73	0.50	0.61	0.61
Lower Grande Ronde	Lower Grande Ronde	0.82	0.82	0.84	0.77	0.81	0.81
Upper Grande Ronde	Upper Grande Ronde	0.61	0.63	0.74	0.46	0.60	0.60
Overall NFS trend and rate (interpretation of protection scores)	All	Upward trend continues	Upward trend faster than E,F	Fastest upward trend	Slowest; possibly no trend	Upward trend faster than A	Upward trend faster than A

Wallowa-Whitman National Forest – Passive Restoration: Based on protection scores for interior redband trout shown in table 226 for the Wallowa-Whitman National Forest, alternative C would contribute the most to improved viability for redband trout through passive restoration, followed by alternatives B, E and F, then by alternative A in all GMUs except the Lower Snake River GMU. Protections provided to the MCR and Lower Snake River GMU populations parallel effects to MCR and SRB steelhead, previously discussed. Relative protective effects to redband in the Powder and Burnt River GMUs from alternatives, parallel the relative effects to MCR redband, due to similar balances of land allocations and land use suitabilities. Increased riparian grazing utilization Protections afforded to bull trout watersheds would not apply under alternative F for the Burnt River GMU, and increased riparian grazing utilization protections afforded to anadromous watersheds would not apply under alternative E for the Powder River GMU.

Table 226. Wallowa-Whitman National Forest protection scores, anticipated habitat trends, and relative restoration rates through natural processes for interior redband trout, by Geographic Management Unit

Subbasin	Redband Trout Population Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Lower Snake River GMU							
Hells Canyon	Hells Canyon	0.90	0.90	0.90	0.90	0.90	0.90
Lower Grande Ronde	Lower Grande Ronde	0.58	0.67	0.79	0.53	0.64	0.64
Upper Grande Ronde	Upper Grande Ronde	0.59	0.65	0.75	0.51	0.62	0.62
Wallowa	Wallowa-Minam	0.87	0.88	0.89	0.86	0.88	0.88
Imnaha	Imnaha	0.90	0.90	0.90	0.90	0.90	0.90
Overall NFS trend and rate (interpretation of protection scores)	GMU	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend slower than A	Upward trend slower than A
Middle Snake River GMU							
Brownlee	Brownlee	0.75	0.78	0.84	0.71	0.76	0.76
Overall NFS trend and rate (interpretation of protection scores)	GMU	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend slower than A	Upward trend slower than A
Powder GMU							
Powder	Powder	0.61	0.68	0.77	0.55	0.66	0.66
Burnt	Burnt	0.53	0.59	0.68	0.43	0.56	0.56
Overall NFS trend and rate (interpretation of protection scores)	GMU	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend slower than A	Upward trend slower than A
Middle Columbia River GMU							
North Fork John Day	North Fork John Day	0.72	0.66	0.73	0.52	0.63	0.63
Overall NFS trend and rate (interpretation of protection scores)	GMU	Upward trend continues	Upward trend faster than E, F	Fastest upward trend	Slowest; possibly no trend	Upward trend slower than A	Upward trend slower than A

Environmental Consequences to Threatened and Endangered Species and Designated Critical Habitats

All of the plan alternatives may affect listed species or their designated critical habitats. Effects of projects implemented for any of the alternatives are expected to move the planning area towards desired conditions for watershed function and species diversity and viability, as described in appendix A to this DEIS. Rate of progress towards desired conditions would vary by alternative. Active restoration may have short term effects for any alternative, but the magnitude of those effects at any point in time is likely to be localized as restoration work would not happen in all

priority watersheds at the same time. The duration of effects would vary by activity, and would also depend on the sequencing of multiple restoration activities. Fish and habitats would likely respond in positive ways to those restoration activities in subsequent decades in the watersheds targeted as priority for restoration. The effects of roads on streams are documented in the Watershed Function, Water Quality, and Water Uses section of this document. Increased protections related to roads, new standards and guidelines, and/or desired conditions have been included in alternatives B, C, E, and F prohibiting construction of new roads and trails in high elevation riparian areas, adding protection for bull trout and other listed species spawning in high elevation streams. In addition, no increases in road density would be allowed in key watersheds, which would be more beneficial to aquatic species than current requirements under PACFISH or INFISH.

The objectives for road improvements in alternative D would potentially allow for increased maintenance and reconstruction of problem roads relative to the other alternatives, and in relative terms, would thereby reduce road-related water-quality impacts from sediment delivery, and reduce fish passage impacts by culvert upgrades based on current standards for fish passage design. The effects of grazing on streams and aquatic species are well documented. Cattle and sheep can have negative effects when they are in streams, depositing excess nutrients and trampling spawning beds and stream banks. Grazing in riparian zones can reduce vegetation and tree recruitment, affecting stream temperature and sediment delivery via removal of shade and compacted soils (Platts 1991, Armour et al. 1994, Bohn and Kershner 2002).

Plan standards and guidelines for grazing in any of the action alternatives would require grazing to be managed in a way that would avoid redd trampling, and to be managed in ways that would move riparian and aquatic habitats towards desired conditions. While grazing may affect listed species or designated critical habitats, those effects may be reduced as grazing would be managed to meet and maintain desired conditions. Current management is already resulting in improving riparian and aquatic habitat trends (Archer et al. 2009), and this would be expected to continue under any of the action alternatives where AUM stocking levels are similar to or less than current stocking levels. Desired conditions, standards, and guidelines could be met under alternative D, but the heavier stocking levels would likely require relatively more intensive management to achieve desired conditions and to meet standards and guidelines on an annual basis. Reduced impacts to riparian areas and aquatic habitats could be expected to occur under alternatives E and F in the majority of watersheds on each forest due to presence of anadromous species and/or bull trout, and the reduced riparian utilization standards that would apply in those watersheds.

Timber harvest can influence aquatic ecological condition via such activities as removal of trees in the riparian zone, removal of upslope trees, and associated understory or slash burning (Hicks et al. 1991). These activities can affect wood recruitment, stream temperatures, erosion potential, stream flow regime, and nutrient runoff, among others (Hicks et al. 1991). Effects of harvest are likely to be different at different scales. Hemstad and Newman (2006) found few effects of harvest at the site or reach scale, but found that harvest five to eight years earlier resulted in losses of habitat quality and species diversity at the scale of a stream segment (larger than a reach) or at the subwatershed level. Those losses were revealed in terms of increases in bank instability and fine sediment throughout the watershed and increased water temperatures and sediment problems throughout the channel segment. The cumulative effects of widespread harvest within a single drainage in a short period of time resulted in deterioration of the aquatic and riparian habitats, but evidence of effects lagged harvest by several years and different evidences of deterioration showed up at different spatial scales within the watershed.

To minimize risks of unintended effects, ground disturbance in riparian areas would be managed to achieve desired conditions for water quality and fish habitat through use of Best Management Practices (BMPs) and watershed analyses. Watershed-specific objectives for riparian and aquatic habitats would be integrated with watershed-specific objectives for fuels and vegetation management at the project level. Watershed analyses and integration of multiple objectives in project design is likely to contribute to restoration of natural watershed and hydrologic function and processes at watershed-scale over the long term.

Plan alternatives could have indirect effects on designated critical habitat since projects implemented under any of the alternatives would be required to move towards desired conditions for watershed function and maintain or improve species diversity and viability. Restoration actions, such as culvert replacement or floodplain restoration requiring in-channel or near-channel operation of heavy equipment, may affect individuals of listed species or designated critical habitats, or both, in the short term. The long term effects would be expected to be beneficial in terms of habitat response in most cases.

Watershed restoration actions in priority watersheds would serve to recreate larger networks of connected high quality habitats within and between watersheds in each subbasin with identified key watersheds. Building these larger connected networks of good habitat would increase resiliency of listed species to both landscape scale and smaller disturbances by allowing listed and other species to relocate to better habitat when the habitat they are currently using is impacted by episodic natural disturbances. Watershed analyses and Endangered Species Act consultations would help to determine project-level tradeoffs in short-term effects to fish and habitats for the sake of long term benefits of restored natural processes for projects implemented.

Other land management activities could result in short term effects to designated critical habitat or listed species, depending on project design and the frequency and intensity of the activity. Those activities would potentially include livestock grazing, construction of new roads, mining activity, and/or timber harvest within 300 feet of perennial or intermittent fish-bearing streams. Alternative D would experience the highest frequency and intensity of ground disturbing activities that could affect listed species and designated critical habitat over the life of the plan, based on objectives, desired conditions, standards, and guidelines for that alternative. The higher level of vegetation management objectives in alternative D would require retaining higher amounts of system road than would be needed for implementation of the other alternatives and could require retaining key system roads in riparian management areas that would not need to be retained under alternatives with lower levels of vegetation management, particularly in dry forest landscapes. The tradeoff is in achieving reductions in road effects in parts of the landscape where frequent reentries would not be needed for prescribed burning or other forest management activities to maintain desired forest vegetation conditions (Rieman et al. 2000).

Consultation would be undertaken with NMFS and USFWS based on effects of implementing actions for the selected alternative. Actions implemented under a new plan will be consulted at the project level or at program level for specific categories of activities. Modifications will be developed at project or program level if needed, to reduce risks to listed species and their designated critical habitats.

In summary, each of the plan revision alternatives **may affect** any or all of the listed species and/or their designated critical habitats, for the reasons given. A biological assessment for the preferred alternative would be developed in detail and serve as the basis for Endangered Species Act Section 7 Consultation with NMFS and USFWS.

Environmental Consequences to Sensitive Species

Forest Service viability status and effects analyses for redband trout populations in the Harney-Malheur Lakes subbasin within the Malheur National Forest represent status and indirect effects to sensitive redband trout of the Malheur Lakes DPS. Based on the redband protection scores presented in table 224, standards and guidelines, desired conditions for alternatives B, C, E, and F are, in some cases, as strong as or stronger than those elements as they are contained in the 1990 plans, as amended by INFISH. For example, additional guidelines (standards in the case of alternative C) have been added to avoid the risk of grazing livestock trampling redds of listed species during spawning season before young fish have emerged from the gravels (MA 4B, RMA-RNG-5 G-118). Non-listed sensitive aquatic species that spawn in those streams during the same season as either spring and/or fall spawning listed species would likely accrue collateral direct benefits from this guideline. Another guideline, RMA-RNG-6 (a standard under alternative C), to avoid use of pastures during spawning season and thus reduce grazing impacts for listed species, further strengthens alternatives B, C, E, and F relative to alternative A.

Increased protections related to roads are reflected in standards and guidelines for alternatives B, C, E, and F that prohibit construction of new roads and trails in high elevation riparian areas. This requirement would be an added protection for sensitive westslope cutthroat trout and other species spawning in high elevation headwater streams.

Monitoring using protocols developed for the PACFISH/INFISH Biological Opinion (PIBO) Effectiveness Monitoring Program would likely remain in use in future years, and local monitoring would likely employ these same or similar protocols where additional, site-specific monitoring may be needed. PIBO monitoring trend results are currently showing a slowly improving trend in riparian and aquatic habitat conditions across the plan area under the 1990 forest plans and those trends are expected to continue for all alternatives.

Management would potentially affect viability for sensitive species in the Umatilla and Walla Walla subbasins, particularly for the Margined sculpin. A narrow endemic Sensitive species, the Margined sculpin inhabits the Upper Tucannon, Walla Walla and Umatilla subbasin headwaters within the Umatilla National Forest, as well as the mainstem Tucannon River in state lands downstream of the national forest boundary. The known distribution ranges from medium rivers to moderate-elevation headwater tributaries in those systems.

Margined sculpin are a small bodied resident species strongly associated with the stream bed, as are bull trout, but are a spring-spawner similar to redband and steelhead. Fair to mostly good connectivity and condition ratings for redband and bull trout habitats in the Walla Walla and Tucannon subbasins suggest that the Margined sculpin is not trending towards listing within the Umatilla National Forest (see table 216 and table 222).

The Malheur National Forest is the only national forest where management would potentially affect viability for Harney Basin Duskysnail and the Great Basin (Malheur Lakes) DPS of redband trout. Based on current knowledge of its distribution, surveys for presence of the Duskysnail would need to be done prior to development of any natural springs, and a site-specific assessment would ensure any populations located would be protected.

Effects of projects implemented under any of the alternatives would be expected to move towards desired conditions for watershed function, key watersheds, hydrologic connectivity, stream shade, water quality and riparian condition, as described in appendix A. Improvement of any of these factors would help to maintain and improve population viability for the sensitive species considered in this assessment.

Active restoration in priority watersheds would potentially have short-term effects for any alternative, but the magnitude of those effects at any point in time would likely be localized. Road decommissioning in riparian management areas, replacement of culverts for fish passage, and instream habitat restoration are all potential short-term effects that would result in long-term beneficial effects. These actions would be most likely to occur in key watersheds and would serve to recreate larger networks of connected high quality habitats within and between watersheds in each subbasin with identified key watersheds. Long-term effects would be expected to benefit all aquatic species present or potentially present within those project areas.

Best management practices would be applied to all ground disturbing projects to protect water quality and habitat for Sensitive aquatic species; however, research has shown BMPs to lose effectiveness the closer activities are to stream channels, to become less effective the steeper the ground is adjacent to the channel, and to be ineffective or to vary in effectiveness when riparian buffers are not in place (Rashin et al. 2006). Best management practices would be an added protection for bull trout and other listed species spawning in high elevation streams.

Rate of progress towards desired conditions through natural processes would vary by alternative, as indicated by differences in protection scores (see table 215 through table 226). In addition, no increases in road density would be allowed in key watersheds.

For alternative A, all subwatersheds where listed fish species are present would remain key and priority subwatersheds respectively under the 1990 plans as amended by PACFISH or INFISH. A smaller set of key (including priority) subwatersheds would be implemented for any of the action alternatives as discussed previously. For alternatives B, E, and F, riparian management areas would provide the same or greater degrees of protection as currently provided in RHCAs within key and priority watersheds under PACFISH and INFISH (alternative A), because the maximum riparian management area widths would apply in every subwatershed in each national forest. They would not be limited to key and priority watersheds with designated critical habitat or listed species, as now directed by INFISH and PACFISH for RHCAs for alternative A. Practically speaking, the application of these maximum riparian management area widths for alternatives B, E, and F make no difference for the Umatilla National Forest. In the Umatilla National Forest, essentially every subwatershed contains designated critical habitat for one or more listed species. The maximum riparian management area widths are already being applied throughout the Umatilla National Forest for this reason and would continue to be applied for alternative A.

For the Malheur and Wallowa-Whitman National Forests, the application of these maximum riparian management area widths for alternatives B, C, E and F would constitute an increase in acres incorporated in riparian management areas and miles of aquatic habitat receiving passive restoration benefits relative to the number of acres managed within RHCAs in alternative A. The reason for the increase in riparian management area acreage for these two national forests is that they have a substantial number of subwatersheds where only redband trout are present. As a result, these watersheds do not currently contain designated critical habitat for any listed species and therefore the maximum RHCA widths are not currently being applied and would not be applied under alternative A.

The allocation to more acreage to riparian management areas for the Malheur and Wallowa-Whitman National Forests for alternatives B, C, D, E, and F relative to the amount of acres managed as RHCAs in alternative A would potentially result in greater benefits from passive restoration to Great Basin redband trout and other resident species in the Oregon Interior Basins. The increase in riparian management area acres for these alternatives would be added in subwatersheds which do not contain designated critical habitat or listed species, i.e., in

subwatersheds located within the Oregon Interior Basins within the Malheur National Forest in particular. Redband trout may also receive added benefits with respect to passive restoration from increased acreages in riparian management areas in subwatersheds upstream of Hells Canyon Dam and in the Crooked River subwatersheds where no listed species or designated critical habitats are present.

Research has shown that effective vegetated filter strips need to be at least 200 to 300 feet wide to effectively capture sediment mobilized by overland flow from outside the riparian management area. Rieman et al. (2001), in analyzing the most aggressive restoration alternative for the Interior Columbia Basin Ecosystem Management Project, determined that the habitat benefits provided during the first 10 years of implementation for restoration of forest vegetation under that alternative were lower than the benefits achieved through less aggressive restoration schedules. They noted that vulnerable aquatic species could be impacted in the short term in ways from which they could not easily recover, even if long-term benefits eventually became evident in later years.

Alternatives B, C, E, and F provide for protections at least as strong as those provided by current management direction under alternative A. Activities are currently permitted within RHCAs, so long as they do not retard habitat recovery through natural processes, thus the difference between alternative D and alternative A is a difference in level of risk of degradation that may occur once the streamside area identified for management for riparian and aquatic habitat values is narrowed. Protections of water quality, aquatic and riparian habitats would be lower for alternative D when compared to alternative A in terms of permitted activities and infrastructure near stream channels, and the narrow riparian management area widths associated with alternative D would pose higher risks of unintended negative effects to aquatic species and habitats, and could interfere with restoration of natural hydrologic processes and watershed function.

The increased risks from activities with alternative D would be associated with roads, livestock management, timber/fuels management, and mining, and would also be potentially associated with other infrastructure-related management activities. These activities potentially affect Sensitive or focal species and their habitat, and, by association, other aquatic species of conservation concern that are not yet Endangered Species Act listed. Such effects would likely be localized and would be unlikely to result in a trend toward listing for Great Basin redband trout, westslope cutthroat trout, margined sculpins or riverine mollusks.

BMP monitoring, aquatic surveys and continued monitoring of conditions and trends in aquatic and riparian habitat conditions are likely to identify any project-level situations detracting from achievement of desired condition. Use of BMP monitoring is expected to facilitate implementation of proactive management changes quickly enough to maintain or restore timely progress towards desired conditions for riparian and aquatic habitats.

Both the regional ARCS and ARS strategies recognized the need to strategically focus scarce restoration funds where they would contribute the most to recreating effective networks of connected watersheds and high quality habitats across the Blue Mountains national forests. The intent behind targeted watersheds for restoration was that they would provide the greatest benefits for recovery of listed species. The above Sensitive species are each known present in at least some of the key watersheds within their range and are likely to benefit to some extent from active restoration in priority watersheds, depending on where work is done relative to the distribution of each species.

Sensitive Species Determinations

Malheur National Forest – Alternatives A, B, C, E, and F may impact individuals or habitat (MIIH), but are not likely to result in a trend towards listing for the Malheur Lakes DPS of redband trout or other sensitive fish and aquatic invertebrate species within the Malheur National Forest for reasons discussed above and in the focal species sections.

None of the plan components completely address risks to potential habitat for the dusky snail with respect to spring development or water diversion out of a spring fed channel flow. However, site surveys and project-specific analyses would likely ensure any newly discovered populations are protected in ways that would avoid a trend towards Federal listing.

Umatilla National Forest – Alternatives A, B, C, D, E, and F may impact individuals or habitat (MIIH), but are not likely to result in a trend towards listing for margined sculpin or other sensitive fish and aquatic invertebrate species within the Umatilla National Forest for reasons discussed above and in the focal species sections.

Wallowa-Whitman National Forest – Alternatives A, B, C, D, E, and F may impact individuals or habitat (MIIH), but are not likely to result in a trend towards listing for sensitive fish and aquatic invertebrate species within the Wallowa-Whitman National Forest for reasons discussed above and in the focal species sections.

Environmental Consequences to Management Indicator Species

Only the no action alternative (alternative A) would be evaluated in terms of the management indicator species listed in the 1990 forest plans. No management indicator species were selected for evaluation for alternatives B, C, D, E, or F (action alternatives), based on factors discussed in the Affected Environment section and expanded upon here. Limiting aquatic management indicator species to alternative A reflects the historic and ongoing cumulative effects to populations and fish habitats in lands in other ownerships within the subbasins occupied by each management indicator species as represented by focal species that served as management indicator species in the 1990 forest plans. Further detail is provided in the Analysis of the Management Situation.

The focal species concept used for alternatives B, C, D, E, and F would use habitat condition and trends as a proxy to monitoring species diversity and viability on National Forest System lands. Population viability status in each subbasin would be tracked at the all-lands scale by USFWS and NMFS and would be based on integration of multiple criteria for each population. Viability for species not tracked by USFWS and NMFS would likely be tracked by state agencies responsible for fish and wildlife resources in their respective states, to the extent that state resources are available.

Within the limits of the Forest Service authority and landbase, alternative A would not likely result in a loss of viability for redband trout or other management indicator species. Riparian and aquatic habitat conditions are beginning to demonstrate statistically supportable trends in improvement resulting from implementation of PACFISH and INFISH standards, guides, goals and objectives, and key and priority watersheds. Implementation of PACFISH and INFISH standards, guides, goals and objectives would continue under alternative A. Active restoration is currently ongoing to restore habitat quality and quantity in select subwatersheds and is expected to continue to the extent funding and staffing are available. Those trends would likely continue with continued implementation of PACFISH and INFISH.

Monitoring conducted under the PIBO effectiveness monitoring program would continue. Additional analysis over time would serve to strengthen these conclusions or reduce statistical "noise" enough to detect whether the apparent trends are genuine and continuing. PIBO effectiveness monitoring may provide the means to project rates of recovery of aquatic habitats across the landscape as enough data accumulates to provide stronger statistical assessments of trends and rates of recovery in riparian and aquatic habitat conditions.

Malheur National Forest

Westslope cutthroat trout are a management indicator species for the Malheur National Forest for the 1990 forest plan, as amended by PACFISH and INFISH (alternative A), and viability for the species needs to be considered at the scale of the Malheur NF for alternative A. Outcomes for redband trout as a focal species are considered to represent outcomes for westslope cutthroat trout and other resident trout, aside from bull trout, but effects to westslope cutthroat are represented specifically by effects to redband trout in the Upper John Day subbasin, since westslope cutthroat do not occur elsewhere within the Malheur NF. Viability for redband trout in the Upper John Day subbasin is good, therefore viability for westslope cutthroat trout is currently considered good within the Malheur National Forest under alternative A. The Malheur National Forest's contribution to viability of westslope cutthroat trout is moderate, as the proportion of spawning and rearing habitat within that national forest is nearly 70 percent and much of that habitat is located within Wilderness areas.

Effects to viability of bull trout for alternative A are discussed and disclosed in the Species Viability section. An assessment of short and long term implications to viability for each alternative is disclosed in the Threatened and Endangered Species discussion. Loss of viability for species or component populations in National Forest System lands would not be expected if current management direction (alternative A) were to be continued under PACFISH and INFISH direction, given current improving trends for riparian and aquatic habitat conditions at the scale of the plan area.

Umatilla National Forest

Redband trout and steelhead are management indicator species for the Umatilla National Forest for the 1990 forest plan, as amended by PACFISH (alternative A). Viability for both species needs to be considered at the scale of the Umatilla National Forest for alternative A.

Effects to viability of steelhead for alternative A are discussed and disclosed in Effects to Viability in the Focal Species section. Effects to viability of redband for alternative A are discussed and disclosed in the Effects to Species Viability section. An assessment of short and long term implications of alternatives to steelhead viability is disclosed in the Threatened and Endangered Species discussion above.

Viability for redband trout and steelhead in Umatilla NF subbasins currently is fair or good, and the loss of viability for species or component populations at in National Forest System lands would not be expected if current management direction were to be continued under PACFISH and INFISH direction, given current improving trends for riparian and aquatic habitat conditions at the scale of the plan area.

Wallowa-Whitman National Forest

Because westslope cutthroat trout are a management indicator species for the Wallowa-Whitman National Forest for the 1990 forest plan, viability for the species needs to be considered at the scale of the national forest for alternative A. Outcomes for redband trout as a focal species are

considered to represent outcomes for westslope cutthroat trout and other resident trout, aside from bull trout. Steelhead and bull trout are also management indicator species for the Wallowa-Whitman National Forest for the 1990 forest plan, and viability for both species needs to be considered at the national forest scale for alternative A.

Effects to viability of steelhead and redband trout with alternative A are discussed and disclosed in Effects to Viability in the Focal Species section. Assessments of short and long term implications of alternatives to steelhead viability are disclosed in the threatened and endangered species discussion.

Viability for redband trout, westslope cutthroat trout, and steelhead in subbasins of the Wallowa-Whitman National Forest currently is fair or good for the 1990 forest plan as amended by PACFISH and INFISH (alternative A) and loss of viability for species or component populations on National Forest System lands would not be expected if current management direction were to be continued under PACFISH and INFISH direction, given current improving trends for riparian and aquatic habitat conditions at the scale of the plan area.

Environmental Consequences to Magnuson-Stevens Act Species (Pacific Salmon)

A determination of “may affect” under the Magnuson-Stevens Act is made when a determination of “no effect” cannot be made with certainty. Since plan components and other plan direction, either together or separately, may indirectly affect Endangered Species Act-listed SRB Chinook salmon and may affect other non-listed spring Chinook salmon stocks wherever they occur for reasons similar to those given for listed salmon species, a finding of “may affect” under the Magnuson Stevens Act would apply to each plan action alternative for each national forest where SRB or MCR spring Chinook salmon are present. The “may affect” determination applies to spring Chinook salmon in either ESU, and a “no effect” determination would apply to SRB fall Chinook salmon, as well as to SRB sockeye.

Pursuant to requirements of the Magnuson-Stevens Act that include an assessment of effects, consultation would be conducted with National Marine Fisheries Service concurrently with Endangered Species Act Section 7 Consultations to ensure protection of all Pacific Ocean salmon species within the Blue Mountains national forests.

Cumulative Effects

Cooperative fish habitat and native fish population restoration work is ongoing between Forest Service ranger districts, tribes, and local stakeholders represented by soil and water conservation districts, watershed councils and nongovernmental organizations. Cooperation across administrative boundaries is increasingly important in efforts to meet increasing demands and competing values for natural resources placed by a growing human population with ultimate impacts on fisheries resources. This cumulative effects analysis considers actions in lands of all ownerships within the full subbasins in which National Forest System lands are found over the next 10 to 20 years, unless otherwise specified.

Cumulative Effects on Species Viability

The biology and legal status of anadromous steelhead demonstrates that steelhead populations are heavily influenced by many factors outside and downstream of National Forest System lands. These factors include competition and interbreeding with hatchery stocks; tribal, recreational and commercial harvest; habitat conditions including water quality in the migratory river corridors and yearly and decadal changes in the ocean rearing environment; and, impacts of passing through multiple main-stem hydropower dam operations during both emigration downriver to the

ocean as subadults and as adults returning upriver to spawn in their natal streams. These population- and ESU/DPS-level impacts are described in multiple documents including the Middle Columbia River Steelhead Recovery Plan (NMFS 2008) and subbasin plans for the Middle Columbia River and Lower Snake River subbasins associated with the Blue Mountains national forest planning area (NWPCC 2004 online).

Current habitat conditions and connectivity at the subbasin scale were considered in lands of all ownership for each component population of the selected focal species using the Blue Mountain sustainability model for Plan Revision (Gecy (2013a). Those conditions influence resident species as well as the anadromous species, since freshwater resident populations move seasonally within the drainage network and larger fluvial individuals of resident species are known to winter in the larger, lower elevation portions of the stream network downstream of National Forest System lands.

Current connectivity and habitat conditions in National Forest System lands are the result of past natural disturbances, particularly floods and wildfire, and past land management activities including grazing, mining, timber harvest and road construction, in particular. Those disturbances, along with fires and floods, have also taken place within private and state lands, including the small, private-ownership inholdings that checkerboard within the forest boundaries, and the habitat condition scores in each subbasin reflect those past effects. Habitat connectivity has been disrupted by culverts, dams, water withdrawals for irrigation. More than 3,700 miles of fish habitat for one or more focal species within National Forest System lands are blocked, or seasonally blocked, by National Forest System road culverts. Existing loss of connectivity within subbasins appears to a primary impact to current viability for any of the species, but particularly for resident bull trout. Timber harvest, grazing and mining have contributed to degradation of stream channels and floodplains, resulting in less water storage and release for instream flows during the summer season.

Seasonal barriers created by loss of stream flow and/or thermal barriers created by water temperatures can exceed species tolerances. Impassible dams and diversions disrupt habitat and population connectivity downstream of national forest boundaries and between subbasins, and other diversions and water withdrawals have partially disrupted connectivity within National Forest System lands in some subbasins. Many of those effects would continue for the foreseeable future. Grazing and timber production are likely to continue on private lands, and small-scale mining operations are likely to continue on private lands in places where they already occur.

As in the case of anadromous species, the quality, size, and accessibility of spawning and rearing habitat in National Forest System lands play but a partial role in terms of ensuring long-term viability of bull trout as a species. As Nelson et al. (2002) discovered, even where other associated salmonids, such as redband trout and westslope cutthroat trout, retained fluvial life histories, bull trout populations in the same drainage may exhibit only the resident life history, even where the fluvial life history may have been present in the drainage in times past. Various theories for this divergence in life history capabilities between species in the same drainage were posited, but further research on loss and recovery of the expression of the fluvial bull trout life history would be needed to help answer the uncertainties that remain.

A study of long-term (10-plus years) effects of fire was conducted by Rosenberger et al. (2011). Their findings suggest that general characteristics of stream ecosystems may recover more quickly than the underlying processes from which they are derived. They concluded that detecting more subtle long-term ecosystem impacts from wildfire disturbance and correlating condition of fish populations may require more in depth analyses. This is particularly important considering

increased water temperatures, wildfire occurrence, and the accompanying shifts in ecosystem function that could be exacerbated by ongoing climate warming.

Recovery plans are in place for Middle Columbia River steelhead (NMFS 2008). Private stakeholder and state agencies in Oregon and Washington within the range of Middle Columbia River steelhead are implementing recovery actions in subbasins identified in the recovery plan, and are contributing to and complementing Forest Service restoration efforts in these subbasins. The Southeast Washington Recovery Plan for listed Snake River steelhead, sockeye, fall Chinook salmon and spring Chinook salmon (NMFS 2005) is being implemented by private stakeholders and Washington state agencies. Bull trout receive recovery benefits from actions taken to restore salmon and steelhead populations where their habitats coincide within the implementation of restoration activities.

Operation of the many dams on the main-stem Columbia and Snake rivers would continue to affect listed steelhead and salmon species within the cumulative effects analysis area, as would recreational and tribal harvest. State and tribal hatcheries for steelhead and salmon would continue to provide hatchery fish for harvest as mitigation for loss of wild fish due to the dams, but hatchery management at individual hatcheries is shifting to support recovery of wild anadromous stocks. Recreational fishing would continue to affect bull trout to an unknown degree. In subbasins where National Forest System lands provide no spawning and rearing habitat, cumulative effects of Forest Service management on species viability on National Forest System lands are minor at best.

So far as plan revision alternatives would contribute to cumulative effects to viability of aquatic focal species, alternatives B, C, E, and F would reduce effects to these species from past and present management in National Forest System lands, and alternative A would maintain or continue to reduce effects at rates that may be slower or faster than would occur under other alternatives, depending on the species, the number and location of priority subwatersheds restored under each alternative, and the degree of riparian and aquatic habitat protection afforded by each alternative, both short term and long term. Alternative D may create greater cumulative effects than the other alternatives, but the balance of risks from combined short-term effects of landscape protections and active restoration in priority watersheds relative to long-term benefits of landscape protection and active restoration in priority watersheds is unknown, since the same desired conditions apply to all alternatives.

Cumulative Effects to Focal Species

Alternative A would continue 1990 forest plan direction, as amended by PACFISH and/or INFISH, and support ongoing passive restoration processes at nearly natural rates and ongoing active restoration at current budget rates. Active restoration in watersheds and subbasin where more than one national forest is contributing to recovery of listed species and their habitats would continue. Non-listed redband trout would receive cumulative positive effects from actions taken to restore listed species. The contribution of the Umatilla and Wallowa-Whitman National Forests to viability of redband trout and steelhead in an all lands context would continue to be moderate with alternative A for all subbasins.

There would be cumulative positive effects from active restoration to benefit multiple focal species present in priority watersheds under all alternatives. Passive and active restoration combined across each national forest would complement restoration efforts undertaken by stakeholders including tribes, local nongovernment organizations and state agencies to restore

listed species and habitats in those watersheds and would cumulatively contribute to restoration of entire watersheds over time.

The biology and legal status of steelhead and spring Chinook salmon, particularly in the Snake River and Middle Columbia River basins, demonstrate that anadromous populations are heavily influenced by many factors outside and downstream of National Forest System lands. Competition and interbreeding with hatchery stocks; tribal, recreational and commercial harvest; habitat conditions including water quality in the migratory river corridors and yearly and decadal changes in the ocean rearing environment; and impacts of passing through multiple main-stem hydropower dam operations during both emigration downriver to the ocean as subadults and as adults returning upriver to spawn in their natal streams influence focal species viability. These population and ESU/DPS level cumulative impacts from historic and ongoing factors outside the scope of Forest Service management authority are described in multiple documents, including Federal Registers in which steelhead and spring Chinook salmon were listed as threatened species, the Middle Columbia River Steelhead Recovery Plan (NMFS 2008), and subbasin plans for the Middle Columbia River and Lower Snake River subbasins (NWPCC 2004). Federal Registers that listed Columbia River Basin bull trout and their designated critical habitats describe similar cumulative impacts to bull trout in subbasins where bull trout occur. Subbasin plans describe similar cumulative impacts and threats to redband populations where redband populations occur.

Alternative C would create the most substantive reductions in risk from major land management activities relative to the other alternatives, and would reduce cumulative effects slowly through passive restoration methods for all focal, listed, sensitive species. Alternative D focuses on maximum commodities production, with a concomitant greater risk of adverse effects and loss of viability, in part due to the number of acres of potential disturbance, narrow riparian management areas, and decreased potential protection of habitat elements including water temperature, sediment, large wood inputs and stable streambanks.

Alternative A would continue the baseline for no net habitat degradation on National Forest System lands and slow improvement in riparian and aquatic habitats through natural processes. Alternative D would not necessarily result in cumulative effects in terms of net degradation of aquatic habitat, but may slow natural recovery rates to the point that degraded habitat conditions remain static. Protection scores are lower for alternative D than for alternative A, which is currently creating conditions resulting in a detectable upward trend in various habitat features and static trends for others within the Blue Mountains national forests. Other analyses of landscape scale planning efforts have resulted in similar findings for management alternatives, which emphasize intensive ground disturbing restoration activity relative to alternatives posing a more moderate balance between passive and active restoration (Rieman et al. 2001).

The positive cumulative effect of active restoration in the Umatilla National Forest may be highest with alternative C, followed by alternative E, then alternative F. In all cases, alternative D would potentially contribute the least cumulative restoration benefits when passive and active restoration benefits are considered together. There would be little or no difference in cumulative effects to bull trout within the Umatilla National Forest from the intensified grazing requirements, as bull trout spawning and rearing streams receive virtually no use under current management direction. Reduction in cumulative effects for bull trout populations and habitat from grazing may be more measurable for the Malheur and Wallowa-Whitman National Forests as more spawning and rearing reaches are accessible and grazed currently in those allotments than are accessible and

grazed on the few spawning and rearing reaches located within Umatilla National Forest allotments.

When active restoration is combined with restoration through passive protection measures, alternatives A, B, C, E, and F are all likely to result in reductions of cumulative effects through time. Relative to each other, the rate of reduction in cumulative effects under each alternative is uncertain and is likely to vary for each focal species, and would depend upon the types of activities funded, the level of activity funded and undertaken for each of those activity types, and when and where those activities are accomplished during the life of the plan on each forest.

Cumulative Effects to Threatened and Endangered Species

Restoration actions are ongoing on private, state and tribal lands in subbasins supporting listed steelhead, bull trout and Chinook salmon populations within the cumulative effects analysis area, including changes in hydropower operations, hatchery operations, harvest management by the states and habitat improvement activities. Those actions are guided by individual subbasin plans developed for the Northwest Power Planning Council and by Recovery Plans for listed bull trout and anadromous species. Restoration actions are likely to continue for the foreseeable future as a continuation of recovery plan implementation through state, Federal, and private partnerships and other collaborative efforts.

Cumulative Effects to Sensitive Species

Cumulative effects of alternatives to redband trout and steelhead were discussed in the focal species section. Redband and bull trout serve as focal species surrogates for westslope cutthroat trout and margined sculpin, and cumulative effects of the alternatives on these species constitute the cumulative effects analyses for redband trout, westslope cutthroat trout and margined sculpin as sensitive species. There would be no cumulative trends towards Federal listing for these species from management actions for any of the alternatives.

Cumulative Effects to Management Indicator Species

Cumulative effects to redband trout, steelhead, bull trout, westslope cutthroat trout and other resident trout were discussed as focal species or are represented by cumulative effects to focal species. No cumulative effects to these management indicator species from management actions are expected to occur for alternatives B, C, D, E, or F. Net reductions in cumulative effects are likely to occur for alternative A, given current indications of improving trends in aquatic habitat and riparian conditions across the Blue Mountain forests' planning area, and improving trends in population viability (all-lands) scale in many subbasins and stable populations in other subbasins, at the all-lands scale. Those improving trends are expected to continue at nearly natural rates for alternative A, which would continue current management under PACFISH and INFISH direction.

Climate Change Implications for Species Diversity and Viability

McElhany et al. (2000), noted "…processes contributing to extinction risk (catastrophes and large scale environmental variation) …need to be assessed at the larger temporal and spatial scales represented by ESUs or other entire collections of populations (i.e., scales larger than the Blue Mountains planning area). More recently, climate change effects can be projected at the scale of the plan area and even by subbasin (Haak 2010, Hamlet et al. 2010. Some subbasins and species would be affected more quickly than others (see table 227 through table 229).

Fall spawning species, such as salmon and bull trout, whose eggs overwinter in streambed gravels, are likely to be impacted by increased winter flooding and greater movement of

streambed gravels and cobbles during winter rain-on-snow events. Steelhead and redband trout are spring spawners; their spawning activity typically occurs as winter and spring flood flows are declining. Their eggs are less likely to be damaged than the eggs of fall-spawning salmon and bull trout. Some subbasins that are currently snow-dominated (spring snowmelt) systems, are expected to shift to transitory-snow (winter rain-on-snow) dominated systems, as climate change progresses. These would be the subbasins where spring Chinook salmon and bull trout spawning habitats would be most at risk. Other subbasins may experience limited change in timing of runoff and fish populations would be less affected by shifts in timing of runoff. Other subbasins may shift to winter rain-dominated systems from their current transitory-snow dominated regimes (table 227 through table 229).

The science panel that reviewed the ARCS made the general observation that:

> Climate-related factors, such as temperature and streamflow, could affect habitat in different ways and at different scales depending on local site characteristics. Therefore a diversity of conditions is needed for population stability (Crozier and Zabel 2006).

Effects of ongoing climate change on riparian and aquatic habitats and species of conservation concern could be reduced by active restoration measures described in appendix A. Improvements in fish passage would enable fish to recolonize drainages impacted by uncharacteristically severe fires. Redband trout and bull trout have been shown to recolonize severely burned drainages within two years, provided the drainages were physically accessible (i.e., no culvert barriers, and provided that other fish in unburned areas were close enough to discover and move back into the recently burned habitat (Rieman et al. 1997)).

Table 227 through table 229 summarize the elevated risks from projected climate change for subbasins occupied by MCR steelhead and spring Chinook salmon, Snake River Basin steelhead and spring Chinook salmon, interior redband trout, and bull trout. With anticipated effects of climate change during the next 20 to 40 years, increased winter and early spring flooding effects on fall spawning species, such as Chinook salmon and bull trout, are likely to be exacerbated where streams are deficit of large wood and where large wood inputs are below natural rates of recruitment. Research has shown that flooding has limited impacts on survival of redds and fry when sufficient large wood is present in the channel to mediate flow velocities and create naturally sheltered areas of slower water that act as refugia for older juveniles. Flooding would also have less impact where fish are able to move freely through the system due to passage barriers having been removed.

Interactions between restoration activities and natural disturbances would influence resiliency of fish habitat and community diversity in different ways which cannot be known fully at this time. For example, fish are more likely to be resilient to a stand-replacing fire and/or atypical flooding if fish passage to adjoining drainages is restored prior to the disturbance, thereby providing timely access to alternative habitat from while habitat recovers in the watersheds affected by the disturbance.

In subwatersheds where barriers have not yet been removed, fish habitat may be more resilient to fire if riparian vegetation structure and composition, particularly in subwatersheds dominated by dry forest, are in a condition that would enable habitat to maintain or improve in the presence of frequent low intensity fire, high road density and frequent stand entries for mechanical fuels management. In subwatersheds and larger drainage networks (5th and 4th HUCs) dominated by mixed severity or stand-replacing fire regimes, fish are more likely to be resilient to climate change where restoration of instream large wood, habitat complexity, restored fish passage and

storm proofed road systems contribute to resiliency to flooding and reduced summer stream flows. As Rieman et al. (2000) noted, every subbasin is different due to different climatic characteristics, and the risks to fish and habitat from management impacts including retention and maintenance of existing road networks, versus impacts of wildfire, flood or drought exacerbated by climate change, may balance out in most of the blue mountain province.

Most researchers expect bull trout to be the least resilient to climate change of any of the focal species, in that they are likely heavily impacted by warmer waters which would constrict their habitat by warmer water encroaching further upstream, and further constricted by greater declines in stream flow on the upper colder ends of their habitat high in the watersheds due to earlier loss of snowpack. Lack of connectivity within and between subbasins may be more impactive to bull trout than to the other species.

Bull trout, with their dependence on cold water, are expected to be severely affected; losses of habitat in the Columbia River Basin are estimated at 22 to 92 percent (ISAB 2007, Hixon et al. 2009). The practical implication is that some sensitive fish populations are likely to “blink out” or become isolated.” Although the temporary blinking out of local populations is a natural that bull trout are adapted to, given their highly stochastic natural environments, the species is currently struggling to maintain viability in the face of existing core population numbers, loss of migratory life histories and loss of physical connectivity within and between core populations. Most core populations within the plan area are not able to easily accommodate additional “blinking out” given existing challenges to which they are not well adapted, given their current status (USFWS 2005). The chronic threats posed by climate change would only exacerbate the challenges to recovery the species already faces.

Spring Chinook salmon may be impacted by drought and high water temperatures more than bull trout, steelhead or redband, due to more of their habitat being located within warmer lower elevations of the subbasins. Elevated water temperatures are expected to contract spawning reaches on the lower boundary of those reaches. Across the plan area as a whole, steelhead and redband are likely to be the most resilient of any of the focal species to effects of climate change, as they are the most widespread species with the widest range of habitat available, not all of which would likely be impacted simultaneously. Good connectivity within and between subbasins in terms of fish passage would enable juveniles and adults to move freely through the system to access cooler tributaries during summer heat, and to access slower side channels during floods. Steelhead, Chinook salmon, and bull trout have all been found to recolonize burned drainages within two years post fire and flooding, where they had access to move back into the watershed (Howell 2006, Rieman et al. 1997).

While there would be elevated risks to fish habitat that would likely vary by subbasin and therefore by species, not all of the anticipated trends would necessarily be harmful to aquatic habitats. A distinguished panel of scientists who reviewed the scientific basis for the regional ARCS, noted that climate change scenarios include an increase in large flood events, wildfires, and pathogen outbreaks. Haak et al. (2010) assessed the probability and likely magnitude of such effects within plan area subbasins over the next 50 years (see table 227 through table 229). The science panel reviewing the ARCS noted that these trends have some potential to improve habitat complexity in some areas as a result of floodplain reconnection and large wood recruitment.

Table 227. Elevated risks from projected climate change for subbasins occupied by Middle Columbia River steelhead and spring Chinook salmon

Projected timing and direction of shifts in hydrologic regimes[1]					Increased habitat risks by 2050-2060[3] from 3 degree C increase in mean air temperature			
		2020		2040 (2020-2059)				
Subbasin	**National Forest**	**Snow to Transitory**	**Transitory Shifting to Rain**	**Transitory Shifting to Rain**	**Winter Flooding**	**Wildfire**	**Risk of Unsuitable Summer Temperatures**	**Increasing Drought Risk Through 2060 Modified for Elevation and Precipitation by Subbasin**
Walla Walla	UMA		X		Moderate	No change	Moderate	Low
Umatilla	UMA			X	Moderate	Low/no change	Moderate	Moderate
Upper John Day	MAL		X		Moderate	Low/no change	Moderate	Moderate
North Fork John Day[2]	MAL, UMA, and WAW			X	Moderate; risk increases with elevation	Low/no change (high at highest elevations)	Low	Moderate
Middle Fork John Day[2]	MAL and UMA			X	Moderate	Low/no change	Moderate	Moderate
Lower John Day River	MAL and UMA	No change	No change	No change	No change	No change	Moderate	Moderate
Walla Walla	UMA		X		Moderate	No change	Moderate	Low

1. Mantua et al. 2010;Tohver and Hamlet undated. Maps available at http://warm.atmos.washington.edu/2860/r7climate/study_report/CBCCSP_chap7_extremes_final
2. Subbasins with priority subwatersheds targeted for restoration.
3. Haak et al. 2010

Table 228. Elevated risks from projected climate change for subbasins occupied by Interior redband trout

Projected timing and direction of shifts in hydrologic regimes[1]				Increased habitat risks by 2050-2060[3] from 3 degree C increase in mean air temperature			
	2020		2040 (2020-2059)				
Subbasin	**Snow to Rain-on-Snow**	**Rain-on-Snow to Rain**	**Rain-on-Snow to Rain**	**Winter Flooding**	**Wildfire**	**Higher Summer Temperatures**	**Drought Risk (Modified for Elevation and Precipitation)**
Upper John Day		X		Moderate	Low/no change	Moderate	Moderate
North Fork John Day[2]			X	Moderate (risk increases with elevation)	Low/no change (high at highest elevations wilderness/scenic area)	Moderate	Moderate
Hells Canyon			X	Moderate	Low/no change (high at highest elevations east)	Moderate	Moderate
Silver Creek[2]			X	Moderate (high on NFS lands)	High at highest elevations, otherwise low/no change	Moderate	Moderate
Silvies			X	Moderate (high on NFS lands)	High/moderate on national forest, otherwise low/no change	Moderate	Moderate
Harney-Malheur Lakes			X	Moderate	Low/no change	Moderate	Moderate
South Fork Crooked			X	Moderate	High at highest elevations, otherwise low/no change	Moderate	Moderate
Upper Malheur[2]	No change	No change	No change	High risk	High/moderate on national forest, otherwise low/no change	Moderate	Moderate
Willow (Snake)	No change	No change	No change	Moderate	Low/no change	Moderate	Moderate
Powder River	No change	No change	No change	No change	No change	Moderate	No change
Burnt River	No change	No change	No change	High (on NFS lands)	Low/no change except high at highest elevations	Moderate	Moderate
Brownlee Reservoir	No change	No change	No change	Moderate	Low. no change	Moderate	Moderate

1. Mantua et al. 2010;Tohver and Hamlet undated. Maps available at http://warm.atmos.washington.edu/2860/r7climate/study_report/CBCCSP_chap7_extremes_final
2. Subbasins with priority subwatersheds targeted for restoration.
3. Haak et al. 2010

Table 229. Elevated risks from projected climate change for subbasins occupied by bull trout

Subbasin	Projected timing and direction of shifts in hydrologic regimes[1]			Increased habitat risks by 2050-2060[3] from 3 degree C increase in mean air temperature				Relative Risk of Extirpation by 2050[4]
	2020		2040 (2020-2059)					
	Snow to Transitory	Transitory Shifting to Rain	Transitory Shifting to Rain	Winter Flooding	Wildfire	Higher Summer Temperatures	Drought Forecast	
Wallowa	X	NA	No change	High	High/moderate, risk decreases as elevation drops	Moderate	Low	Low/moderate
Walla Walla		X		Moderate	No change	Moderate	Low	High/high
Upper John Day		X		Moderate	Low/no change	Moderate	Moderate	Moderate/high
Tucannon		X		Moderate	Low/no change	Moderate	Low	High/high
Asotin	No change	No change	No change	Moderate	Low/no change	Moderate	Moderate	High/high
Lower Grande Ronde		X		Moderate	Low/no change	Moderate	Moderate	High/high
Imnaha[2]	No change	No change	No change	High in upper subbasin, moderate in lower subbasin	No change	Moderate	Moderate	Low/moderate
Hells Canyon (in the HCNRA)			X	Moderate	Low/no change (high at highest elevations east)	Moderate	Moderate	High/high
North Fork John Day			X	Moderate; risk increases with elevation	Low/no change (high at highest elevations)	Moderate	Moderate	Low/moderate
Middle Fork John Day			X	Moderate	Low/no change	Moderate	Moderate	High/high
Umatilla			X	Moderate	Low/no change	Moderate	Moderate	High/high
Upper Grande Ronde	No change	No change	No change	High	High	Moderate	Moderate	Moderate

Projected timing and direction of shifts in hydrologic regimes[1]				Increased habitat risks by 2050-2060[3] from 3 degree C increase in mean air temperature				Relative Risk of Extirpation by 2050[4]
	2020		2040 (2020-2059)					
Subbasin	**Snow to Transitory**	**Transitory Shifting to Rain**	**Transitory Shifting to Rain**	**Winter Flooding**	**Wildfire**	**Higher Summer Temperatures**	**Drought Forecast**	
Upper Malheur	No change	No change	No change	High	Low/no change (high/moderate on national forest)	Moderate	Moderate	Moderate/high
Powder River	No change	No change	No change	No change	No change	Moderate	Moderate	Low/high
Brownlee Reservoir (in the HCNRA)	No change	No change	No change	Moderate	Low/no change	Moderate	Moderate	High/high
Little Salmon (in the HCNRA)	No change	No change	No change	Low/no change	Low/no change	Moderate	Moderate	Moderate/high
Lower Salmon (in the HCNRA)	No change	No change	No change	Moderate	Moderate	Moderate	Moderate	Moderate/high

1. Mantua et al. 2010;Tohver and Hamlet undated. Maps available at http://warm.atmos.washington.edu/2860/r7climate/study_report/CBCCSP_chap7_extremes_final
2. Subbasins with priority subwatersheds targeted for restoration.
3. Haak et al. 2010
4. Rieman et al. 2007

If Mote (2003) stated that the extent to which restoration of stream habitat and altered dam operations would contribute to restoration of focal species and species of conservation concern, or the extent to which such actions would increase species resilience to climatic stresses, is an unknown. He stated his belief that it is impossible to say broadly (let alone for specific stocks) how those changes would compare with other environmental changes salmon have faced and would face in future. Steelhead are likely to experience challenges similar to those faced by salmon of similar ages, but due to seasonal differences in timing of migratory movement, spawning and egg residence periods in natal gravels relative to stream flows and water temperatures, the two species are likely to experience climate change in somewhat different ways.

With a warming climate, increased frequency of winter rains and an earlier snowmelt, "a higher frequency of severe floods would probably result in increased egg mortality due to gravel scour. Winter snowpacks would likely retreat and run off earlier in the spring (Mote et al. 2003a and 2003b), potentially impacting species whose migration to the ocean is timed to coincide with plankton blooms (Pearcy 1997). Summer base flows would probably be lower and the network of perennially flowing streams in a drainage system is likely to shrink during the summer dry period, forcing fish into smaller wetted channels and less diverse habitats (Battin et al. 2006). Warmer water temperatures would increase physiological stresses and lower growth rates. Summer peak temperatures may approach or exceed lethal levels for salmon and trout (Crozier and Zabel 2006, Crozier et al. 2008). Higher temperatures would also favor species that are better adapted to warmer water, including potential predators and competitors (Reeves et al. 1987).

Climate change would likely force shifts in the distribution of fish populations affecting their ability to cope with natural disturbances, particularly drought (Battin et al. 2006). Streams located high in watersheds that historically provided some of the best habitat may no longer be accessible to migratory fishes if snowpack is reduced, thus limiting available rearing areas and access to thermal refugia in summer. Even moderate climate induced changes may significantly increase the risk of extirpating local populations of Chinook salmon (Crozier et al. 2008). Climate related factors, such as temperature and streamflow, could affect habitat in different ways and at different scales depending on local site characteristics. Therefore, a diversity of conditions is needed for population stability (Crozier and Zabel 2006).

"Existing well connected, high elevation habitats on public lands would be important to supporting salmon survival and recovery as the climate continues to warm (Martin and Glick 2008). As stated in the ARCS:

> Maintaining and restoring these areas is a fundamental purpose for establishment of key watersheds. Active restoration actions would achieve objectives that would increase resiliency of aquatic habitat and populations to climate change, by reducing flood peaks by enhancing floodplain connectivity and disconnecting roads from streams, reconnecting isolated habitats by removing or replacing culverts, managing riparian forests to provide shade and other functions, and improving watersheds where aquatic habitats and water quality have been degraded. Actual impacts to aquatic ecosystems would be highly dependent on the degree to which these adaptation actions are implemented now and in the future.

Without these types of restoration actions the ARCS postulated that aquatic habitats and species are likely to become increasingly isolated, simplified, and less likely to recover after significant disturbance events.

At a smaller scale, warmer stream temperatures associated with climate change are likely to exacerbate the extent and frequency of lethal temperatures in reaches occupied during low flow.

Resident salmonids have been shown to move extensively within the stream network during periods in spring and fall when flows are either rising or falling, and tend to become sedentary during summer months when spring flows drop (Mellina et al. 2005), which puts them at risk from lethal temperatures they are not wired to escape. However, such extinctions would be dispersed, and resident trout move enough in cool seasons to keep populations connected. That population interconnectivity may contribute to long-term viability of local populations even of resident species, where that connectivity between populations exists or where it can be restored.

Two foundational assumptions for this analysis have been: (1) Those species utilizing an aquatic ecosystem should benefit when it is functioning properly or when it is improving; and should be negatively impacted if aquatic habitats are degraded or in a downward trend; and (2) The most immediate potential for irreversible and irretrievable commitments of aquatic resources, are associated with threatened and sensitive aquatic species. Land management can positively or negatively affect aquatic resources. The magnitude of effect commonly relates to the scope (size of area) and intensity of an action; its proximity to aquatic resources, the type of activity and the effectiveness of mitigation standards applied.

Considering adaptation of aquatic species habitat to climate change, differences between alternatives are relatively small. Alternatives C, E and F have more area in riparian management areas, and carry the lowest risk from management impacts, and may provide more opportunities for riparian habitat protection than other alternatives. Alternative D has the lowest number of miles and acres of stream structure and riparian restoration, and the least reduction in hydrologic connectivity of roads, and thus would have the lowest potential for maintaining aquatic habitat resiliency and habitat network connectivity in the face of climate change. Alternative C would have the greatest number of miles of riparian restoration and stream channel enhancements, and the greatest reduction in hydrologic connectivity of roads, thus providing the greatest potential for maintaining aquatic habitat resiliency and network connectivity that would enable fish to relocate to the most suitable habitats seasonally, and would maintain habitable stream temperatures for aquatic species as air temperature rises.

Cumulative Effects on Species Diversity

Forest plan level decisions for any alternative are expected to maintain and improve habitats and maintain viability for aquatic species on National Forest System lands. These decisions include desired conditions, objectives, standards and guidelines for maintaining or improving all watersheds, priority watersheds, protecting key watersheds, protecting and restoring riparian management areas, Water Quality, decisions regarding Suitability of riparian management areas for various management uses, investment in active restoration of National Forest System lands in priority watersheds, monitoring of watershed, riparian and aquatic habitat conditions, combined with designation of key watersheds, active restoration, and monitoring of watershed, riparian and aquatic habitat conditions,

When combined with other components of the regional restoration and conservation strategy that are outside the scope of the plan decision, (multiple scale assessments, designation of key watersheds), implementation of those components of the strategy that constitute plan level decisions, (restoration, riparian management areas, and monitoring) are not expected to prevent the listing of any species or DPS, mainly because Federal land management agencies are responsible only for the habitat they manage. State agencies are responsible for populations on all lands and for the regulation of activities that affect populations and habitats on other ownerships. For listed salmon and trout, factors outside the responsibility of Federal land managers contribute to the status and trends of populations. These include changes in freshwater and estuarine

habitats; harvest in commercial and recreational fisheries; management of dams; and the effects of hatchery practices and introductions (NMFS 2008).

Per Kostow (2003), fish-bearing streams in the John Day River Basin historically relied on extensive headwater beaver meadows for water storage and related maintenance of base flows which contributed to cooler water temperatures during the low flow season. These headwater meadows were largely lost in the late 1800s which changed the hydrology of the lower mainstem. The lower Umatilla and Walla Walla rivers are severely modified by irrigation diversions which have resulted in elevated water temperatures and abnormally low flows during the low flow season. In the years since 2003, a bucket-for-bucket program has begun providing water from the Columbia River for Umatilla Basin irrigators, which allows more water to remain in the Umatilla River mainstem during the low flow season, thereby contributing to suitable migration and spawning conditions for the Chinook salmon stock reintroduced by the Confederated Tribes of the Umatilla Indian Reservation in recent years. Kostow (2003) speculated that all major rivers in the Middle Columbia River basin once provided rearing habitat for resident redband trout historically, based on current redband trout populations present in the lower mainstem Deschutes River, but that those other river populations have gone extinct as a result of water withdrawals for irrigation and other purposes, leading to poor rearing habitat quality and quantity in summer and fall due to low flows and elevated water temperatures. This possible loss of mainstem habitats and populations may have contributed to reduced viability of redband populations on National Forest System lands due to loss of spatial and genetic connectivity and diversity within each subbasin.

The entire Crooked River is above the Pelton-Round Butte and Bowman dams and was probably the major steelhead production area historically. Much of the mainstem Crooked River, and the entire South Fork, are now severely impacted by irrigation and cattle grazing. These activities have lowered water tables, caused passage blockages, dewatered reaches, and decreased water quality (Kostow 2003). Many of the headwater areas still have good desert trout habitats, although the best remaining habitats are limited. If habitat has been fragmented or lost and the potential for dispersal and recolonization is limited by barriers or by loss of the migratory life history in the case of bull trout, lagged extinctions in presently occupied habitat may be anticipated. When habitat is lost more rapidly than populations, a ‘‘debt of extinction’’ is incurred (Hanski 1996), so even if further habitat loss is prevented, local extinctions would continue to occur until a new equilibrium between extinction and recolonization is established. The implication is that conservation of existing habitats alone may not be adequate for the long term conservation of some species.

Active cooperation between the Forest Service, other Federal agencies, the states, tribes, and local interest groups and organizations is important to national forest fish and wildlife programs, and programs integrated between different parties promote a synergy that leads to faster restoration of fish and fish habitats at the landscape scale than would likely occur only with funds appropriated to the Forest Service by Congress for these purposes.

Forested Vegetation, Timber Resources, and Wildland Fire

Introduction

The Blue Mountains of northeastern Oregon range from approximately 1,000 to nearly 10,000 feet in elevation. Most of the higher elevations have been glaciated. The landscape includes mountains with narrow valleys, basins, alpine meadows, and break lands. Maritime climate, westerly winds, and mountainous terrain yield less than 10 inches of precipitation at the lowest elevations to more than 80 inches in mountainous areas. The dry upland forest, moist upland forest, and cold upland forest potential vegetation groups are currently dominated by Douglas-fir, ponderosa pine, western larch, subalpine fir, Engelmann spruce, lodgepole pine, and grand fir cover types. Soils in many areas are only moderately productive because of shallow depths associated with cold temperatures and low precipitation. The most productive soils occur in valleys and basins where soils are often deep and have high water-holding capacity due to their increased volcanic ash content. The dominant valley bottom settings include both steep, confined valleys with step-pool and rapids dominated streams, and broad, gently sloping valleys with meandering streams in well-developed floodplains at lower elevations (Quigley et al. 1996). Approximately 80 percent of the National Forest System lands in the Blue Mountains are dominated by upland forest potential vegetation groups.

Disturbance processes, including fire, insects, diseases, and wind, were, and continue to be, significant drivers of ecosystem resilience (Agee and Maruoka 1994) and agents of change in vegetation. These impacts can be both positive and negative. For example, fire exclusion and suppression has been one of the main factors that has resulted in a decrease in the extent of ponderosa pine and aspen, increased stand densities, lengthened fire return intervals, and increased fire severity within the dry and moist upland forest potential vegetation groups. However, the increased stand densities resulting from fire exclusion and suppression have also favored some wildlife species.

Wildland fire is a disturbance process in the Blue Mountains that contributes to ecosystem structure, process, and function (Agee 1993). However, unlike disturbance processes such as wind, insects, disease, and flood, fire is often used as a tool to manage natural resources. Like all disturbance processes, fire effects are often highly variable and can result in a wide range of outcomes. Wildland fire as a tool is most often used to modify fuels to reduce the risk of undesirable fire effects or to help achieve desired conditions for vegetation. Fire is also used to contribute to ecosystem processes and functions, such as nutrient cycling. In many areas within the national forests, the management objective is to restore the natural role of fire and to use fire as a key ecological process. The underlying assumption of this objective is that ecosystems are most resilient and resistant to disturbance, including climate change, when they exist in a condition closest to that under which they evolved (Morgan et al. 1994). However, though Blue Mountains forests evolved with wildland fire, it is neither possible nor desirable to restore the historical role of fire or historical conditions everywhere. In some cases, high severity fire, which is the historical fire regime in some ecosystems, may not be desirable. For example, high severity fire is particularly undesirable in places like the wildland-urban interface, regardless of the historical context.

History

Historically, the dry upland forest potential vegetation group was dominated by ponderosa pine and Douglas-fir. These forests are located at low to moderate elevations. The dry upland forest potential vegetation group was characterized by predominantly frequent, low severity surface

fires occurring at intervals of less than 20 to 25 years (Barrett et al. 1997, USDA Forest Service 2002). While larger-diameter, old trees typically survived these low severity fires, younger, smaller-diameter trees and less fire-tolerant species were killed. The historical fire regime created and maintained a generally open forest structure, with a small-scale mosaic pattern of clumps or patches of trees dominated by large diameter, old ponderosa pines, scattered individual trees, and openings that contained an abundance of native grasses and shrubs (Churchill et al. 2013, Larson and Churchill 2012, and Franklin et al. 2008). This spatial heterogeneity is a key structural element of the historical dry upland forest (Franklin et al. 2008). Crown fires may have occurred historically in mid- to late-seral closed canopy structural stages. However, these events were limited in extent due to the predominance of open canopy forest (Barrett et al. 2010). The frequent fires in the dry upland forest potential vegetation group also contributed to relatively low fuel loadings.

The moist upland forest potential vegetation group was dominated by Douglas-fir, western larch, western white pine, grand fir, and sub-alpine fir, and generally located at moderate elevations. The moist upland forest potential vegetation group was characterized by mixed-severity fires occurring every 40 to100 years (USDA Forest Service 2002). In a mixed-severity fire regime, fire alternates between stand-replacing crown fires that kill all trees to nonlethal, low-intensity surface fires that leave patches of living trees. According to Perry et al. (2011), mixed-severity fires create a patchiness of forest structure, composition, and seral status that can be observed and quantified at an intermediate or meso-scale, with patch sizes ranging from a few hundredths up to tens or hundreds of a hectare, depending on locale and climatic drivers. In forest types that were historically dominated by mixed-severity fire regimes, surface and canopy fuels, topography, climatic conditions, and ignitions worked in concert to influence variation in fire frequency, severity, spatial extent, and seasonality. The result was a complex spatial-temporal mix of low, moderate, and high severity patches. Due to patterns of burning, this type of historical fire regime created a complex mosaic pattern across the landscape, resulting in high levels of diversity in both plants and animals (Perry et al. 2011).

The cold upland forest potential vegetation group was dominated by Engelmann spruce and subalpine fir. These forests are located at higher elevations. The cold upland forest potential vegetation group was characterized by stand-replacing fire events that occurred very infrequently, generally at return intervals of 150 to 300 years (Barrett et al. 2010). All or most trees were killed in both the overstory and understory across large areas (USDA Forest Service 2002).

On drier high-elevation sites, high-severity fires sometimes perpetuated forests of lodgepole pine. These stand-replacing fires usually occurred every 100 to 200 years. When large fires did not occur, these stands succumbed to attacks by mountain pine beetle and were replace by more shade-tolerant species, such as grand fir and white fir (USDA Forest Service 2002).

Other high elevation dry sites were dominated by whitebark pine. Historical fire frequencies and severities were highly variable, but trended toward mixed-severity and stand-replacing fires with longer return intervals, generally 100 to 200 years or more (Barrett et al. 2010).

Within each potential vegetation group, historical fire return intervals and severity varied, depending on several factors, such as fuel loadings, aspect, elevation, and weather conditions before and during fires (Heyerdahl et al. 2001).

Over the past century, numerous factors, including fire exclusion and suppression, timber harvest, introduction of nonnative plant species, and livestock grazing, have altered the historical fire regimes in the Blue Mountains (USDA Forest Service 2002). The dry upland forest potential

vegetation group has experienced the greatest amount of departure from historical conditions (USDA Forest Service 2002). Dry upland forests that historically experienced frequent, low severity fires have now missed several fires due to over a century of fire exclusion and suppression, which has resulted in substantial increases in fuel loadings and the number of smaller trees. Additionally, historic grazing removed the fine fuels that carried low severity surface fires. Without competition from grasses, tree regeneration increased substantially. Tree regeneration that historically would have been thinned by fire continued to grow into dense stands and form multi-storied, closed canopies. The historically open stands within the dry upland forest potential vegetation group, with their mosaic pattern of tree clumps or patches and openings, have now filled in with younger trees, resulting in a more uniform stand structure, increased ladder fuels, increased stand densities, increased fuel continuity, and decreased spatial heterogeneity. Increased stand densities and a reduction in low severity fire events on dry sites has also contributed to a shift from shade intolerant/fire tolerant tree species, such as ponderosa pine, to more shade tolerant/fire intolerant species, such as grand fir. Increased stand densities have also contributed to a decrease in the abundance and diversity of understory grasses, forbs, and shrubs. As a result of these changes, fires are now larger and more severe than historical levels, especially in the dry forest types (Quigley and Arbelbide 1997). Between 1960 and 1979, the average annual acres burned (wildfire) in the Blue Mountains was 4,400 acres. This increased to 26,500 acres per year during the period of 1980 to 2000 (more information is available from the project record).

Commercial logging began in the 1870s when the transcontinental railroad linked the Blue Mountains to national lumber markets. Logging accelerated during the 1890s. Timber companies extended railroad lines into several drainages and sawmills began to appear across the Blue Mountains (Wickman 1992). With the establishment of the national forests, harvest slowed on public lands. National forest timber was difficult to access and more costly to acquire. From 1905 until 1916, most commercial timber harvest in the Blue Mountains came from private lands. This situation changed in the 1920s. National forests began offering large timber sales that focused on removal of commercially valuable stands of old ponderosa pine. Heavy logging occurred throughout the decade and was only abated by the drop in the national economy and the oversupply of lumber that occurred in the 1930s (Langston 1995). Logging on the national forests increased again in the 1940s. Harvest levels remained relatively high throughout the next four decades (1950s through 1980s) as forest managers raced to salvage insect-killed timber and provide lumber for a growing national market.

From its beginning, logging preferentially removed large, old ponderosa pine trees. Management of the national forests emphasized efficient and productive forests capable of meeting the nation's demands into the future. The emerging discipline of forestry at the time held that inferior diseased and decadent trees needed to be removed and replaced with young, healthy, rapidly growing trees. Generally, this meant replacing stands of slower growing, old ponderosa pine with young, faster growing stands. Logging of pine was so intense during the logging boom that started in the 1920s that it exceeded sustainable rates. Two large timber sales from the Malheur National Forest made 2 billion board feet of pine available out of an estimated supply of 7 billion board feet in the forest. As harvest of large, old ponderosa pine continued, the size of available pine gradually decreased on national forests. The average ponderosa pine harvested from the Wallowa-Whitman National Forest in 1912 was 33 inches d.b.h. (diameter at breast height). In 1992, the average size harvested was 19 inches d.b.h. The quantity of ponderosa pine harvested also decreased over time. In the Wallowa-Whitman National Forest, 57 percent of the timber by volume in 1906 was ponderosa pine; in 1991, ponderosa pine volume was less than 20 percent. From the Umatilla National Forest, ponderosa pine was 34 percent of the harvest volume in 1931 (Weidman and Silcox 1936) and 16 percent in 1981.

As the more drought tolerant and shade intolerant ponderosa pine was harvested, it was replaced in many areas by less drought tolerant species that are more shade tolerant, such as grand fir and Douglas-fir. The more open, single-storied ponderosa pine stands were converted to multi-storied stands. As stand densities increased and species compositions and forest structures were altered, the frequency and intensity of insect outbreaks increased. In the Blue Mountains, annual precipitation averages 30 inches on National Forest System lands and ranges from 10 to 80 inches. Drought is a common occurrence. Under the Blue Mountains' normal moisture-limited conditions, densely-stocked stands of grand fir and Douglas-fir trees become stressed, increasing their vulnerability to insect infestation. Similarly, on pine sites, multi-storied, densely stocked ponderosa pine stands are at risk of insect infestation under drought conditions. As these densely stocked and moisture-stressed stands became more abundant during the last half of the 20th century, localized insect infestations quickly blossomed into outbreaks covering thousands of acres (Gast et al. 1991). Insects which attack Douglas-fir and grand fir include western spruce budworm (*Choristoneura occidentalis*), Douglas-fir tussock moth (*Orgyia pseudotsugata*), Douglas-fir beetle (*Dendroctonus pseudotsugae*), and fir engraver (*Scolytus ventralis*). Although insect outbreaks likely occurred prior to the time of the first Euro-American settlers, the frequency and size of outbreaks caused by western spruce budworm species and possibly other insects that attack Douglas-fir and grand fir appear to have increased as a result of the proliferation of fir-dominated forests (Swetnam et al. 1995). Similarly, the multi-storied ponderosa pine stands that replaced the single-storied stands on pine sites have also increased the potential for outbreaks of the western pine beetle (*Dendroctonus brevicomis*) and mountain pine beetle (*D. ponderosae*) (Hessburg et al. 1994). During the past 50 years, tree mortality from insect disturbances in some stands has exceeded 80 percent of all overstory trees (Swetnam et al. 1995). Several large-scale insect outbreaks, including spruce budworm, spruce bark beetle, and Douglas-fir tussock moth, occurred from the 1970s to the 2000s and caused extensive defoliation and mortality. Most tree diseases are increasing in occurrence and severity due to changes in tree species composition (increased grand fir within the dry upland forest potential vegetation group), stand structures (increases in multi-storied structure), and increased stocking levels (Scott and Schmitt 1996). Although each outbreak was followed by an effort to salvage dead trees, low merchantability and limited access prevented removal of dead trees from many areas. The abundance of insect-killed trees substantially increased the surface fuel loads for thousands of acres across the Blue Mountains. Conditions became conducive for the occurrence of large, high-intensity wildfires. From 1985 until 1994, lightning-caused wildfires burned more than 445,000 acres in the Blue Mountains. Many of these fires were high severity, stand-replacing events that killed most of the trees across large areas.

As a consequence of the past history of timber harvest, fire suppression, and grazing, the national forests within the Blue Mountains are substantially different from those that existed a century earlier (Munger 1917). Open, single-storied ponderosa pine stands have decreased, while dense, multi-storied stands of Douglas-fir and true fir have increased. Today, more stands are dominated by a uniform distribution of young to mid-aged trees as a result of selective harvesting of larger trees, salvage logging, and regeneration harvests that followed insect and fire mortality. The risk of insect outbreak has increased due to an abundance of densely stocked mixed-species stands. The probability of large, high-severity wildfire has also increased due to the increase in insect-induced tree mortality, increased fuel loadings, and the large acreage of densely stocked, multi-storied stands composed of shade-tolerant and fire-intolerant tree species.

Affected Environment – Forested Vegetation, Timber Resources, and Wildland Fire

This section describes the affected environment related to the forested vegetation, insects and disease, wildland fire, and timber resource contribution to ecological resilience. Resilience is defined as the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change (FSM 2020 interim directive). An ecologically resilient landscape is less susceptible to uncharacteristic wildfire (Averill et al. 1995, Gunderson 2000, Walker 2004), is at lower risk from uncharacteristic insect and disease infestations and epidemics, provides a full range of habitats for native terrestrial and aquatic species, protects water quality and abundance, provides a full range of uses, products and services, and is more adaptable to changes in climate. Affected environment and environmental consequences topics include:

Forested vegetation (includes background description of rangeland/herbland/shrubland vegetation):

- Forested structural stages
  Indicator: percent of upland forest potential vegetation group in each forested structural stage
- Forested tree species composition
  Indicator: percent of upland forest potential vegetation group in each species composition tolerance class
- Forested stand density
  Indicator: percent of upland forest potential vegetation group in open and closed canopy forest

Wildland fire:

- Fire regime (fire severity and fire frequency)
  Indicator: Fire regime condition class departure score
- Acres of prescribed fire
  Indicator: acres treated with fire

Insects and disease:

- Predicted mortality
  Indicator: percent of upland forest potential vegetation group in each forested structural stage, species composition tolerance class, and stand density class

Timber resource:

- Acres suitable for timber production
  Indicator: acres suitable for timber production
- Allowable sale quantity (ASQ)
  Indicator: ASQ
- Total sale program quantity (TSPQ)
  Indicator: TSPQ
- Acres of harvest treatment
  Indicator: acres of harvest treatment

Forested Vegetation

For the purpose of this analysis, vegetation in the Blue Mountains was classified into broad categories of forest, woodland, herbland, or shrubland. Categories were further classified as upland or riparian vegetation. The riparian vegetation is described in more detail in the watershed section of the EIS chapter 3. Shrubland, woodland, and herbland are discussed in the "Livestock Grazing" section of chapter 3. Upland and riparian vegetation were categorized into potential vegetation groups. Potential vegetation groups are aggregations of plant associations found in the Blue Mountains (Johnson and Simon 1987, Johnson and Clausnitzer 1992, Powell et al. 2007) and represent a combination of temperature and moisture regimes. The potential vegetation groups represent areas on the landscape that evolved under similar disturbance regimes and which would respond to management in a similar manner. Approximately 500 plant associations were grouped into 60 plant association groups (PAG), which were classified into 20 potential vegetation groups for this analysis, following procedures from Powell et al.(2007) (see table 230).

Table 230. Classification of potential vegetation groups (PVG) used in the analysis

Category		PVG Definition	PVG Code
Forest	Upland	Cold upland forest	Cold UF
Forest	Upland	Moist upland forest	Moist UF
Forest	Upland	Dry upland forest	Dry UF
Forest	Riparian	Cold riparian forest	Cold RF
Forest	Riparian	Low soil moisture riparian forest	Low SM RF
Forest	Riparian	Warm riparian forest	Warm RF
Woodland	Upland	Moist upland woodland (juniper)	Moist UW
Woodland	Upland	Dry upland woodland (juniper)	Dry UW
Shrubland	Upland	Cold upland shrubland	Cold US
Shrubland	Upland	Moist upland shrubland	Moist US
Shrubland	Upland	Dry upland shrubland	Dry US
Shrubland	Riparian	Cold riparian shrubland	Cold RS
Shrubland	Riparian	Warm riparian shrubland	Warm RS
Shrubland	Riparian	Low soil moisture riparian shrubland	Low SM RS
Herbland	Upland	Cold upland herbland	Cold UH
Herbland	Upland	Moist upland herbland	Moist UH
Herbland	Upland	Dry upland herbland	Dry UH
Herbland	Riparian	Cold riparian herbland	Cold RH
Herbland	Riparian	Warm riparian herbland	Warm RH
Herbland	Riparian	Low soil moisture riparian herbland	Low SM RH

Table 231 displays the percent of each national forest within each of the potential vegetation groups. The national forests within the Blue Mountains consist of mostly upland forest potential vegetation groups (approximately 70 to 87 percent), with an additional 13 percent to 30 percent comprised of shrubland, herbland, and nonvegetation (rock, water). The forested environment in the Blue Mountains is dominated by dry upland forest (34 percent to 72 percent), followed by moist upland forest (6 to 31percent) and cold upland forest (8 to 18 percent). The Malheur National Forest contains the highest percent of dry upland forest (72 percent). The Umatilla

National Forest contains the highest percent of moist upland forest (31 percent) and the lowest percent of cold upland forest (8 percent) due to a Columbia River maritime influence. The largest percentage of the Wallowa-Whitman National Forest consists of dry upland forest but it also contains a substantial percentage of moist (18 percent) and cold (18 percent) upland forest.

Table 231. Percent of each national forest within each potential vegetation group

Potential Vegetation Group	Malheur	Umatilla	Wallowa-Whitman
Cold upland forest	9%	8%	18%
Moist upland forest	6%	31%	18%
Dry upland forest	72%	43%	34%
Cold riparian forest	T*	T	T
Low soil moisture riparian forest	T	T	T
Warm riparian forest	T	T	T
Moist upland woodland (juniper)	3%	1%	1%
Dry upland woodland (juniper)	T	T	1%
Cold upland shrubland	T	T	1%
Moist upland shrubland	T	2%	1%
Dry upland shrubland	6%	1%	2%
Cold riparian shrubland	T	T	T
Warm riparian shrubland	T	T	T
Low soil moisture riparian shrubland	T	T	T
Cold upland herbland	T	T	T
Moist upland herbland	T	1%	3%
Dry upland herbland	2%	13%	15%
Cold riparian herbland	T	T	T
Warm riparian herbland	T	T	T
Low soil moisture riparian herbland	T	T	T
Non-vegetation or other	T	T	4%
Totals	100% (1,700,000 acres)	100% (1,400,000 acres)	100% (1,800,000 acres)

* T indicates trace (less than 1 percent).

Historical Range of Variability (HRV) Analysis

Powell (2012) compiled and summarized research and background information on the topic of range of variation. The following information was obtained from this white paper, which can be found in the project record.

Reference conditions provide an ecological basis from which to compare existing conditions and management options. “Considerable attention has been focused on natural disturbance processes as a guide for forest management. Concepts such as the historical range of variability (Landres et al. 1999) suggest that successful management of ecosystems may best be achieved by mimicking natural disturbance patterns and processes (Wright and Agee 2004:443; Arno and Fiedler 2005, Perera et al. 2004)”. The historical range of variability (HRV) has become a common reference condition for assessing landscapes because it provides a context for understanding the conditions

under which plants and animals evolved (Keane 2009). The HRV concept is used to characterize fluctuations in ecosystem conditions and processes over a period of time (Powell 2012). Ecosystem conditions change as the result of disturbance processes. When disturbance processes occur with characteristic frequency and intensity, ecosystems respond by exhibiting predictable behavior and complexity (Aplet and Keeton 1999, Morgan et al. 1994). The effects of repeated disturbances cause ecosystem conditions to fluctuate between upper and lower limits (Powell 2012). The HRV concept recognizes that ecosystem components have a range of conditions within which they are resilient and self-sustaining (Egan and Howell 2001, Holling and Meffe 1996). Uncharacteristic disturbance processes can cause ecosystem effects to fluctuate outside of the HRV, resulting in a state of disequilibrium that is not sustainable.

HRV is not intended to portray a static, unchanging condition. Ecosystems within the Blue Mountains evolved with disturbances, including wildfire, insects, disease, landslides, human uses, changing weather patterns, and other factors (Powell 2012). The HRV was designed to characterize the range of vegetation composition, structure, and density produced by these disturbance agents (Morgan et al. 1994). The type and frequency of presettlement disturbances can serve as a management template for maintaining sites within their historical range of plant composition and vegetation structures – if landscapes can be maintained within their HRV, then they stand a good chance of maintaining their biological diversity and ecological integrity through time (Aplet and Keeton 1999, Holling and Meffe 1996). An HRV approach ensures that management activities are consistent with the conditions under which native species and ecosystem processes evolved (Delong and Tanner 1996). It is typically assumed that presettlement conditions represent optimum habitats for native plants and animals, and that the best way to recover an endangered or threatened species is to restore its habitat to some semblance of presettlement conditions (Botkin 1995). Since a key premise of HRV is that native species have evolved with, and are adapted to, the historical disturbance regimes of an area, ecosystem components occurring within their historical range are believed to represent sustainable conditions (Aplet and Keeton 1999, Swanson et al. 1994).

Some believe that presettlement conditions should not be used as reference conditions to guide management activities because climate change projections anticipate a warmer and drier climate. Future climates may trigger major changes in disturbance processes, plant species dynamics, and hydrological processes. However, others believe that using HRV may still be the most viable approach for the near-term because it has the least amount of uncertainty (Keane et al. 2009), particularly as compared to the uncertainty associated with the magnitude, timing, scale, and spatial extent of climate change impacts. Keane et al. (2009) states that, given the uncertainties in predicting climatic and ecological responses to increasing CO2, using an HRV based on the past may provide more certainty than attempting to simulate the future until technology has improved and models have been significantly validated. Keane et al. (2009) further states that the use of HRV to guide management efforts would be unlikely to result in inappropriate activities because HRV projections involve a broad range of conditions which consider the large genetic variation in most species and the robustness inherent in regional landscapes. Fulé (2008) states that the use of historical reference conditions to guide management remain valid because forests were historically resilient to disturbance and drought. Adapting reference conditions to future climates is valid, for example, historical characteristics of lower elevation, southerly, and drier sites may be more applicable to higher elevation, northerly, and currently wetter sites.

Reference conditions for forested vegetation are based on a 300-year time period (Steele 1994 and Hann et al. 1993) prior to Euro-American settlement (circa 1850) (Jaindl et al. 1993). Estimates of the HRV for forested structural stages, species composition, and stand density were

developed for this analysis in 2007 through modeling using the Vegetation Dynamics Development Tool (VDDT). The VDDT model is a nonspatial state and transition model developed by ESSA Technologies, Ltd., of Vancouver, British Columbia and is a user-friendly computer tool that provides a modeling framework for examining the role of succession, various disturbance agents, and management actions for vegetation (Beukema and Kurz 2000). The states within the model are described by combinations of vegetation structure and composition including: structural stage, species composition, number of tree layers, stand density (canopy cover), and tree diameter. The combinations of structure and composition for all of the models produced 403 different states. The transitions part of the model describes how vegetation transitions between the different states through time. The transitions are described as either deterministic or probabilistic. Deterministic transitions are those that occur due to vegetation growth over time. Probabilistic transitions are those that occur due to disturbances, such as fire, insects, and disease. Probabilities and time intervals for the probabilistic transitions were developed through literature searches, expert opinion, and current vegetation survey (CVS) data modeled in the Forest Vegetation Simulator (FVS). VDDT modeling results were summarized for 30 different modeling simulations from model year 200 to year 500. The mean value for this 300-year time period was calculated. HRV was calculated as two standard deviations around the mean. Models were summarized into three potential vegetation groups (cold, moist, and dry upland forest) for the purpose of developing the forest plan and effects analysis. The analysis process is available in the analysis file.

The VDDT reference conditions/HRV were used as the primary basis for developing the desired conditions for forested vegetation. Broad-scale assessments completed for the Blue Mountains physiographic province and the interior Columbia River basin suggest that upland forest ecosystems could be characterized as healthy, sustainable, and resilient if three of their ecosystem components – species composition, forest structure, and tree density – are within the HRV (Caraher et al. 1992, Gast et al. 1991, Lehmkuhl et al. 1994, Quigley et al. 1996, USDA Forest Service 2002). The underlying assumption of this goal is that ecosystems are most resilient and resistant to disturbance, including climate change, when they exist in a condition closest to that under which they evolved (Morgan et al. 1994). When the range of natural variation in a system is reduced, the system loses resilience. When faced with either natural or human-induced perturbations, a system in which natural levels of variation have been reduced will be less resilient than an unaltered system (Holling and Meffe 1996). The HRV for forested structural stages, species composition, and stand density was used as the desired conditions for this analysis in order to create and/or maintain forest conditions that more closely resemble the historical conditions that existed prior to interruption of the historical fire regimes. By restoring and/or maintaining the historical forest structure, density, and species compositions that evolved under the historical fire regimes, forest health, sustainability, and ecological resilience would be improved across the landscape.

Forested Structural Stages

Vegetation for the Blue Mountains national forests plan revision was classified using structural stages similar to those described in O'Hara et al. (1996), Oliver and Larson (1996), and Hessburg et al. (1999). Figure 1 in appendix A and describes the structural stages used in this analysis.

Table 232 displays the existing forested structural stages as a percent of each upland forest potential vegetation group by national forest. Much of the analysis area is dominated by the understory reinitiation stage, which is characterized by overstory trees at low to moderate density, with a new age class of small trees in the understory.

Table 232. Existing forested structural stages as a percent of each upland forest potential vegetation group (PVG) by national forest

Upland Forest PVG/Structural Stage	Malheur	Umatilla	Wallowa-Whitman
Cold/SI	24	30	14
Cold/SE	12	21	10
Cold/UR	44	18	41
Cold/OFSS	1	0	1
Cold/OFMS	20	30	34
Dry/SI	6	12	14
Dry/SE	18	26	16
Dry/UR	54	50	54
Dry/OFSS	3	4	1
Dry/OFMS	20	8	14
Moist/SI	1	9	12
Moist/SE	5	10	11
Moist/UR	41	26	50
Moist/OFSS	5	23	1
Moist/OFMS	47	32	25

SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

Within the Malheur National Forest, the cold and dry upland forest potential vegetation groups are currently dominated by the understory reinitiation structural stage. The Malheur moist upland forest potential vegetation group is currently dominated by the old forest and understory reinitiation structural stages.

Within the Umatilla National Forest, the cold upland forest potential vegetation group is currently dominated by the old forest multi-story and stem initiation structural stages. The Umatilla dry upland forest potential vegetation group is currently dominated by the understory reinitiation stage. The Umatilla moist upland forest potential vegetation group is currently dominated by the old forest structural stages.

Within the Wallowa-Whitman National Forest, the cold upland forest potential vegetation group is currently dominated by the understory reinitiation and old forest structural stages. The Wallowa-Whitman dry upland forest potential vegetation group is also dominated by the understory reinitiation stage. The Wallowa-Whitman moist upland forest potential vegetation group is currently dominated by the understory reinitiation stage.

Historical Range of Variability Estimates for Forested Structural Stages

Table 233 displays the estimated HRV for forested structural stages by upland forest potential vegetation group within the Blue Mountains forests analysis area. The desired conditions for each structural stage within each upland forest potential vegetation group were based upon the HRVs.

Within the cold upland forest potential vegetation group, the largest percent of the landscape historically consisted of the stand initiation (SI) and old forest structural stages. Approximately 20 to 45 percent of the cold upland forest potential vegetation group historically consisted of the SI stage, while approximately 15 to 45 percent of the cold upland forest potential vegetation group

historically consisted of the old forest stages (OFSS and OFMS). Approximately 15 to 30 percent of the cold upland forest potential vegetation group historically consisted of the SE stage and approximately 10 to 25 percent historically consisted of the understory reinitiation stage.

Table 233. The HRV/desired conditions for forested structural stages (percent of each upland forest potential vegetation group)

Potential vegetation Group	Stand Initiation	Stem Exclusion	Understory Reinitiation	Old Forest Single Story	Old Forest Multi-story
Cold Upland Forest	20-45	15-30	10-25	5-20	10-25
Moist Upland Forest	20-30	20-30	15-25	10-20	15-20
Dry Upland Forest	15-30	10-20	0-5	40-65	1-15

Within the moist upland forest potential vegetation group, the landscape historically was relatively evenly distributed between each of the forested structural stages, with a slightly higher percent of the landscape in the two old forest structural stages.

Within the dry upland forest potential vegetation group, the landscape was historically dominated by old forest structural stages. Approximately 40 to 65 percent of the dry upland forest potential vegetation group consisted of the old forest single story structural stage. Approximately 1 to 15 percent of the dry upland forest potential vegetation group consisted of the old forest multi-story structural stage. Only a small percent of the dry upland forest potential vegetation group (0 to 5 percent) consisted of the UR structural stage.

Existing Condition Departure Analysis (Departure of Existing Condition from Estimated Historic Range of Variability)

The departure analysis examines the degree to which existing conditions have departed from estimates of the HRV. Within the dry upland forest potential vegetation group, the old forest multi-story (OFMS) structural stage is within the HRV at the scale of the Blue Mountains, but varies from slightly above to within the HRV when viewed at the scale of the individual national forest (see Figure 16, Figure 17, and Figure 18). The old forest single-story (OFSS) structural stage is below HRV, both at the scale of the Blue Mountains and for each national forest.

Within the cold and moist upland forest potential vegetation groups, the old forest multi-story (OFMS) structural stages are generally within to above the HRV. The old forest single-story (OFSS) structural stage is generally below the HRV.

Within most of the potential vegetation groups, the SI structural stage is slightly below to within HRV at the scale of the individual national forest. However, some individual watersheds within the dry and moist upland forest potential vegetation groups are above the HRV due to recent large-scale, high severity fires on portions of the Umatilla National Forest.

The stem exclusion stage is generally within HRV but at the low end of the range. The mid-age multi-story stage (understory reinitiation) is well above HRV for most potential vegetation groups.

Figure 16 displays the amount of departure from the HRV within the cold upland forest potential vegetation group by comparing the existing and historical forested structural stages within each national forest. In general, existing conditions within the cold upland forest potential vegetation group exhibit a lesser amount of departure from the HRV, in comparison to the moist and dry upland forest potential vegetation groups. The historical fire regime in the cold upland forest potential vegetation group was characterized by high severity, stand-replacing fire events that occurred every 100 years or more. With such infrequent fire events, the cold upland forest potential vegetation group has perhaps missed approximately one fire. Therefore, fire suppression has had less noticeable effects on existing forest structures.

Within the Malheur cold upland forest potential vegetation group, the existing percent of the landscape in the SI and OFMS structural stages is within the HRV. However, the percent of the cold upland forest potential vegetation group in the SE and OFSS stages is currently below the HRV, while the percent in the UR stage is above the HRV.

Within the Umatilla cold upland forest potential vegetation group, the existing percent of the landscape in the SI, SE, and UR structural stages is within the HRV. However, the percent of the cold upland forest potential vegetation group in the OFSS stage is below the HRV, while the percent in the OFMS stage is above the HRV.

Within the Wallowa-Whitman cold upland forest potential vegetation group, the existing percent of the landscape in all of the structural stages is departed from the HRV. The percent of the cold upland forest potential vegetation group in the SI, SE, and OFSS structural stages is currently below the HRV, while the UR and OFMS structural stages are above the HRV.

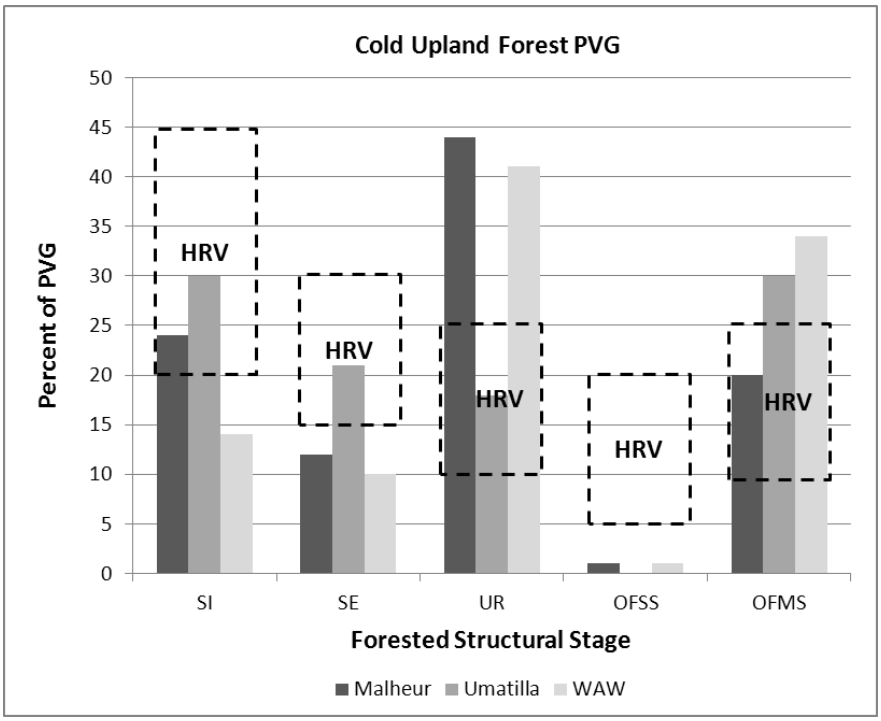

Figure 16. Existing forested structural stages (percent of potential vegetation group) and the HRV/desired conditions by national forest within the cold upland forest potential vegetation group

Figure 17 displays the amount of departure from the HRV within the moist upland forest potential vegetation group by comparing the existing and historical forested structural stages within each national forest. In general, existing conditions within the moist upland forest potential vegetation group exhibit a greater amount of departure from the HRV when compared to the cold upland forest potential vegetation group (figure 16). The historical fire regime in the moist upland forest potential vegetation group was characterized by mixed-severity fire events that occurred every 40-100 years. After over a century of fire suppression, some of these areas may have perhaps missed approximately one to three fires. Therefore, fire suppression has had more noticeable effects on existing forest structures, compared to the cold upland forest potential vegetation group.

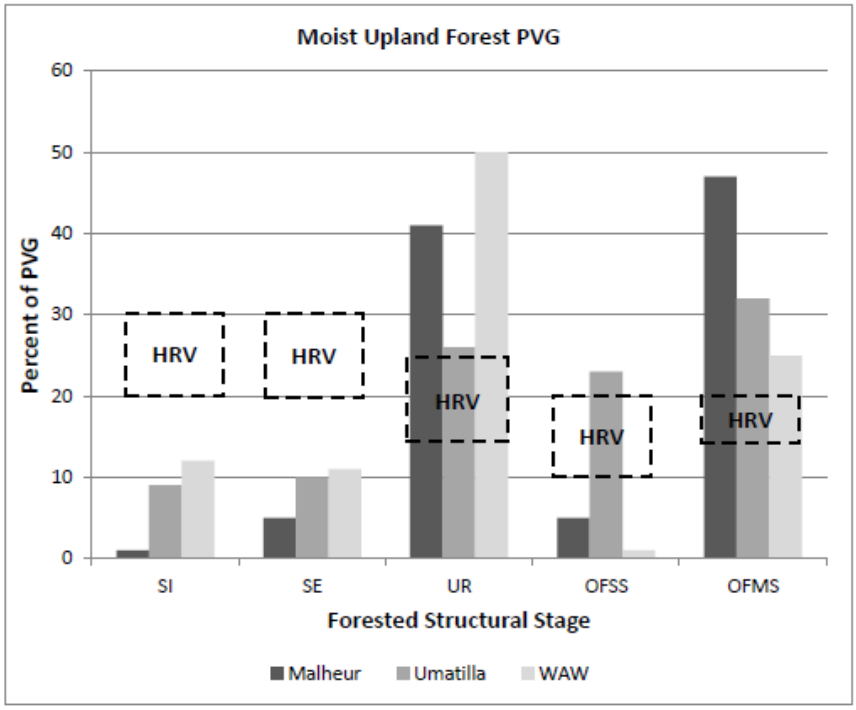

Figure 17. Existing forested structural stages (percent of potential vegetation group or PVG) and the HRV/desired conditions by national forest within the moist upland forest potential vegetation group

Within the Malheur moist upland forest potential vegetation group, the existing percent of the landscape in all of the structural stages is departed from the HRV. The existing percent of the moist upland forest potential vegetation group in the SI, SE, and OFSS structural stages is currently below the HRV. The existing percent of the moist upland forest potential vegetation group in the UR and OFMS structural stages is currently above the HRV.

Within the Umatilla moist upland forest potential vegetation group, the existing percent of the landscape in all of the structural stages is departed from the HRV. The existing percent of the moist upland forest potential vegetation group in the SI and SE structural stages is currently below the HRV. However, portions of the Umatilla National Forest contains some individual watersheds that are currently above the HRV in the SI structural stage due to recent large-scale, high severity fires. The existing percent of the moist upland forest potential vegetation group in the UR, OFSS, and OFMS structural stages is currently above the HRV.

Within the Wallowa-Whitman moist upland forest potential vegetation group, the existing percent of the landscape in all of the structural stages is departed from the HRV. The existing percent of the moist upland forest potential vegetation group in the SI, SE, and OFSS structural stages is currently below the HRV, while the UR and OFMS structural stages are above the HRV.

Figure 18 displays the amount of departure from the HRV within the dry upland forest potential vegetation group by comparing the existing and historical forested structural stages within each national forest. In general, existing conditions within the dry upland forest potential vegetation group tend to exhibit the greatest amount of departure from the HRV. The historical fire regime in the dry upland forest potential vegetation group was characterized by low severity, surface fires that occurred at a frequency of less than 25 years. After over a century of fire suppression, the dry upland forest potential vegetation group has missed perhaps five to seven fires, which has had substantial effects on existing forest structures and resulted in more highly departed landscapes.

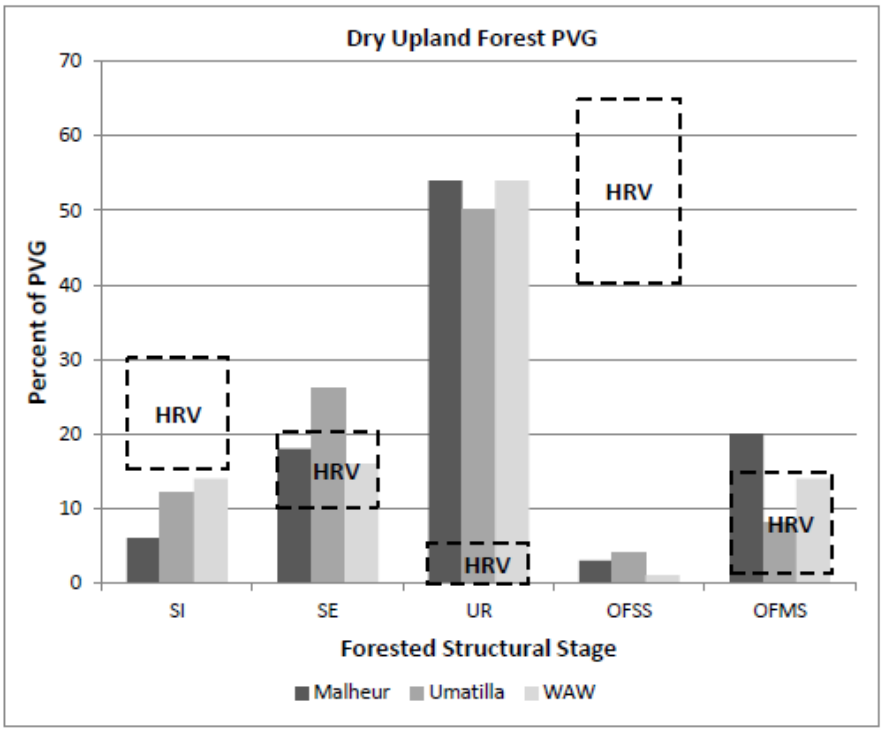

Figure 18. Existing forested structural stages (percent of potential vegetation group or PVG) and the HRV/desired conditions by national forest within the dry upland forest potential vegetation group

Within the Malheur dry upland forest potential vegetation group, the existing percent of the landscape in the SE structural stage is currently within the HRV. The existing percent of the dry upland forest potential vegetation group in the SI and OFSS structural stages are currently below the HRV, while the percent of the dry upland forest potential vegetation group in the UR and OFMS structural stages are currently above the HRV.

Within the Umatilla dry upland forest potential vegetation group, the existing percent of the landscape in the OFMS structural stage is currently within the HRV. The existing percent of the dry upland forest potential vegetation group in the SI and OFSS structural stages is currently

below the HRV, while the percent of the dry upland forest potential vegetation group in the SE and UR structural stages is currently above the HRV.

Within the Wallowa-Whitman dry upland forest potential vegetation group, the existing percent of the landscape in the SE and OFMS structural stages are currently within the HRV. The existing percent of the dry upland forest potential vegetation group in the SI and OFSS structural stages are currently below the HRV, while the percent of the dry upland forest potential vegetation group in the UR structural stage is above the HRV.

Forested Species Composition

Shade tolerance is a relative measure of a species' ability to grow and regenerate in the shade, in comparison to other tree species. In general, tree species that are more shade intolerant are also more fire tolerant, making them better adapted to low and mixed-severity fire. These species tend to have thicker bark, which insulates the cambium from heat and results in decreased fire-related mortality. Shade intolerant tree species also self-prune their lower branches, which increases their crown base height, increases the wind speed required to initiate crown fire, decreases the likelihood of a ground fire transitioning to a crown fire, and decreases fire severity. Shade intolerant tree species such as ponderosa pine also tend to be more drought tolerant. Species that better withstand drought and moisture stress are also less susceptible to attack by bark beetles because of natural defense mechanisms, such as the production of pitch. Tree species that are more shade intolerant include ponderosa pine, western larch, western white pine, and whitebark pine. Tree species that are relatively shade tolerant include Engelmann spruce, subalpine fir, and grand fir. Douglas-fir is intermediate along the shade tolerance ranking continuum. Because shade tolerance is a relative ranking, Douglas-fir may be included in either a shade tolerant or a mixed tolerance class, depending on the other tree species used in comparison.

The analysis of species composition for forested vegetation was conducted using the current vegetation survey (CVS) points. Each of the CVS points was classified into a species composition class of shade intolerant, mixed tolerance, and shade tolerant. The species composition was determined by the dominant tree species based on basal area (see analysis file for a complete definition of species composition classes). In the dry upland forest potential vegetation group, the shade intolerant species class may be dominated by ponderosa pine or western larch, while the shade tolerant species class may be dominated by grand fir or Douglas-fir. In the moist upland forest potential vegetation group, the shade intolerant species class may be dominated by western larch, western white pine, or lodgepole pine, while the shade tolerant species class may be dominated by Englemann spruce, grand fir, or subalpine fir. In the moist upland forest potential vegetation group, the mixed tolerance species class may be dominated by Douglas-fir. In the cold upland forest potential vegetation group, the shade intolerant species class may be dominated by whitebark pine, lodgepole pine, western white pine, or western larch, while the shade tolerant species class may be dominated by subalpine fir or Englemann spruce. In the cold upland forest potential vegetation group, the mixed tolerance species class may be dominated by Douglas-fir.

Table 234 displays the existing species composition as a percent of each upland forest potential vegetation group by national forest. Table 235 displays the VDDT modeling results of the HRV for species composition by upland forest potential vegetation group within the Blue Mountains. A comparison of these two tables shows a change in species composition over time due to over a century of fire exclusion and suppression. Historically, the dry upland forest potential vegetation group was dominated by shade intolerant species, such as ponderosa pine and western larch, with approximately 75 to 90 percent of this forest type consisting of shade intolerant species. When

current conditions are compared to the HRV within the dry upland forest potential vegetation group, shade intolerant species have been reduced from an estimated 75 to 90 percent historically (table 235) to current estimates of approximately 45 to 76 percent across the three national forests (table 234). Shade tolerant species have increased from an estimated 5 to 20 percent historically to current estimates of approximately 24 to 55 percent across the three national forests.

Table 234. Existing species composition as a percent of each upland forest potential vegetation group (PVG) by national forest

Upland Forest PVG/Species Composition	Malheur	Umatilla	Wallowa-Whitman
Cold/shade intolerant	63	70	38
Cold/mixed tolerance	31	10	24
Cold/shade tolerant	7	20	38
Dry/shade intolerant	76	45	45
Dry/shade tolerant	24	55	55
Moist/shade intolerant	21	15	27
Moist/mixed tolerance	6	21	27
Moist/shade tolerant	73	65	46

Table 235. The percentage range of HRV/desired conditions for species composition by upland forest potential vegetation group within the Blue Mountains

Potential Vegetation Group	Shade-intolerant Species Composition	Mixed-tolerance Species Composition	Shade-tolerant Species Composition
Dry Upland Forest	75-90	NA	5-20
Moist Upland Forest	30-60	20-40	10-30
Cold Upland Forest	40-60	5-20	25-50

Species compositions in the dry upland forest potential vegetation group exhibit a greater amount of departure from historical conditions due to a greater number of missed fires. In low severity fire regimes, grand fir was historically maintained at relatively low numbers because of its thin bark and decreased fire tolerance (Van Pelt 2008). Due to fire exclusion and suppression, shade tolerant species have increased in abundance, resulting in decreased wind speeds required to initiate and sustain a crown fire, altered fire behavior, a landscape that is less resilient to fire, and a landscape more prone to larger scale fire events than what would have occurred historically. Altered species compositions also result in increased moisture stress, increased susceptibility to insects and disease, and decreased forest health. Although species composition within the moist upland forest potential vegetation group exhibits departure from the HRV, the amount of departure is less than the dry upland forest potential vegetation group because the historical fire regimes were characterized by a longer fire return interval. Therefore, more than a century of fire exclusion and suppression has resulted in a fewer number of missed fires, in comparison to the more frequent fire regime in the dry upland forest potential vegetation group.

Aspen

Aspen populations within the Blue Mountains currently exist as small, scattered, remnant stands of rapidly declining trees. Although aspen is widespread, it is an uncommon species in the Blue

Mountains (Swanson et al. 2010). According to Swanson et al. (2010), detailed inventories performed in some ranger districts have located hundreds of aspen stands broadly distributed within the Blue Mountains. Although these aspen stands are numerous, they are invariably small. An inventory of approximately 25 percent of the 1.7-million-ac Malheur National Forest has revealed 1,327 stands, with a median stand area of less than 1 acre. Only 5 percent of the stands are greater than 10 acres. Within the Umatilla National Forest, an inventory of 514 stands also shows a median area of less than 1 acre and only 1 percent of the stands larger than 10 acres. The total basal area of aspen is also quite low (Swanson et al. 2010).

Within the Blue Mountains, aspen stands have declined over the past century due to fire suppression and browsing pressure from large ungulates (Shirley and Erickson 2001). Fire suppression results in succession of aspen to conifer species or grass/shrubland. Although succession is a natural event, the alteration of fire regimes and a lack of successful aspen recruitment have promoted a more consistent landscape level succession to conifers or grass/shrubland. In most aspen stands, regeneration has been suppressed to some degree by both fire suppression and browsing. A decline in the area occupied by aspen can be inferred from observations of dead aspen representing former groves with no survivors, the predominance of clones where many individuals are decadent or dead, and the rarity of unbrowsed aspen suckers or young age cohorts (Swanson et al. 2010). Although little is known about the historic distribution of aspen in Oregon, it is believed that stands were once larger and more widely distributed (Shirley and Erickson 2001). However, historical photography (Skovlin and Thomas 1992) and early accounts (Bright 1994) indicate that aspen forests were never as widespread in the Blue Mountains as in other parts of the West.

Aspen communities are a critical element within forested ecosystems, representing one of the most biologically diverse and ecologically-unique sites, and serve as an indicator of ecological integrity (Di Orio et al. 2005). Mortality of mature aspen coupled with fire exclusion and continued browsing pressure by large ungulates is expected to result in continued vegetation changes, with eventual type conversion from aspen to conifers or grassland within the next 80 to 200 years across its range (Strand et al. 2009). Loss of aspen clones at a landscape scale results in decreased biological diversity, with aspen decline cascading into losses of vertebrate species, understory vascular plants, and likely species from a myriad of other organismal groups (Strand et al. 2009).

Whitebark Pine

Whitebark pine has a limited distribution within the Blue Mountains and is strongly associated with higher elevation areas within the cold forest potential vegetation group and within wilderness areas. The Wallowa-Whitman National Forest contains the largest acreage of whitebark pine, with an estimated 49,000 acres. The Malheur National Forest contains an estimated 7,000 acres of whitebark pine. The Umatilla National Forest contains an estimated 1,000 acres of whitebark pine. Whitebark pine was encountered during the installation of the CVS plots and was found on approximately 140 of the 10,000 plots. Locations include the Eagle Cap Wilderness, the Elkhorn Mountains, areas near the Strawberry Wilderness, and Hells Canyon (Seven Devils Mountains).

The four major threats to whitebark pine populations within the Blue Mountains are white pine blister rust (*Cronartium ribicola*), mountain pine beetle (*Dendroctonus ponderosae*), fire, and climate change (Aubry et al. 2008). Monitoring transects within the Blue Mountains analysis area exhibit white pine blister rust infection within the majority of checked sites, with higher levels of infection in the Elkhorn Mountains, compared to the Wallowa Mountains. Increased levels of

whitebark pine mortality have altered high-elevation community composition and ecosystem processes (Keane et al. 2012).

Whitebark pine is now a candidate species for listing under the Endangered Species Act. Whitebark pine is an important component of western high-elevation forests. Large, nutritious seeds produced by whitebark pine are an important food for many bird and small mammal species, as well as grizzly (*Ursus arctos horribilis*) and black bears (*Ursus americanus*). Whitebark pine communities provide habitat for many additional wildlife species. Whitebark pine seed dispersal by Clark's nutcrackers (*Nucifraga columbiana*) combined with hardy seedlings results in early whitebark pine community development after fire and other disturbances. Whitebark pine seedlings survive on harsh, arid sites and may act as nurse trees to less hardy conifers and vegetation. At high elevations where it is common, it helps regulate snow melt and reduce soil erosion. For these collective functions, whitebark pine is considered both a keystone species for promoting community diversity and a foundation species for promoting community stability (Keane et al. 2012).

The Pacific Northwest Region has currently developed a whitebark pine restoration strategy that contains a comprehensive 5-year restoration plan (Aubry 2008). This plan includes several possible management strategies, such as collecting whitebark pine seed, planting seed or seedlings, thinning competing trees, pruning tree limbs infected with blister rust, increasing genetic resistance to blister rust, evaluating areas where health, stand conditions, and restoration needs are unknown, and working collaboratively to increase understanding of impacts affecting whitebark pine communities.

Forested Stand Density

Stand density, as used in this analysis, refers to a measure of the amount of tree vegetation of a unit of land area (Curtis 1970, Ernst and Knapp 1985, and Powell 1999). Canopy cover was used as the stand density measure in the current analysis. Canopy cover refers to the proportion of the forest floor covered by the vertical projection of tree crowns (Jennings et al. 1999). Within the dry upland forest potential vegetation group, closed canopy stands were defined as those having 40 percent canopy cover or greater. Within the moist and cold upland forest potential vegetation group, closed canopy stands were defined as having 60 percent canopy cover or greater. The canopy cover values in the VDDT model are a generalization, and the actual boundaries between open and closed canopy are based on site potential for each plant association (more information is available from the project record).

Table 236 displays existing forested stand densities as a percent of each upland forest potential vegetation group by national forest. Table 237 displays the VDDT modeling results of the HRV for density classes within the Blue Mountains. Across the three national forests, approximately 44 to 88 percent of the cold upland forest potential vegetation group currently contains open stand densities (table 236), compared to an estimated 20 to 30 percent historically (table 237). Approximately 12 to 56 percent of the cold upland forest potential vegetation group currently contains closed stand densities, compared to 65 to 80 percent historically.

Table 236. Existing stand densities as a percent of each upland forest potential vegetation group (PVG) by national forest

Upland Forest PVG/Stand Density	Malheur	Umatilla	Wallowa-Whitman
Cold/open	88	44	62
Cold/closed	12	56	38
Dry/open	60	30	32
Dry/closed	40	70	67
Moist/open	58	55	41
Moist/closed	42	45	59

Table 237. The HRV/desired conditions for stand density (percent of landscape) by upland forest potential vegetation group (PVG)

Potential Vegetation Group	Open Stand Density	Closed Stand Density
Dry upland forest*	80-90	5-20
Moist upland forest **	30-40	60-80
Cold upland forest **	20-30	65-80

* Dry UF forest closed is 40 percent canopy cover or greater.

** Cold and moist upland forest closed is 60 percent canopy cover or greater.

Historically, an estimated 80 to 90 percent of the dry upland forest potential vegetation group was characterized by a generally open forest structure. The historical fire regime created and maintained this open forest structure, with a mosaic pattern of tree clumps dominated by larger diameter, old ponderosa pines, scattered individual trees, and grassy openings. This spatial heterogeneity is a key structural element of the historical dry upland forest. The pattern of tree clumps, separated by openings, affected the way fire moved across the landscape by providing breaks in the canopy to limit the spread of crown fire. It also limited the spread of diseases such as dwarf mistletoe. Due to over a century of fire exclusion and suppression, stand densities in the dry upland forest potential vegetation group have increased from historical levels. Within the three national forests, approximately 30 to 60 percent of the dry upland forest potential vegetation group contains open stand densities, compared to an estimated 80 to 90 percent historically. Approximately 40 to 70 percent of the dry upland forest potential vegetation group currently contains closed stand densities, compared to an estimated 5 to 20 percent historically. This increase in stand densities within the dry upland forest potential vegetation group has resulted in decreased tree health, growth, and vigor, decreased sunlight to the forest floor, decreased regeneration of shade intolerant/fire tolerant tree species, increased regeneration of shade tolerant/fire intolerant tree species, decreased understory productivity and diversity, increased crown continuity across the landscape, increased spread of diseases such as dwarf mistletoe, increased risk of insect attack and mortality, an increased incidence of uncharacteristically severe wildfire, and a less ecologically resilient and less sustainable forest structure.

Within the three national forests, approximately 41 to 58 percent of the moist upland forest potential vegetation group contains open stand densities, compared to an estimated 30 to 40 percent historically. Approximately 42 to 59 percent of the moist upland forest potential vegetation group contains closed stand densities, compared to 60 to 80 percent historically.

Wildland Fire Regime

A fire regime is a generalized description of the role fire plays in the ecosystem (Agee 1993). It includes the characteristics of frequency, severity, and seasonality of fire. The historical fire regime is described according to fire severities that occurred before significant European influence began in approximately 1850 (Jaindl et al. 1993) and includes fires ignited by Native Americans. Fire regimes, especially fire frequency and intensity characteristics, strongly influence which species will prevail in the vegetation complex of a given area. Fire has been a significant process within the plan area historically and is essential to proper ecosystem function. Land managers can mimic many of the effects of fire using management actions (timber harvest, prescribed fire, managing wildfire), but not always at the same scale or frequency as in historical disturbance regimes. Land managers have the ability to choose, to some extent, what relationship with fire is desirable (Agee and Maruoka 1994).

Barrett et al. (2010) recognize five historical fire regimes (I – V). These five regimes include:

I – 0 to 35 year frequency and low (surface fires most common) to mixed severity (less than 75 percent of the dominant overstory vegetation replaced);

II – 0 to 35 year frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced);

III – 35 to 100+ year frequency and mixed severity (less than 75 percent of the dominant overstory vegetation replaced);

IV – 35 to 100+ year frequency and high (stand replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced);

V – 200+ year frequency and high (stand replacement) severity.

Table 238 displays desired fire regimes for the major vegetation types within the plan area and ranges of how often and to what degree fires historically affected the area. Historical fire regime refers to the combination of fire frequencies and severities under which plant communities evolved and were maintained (Schmidt et al. 2002; Hardy et al. 2001). Frequency is expressed as a range of time between fire events. Effects on the dominant vegetation are expressed as fire severity and amount of high severity fire.

Historical fire regimes I to IV were common and integral components of forested ecosystems in the Blue Mountains. Fire regime V (200+ year fire frequency) was relatively rare in this area (Heyerdahl and Agee 1996; Powell 2011).

Noteworthy fire history research has been accomplished within the last 25 years in the Blue Mountains (Hall 1977, Crane and Fischer 1986, Agee and Maruoka 1994, Maruoka 1994, Heyerdahl and Agee 1996, Heyerdahl 1997, and Olson 2000). These studies have aided local efforts to establish historical fire return intervals. Fire size and patch size created within the perimeter of a historical fire have been the least studied element of fire history. Heyerdahl and Agee (1996) were able to identify fire perimeters in the Upper Imnaha drainage that ranged from 117 to 3,086 acres, and averaged 818 acres.

Table 238. Severity and frequency of fire (desired condition)

Potential Vegetation Group	Fire Regime	Fire Frequency (Years)	High Severity Fire (percent of acres burned)
Cold upland forest	IV	100-200	40-80%
Moist upland forest	III	30-150	20-40%
Dry upland forest	I	5-10	5-15%
Dry upland woodland	III	80-160	25-45%
Cold upland shrubland	III - IV	30-60	30-100%
Moist upland shrubland	II - III	10-40	30-100%
Dry upland shrubland	II	20-40	20-80%
Cold upland herbland	IV	30-80	55-100%
Moist upland herbland	II	20-40	20-80%
Dry upland herbland	II	5-20	40-80%
Cool/cold riparian forest	III - IV	100-200	40-90%

The results of this analysis are similar to those previously identified in broad-scale analyses that included the Blue Mountains (e.g. Quigley et al. 1996, Quigley and Arbelbide 1997, and MacDonald et al. 2005). Available data describe the Blue Mountains as having evolved with frequent, low and mixed severity fire. Approximately 88 percent of the Blue Mountains are classified as historical fire Regime I, II, or III, which are short to mixed return interval ecosystems (see table 239). Sixty percent of the Blue Mountains are classified Fire Regime I, which are sites historically dominated by low to mixed severity frequent fires. Historically, approximately 5 to 15 percent of the acres burned within the dry upland forest potential vegetation group were high severity fire. Based on modeling of forest inventory data using the FVS fire and fuels extension (Reinhardt and Crookston 2003), approximately 40 to 60 percent of the acres burned within the dry upland forest potential vegetation group now have the potential for high severity fire. Increased fire severity in the dry upland forest potential vegetation group is due to the abundance of multi-storied stands with high stand densities. An increased potential for high severity fire in the dry upland forest potential vegetation group threatens the attainment of desired conditions for vegetation structure and economic outputs. The potential for high severity fire in the moist and cold upland forest potential vegetation groups (Fire Regimes III and IV) is currently close to what is estimated for historical levels (Countryman 2008).

Table 239. Percent of each national forest area in each fire regime

Fire Regime	MAL	UMA	WAW
I	60	55	53
II	23	3	5
III	15	28	25
IV	2	14	17
V	0	0	0

Wildland Fire Return Interval

The fire return interval is defined as the period of time between fires within a potential vegetation group in a specific area. For example, if a specific area consists of 10,000 acres and has a fire return interval of 100 years, then it would take approximately 100 years for a total of 10,000 acres

within the area to burn. It does not mean that every acre within the area would have a fire every 100 years. Because of the variability of fire processes, a specific site within the area could have a fire every 20 years, while other sites might not have fire reoccur for periods of greater than 100 years. The fire return interval is a generalized indicator of how much fire is on the landscape. Higher numbers (longer fire return intervals) would mean that there is a greater period of time between fires, less area would burn, and there is less fire within the landscape. This is based on the total accumulation of fire within a specific area for a period of time.

Table 240 displays the current fire return intervals by potential vegetation group for each national forest, in comparison to reference conditions. The current fire return interval and the departure from reference conditions (LANDFIRE values) (The Nature Conservancy 2005) were calculated using the Blue Mountains GIS layer for wildfires and prescribed fire since 1980. The return interval was calculated by dividing the analysis area size by the average acres burned per year for each potential vegetation group (see table 240).

Table 240. Current fire return intervals (in years, since 1980) for each national forest, in comparison to reference conditions, by potential vegetation group

Potential Vegetation Group	MAL	UMA	WAW	Blue Mountains National Forests	LANDFIRE Reference (years)	Blue Mountains Forest Plan Revision Reference (years)*
Cold upland forest	38	158	141	126	113	100-200
Whitebark pine forest	45	-	301	182	63	30-120
Moist upland forest	186	665	332	338	71	30-150
Dry upland forest	236-445	159-294	83-214	144-242	7-50	5-25
Juniper woodland	265	1,667	161	250	48	80-160
Dry herbland	70	364	42	61	8	5-20
Dry shrubland	169	1,175	71	125	74	75-125
Cold shrubland	56	608	781	310	20	30-60
Cold herbland	115	-	175	180	239	30-80
Moist herbland	86	329	52	60	30	20-40
Moist shrubland	52	223	841	149	20	10-40

*The reference values were derived from version 2.1 of the LANDFIRE reference condition modeling manual (The Nature Conservancy, 2005) and associated reference condition summary tables. Reference values were also based on work by Crane and Fischer (1986), Agee (1993 and 2003), Maruoka (1994), Heyerdahl and Agee (1996), Olson (2000), and Catherine Macdonald (2005).

Fire return intervals within most of the potential vegetation groups currently exceed reference condition ranges due to fire exclusion and suppression. This is especially evident in the dry upland forest potential vegetation group. Currently, the fire return interval in the dry upland forest potential vegetation group ranges from 144 to 242 years at the scale of the Blue Mountains. Historically, the dry upland forest potential vegetation group was characterized by predominantly frequent, low severity surface fires occurring every 5 to 25 years. While larger-diameter, old ponderosa pine and Douglas-fir typically survived these low severity fires, younger, smaller-

diameter trees and less fire-tolerant species were killed. The historical fire regime created and maintained a generally open forest structure, with a small-scale mosaic pattern of clumps or patches of trees dominated by large diameter, old ponderosa pines, scattered individual trees, and openings that contained an abundance of native grasses and shrubs (Churchill et al. 2013, Larson and Churchill 2012, and Franklin et al. 2008). This spatial heterogeneity is a key structural element of the historical dry upland forest (Franklin et al. 2008). Crown fires may have occurred historically in mid- to late-seral closed canopy structural stages. However, these events were limited in extent due to the predominance of open canopy forest (Barrett et al. 2010). The frequent fires in the dry upland forest potential vegetation group also contributed to relatively low fuel loadings. Due to over a century of fire exclusion and suppression, the dry upland forest potential vegetation group in general has experienced a greater number of missed fires. As a result, the dry upland forest potential vegetation group has experienced the greatest amount of departure from the HRV.

The current fire return interval is closer to the historical reference condition range in the cold upland forest potential vegetation group. The cold upland forest potential vegetation group was characterized by stand-replacing fire events that occurred very infrequently, generally greater than 100 year return intervals. Due to a fewer number of missed fires, the cold upland forest potential vegetation group tends to be less departed from the HRV.

Within the moist upland forest potential vegetation group, the current fire return interval is approximately 338 years at the scale of the Blue Mountains. Historically, the moist upland forest potential vegetation group was characterized by mixed-severity fires occurring every 30 to 150 years. Mixed-severity fires alternated between stand-replacing crown fires, which killed all trees, to nonlethal, low-intensity surface fires that left patches of living trees. According to Perry et al. (2011), mixed-severity fires created a patchiness of forest structure, composition, and seral status that could be observed and quantified at an intermediate or meso-scale, with patch sizes ranging from a few hundredths up to tens or hundreds of a hectare, depending on locale and climatic drivers. In forest types that were historically dominated by mixed-severity fire regimes, surface and canopy fuels, topography, climatic conditions, and ignitions worked in concert to influence variation in fire frequency, severity, spatial extent, and seasonality. The result was a complex spatial-temporal mix of low, moderate, and high severity patches. Due to patterns of burning, this type of historical fire regime created a complex mosaic pattern across the landscape, resulting in high levels of diversity in both plants and animals (Perry et al. 2011). Due to over a century of fire exclusion and suppression, the moist upland forest potential vegetation group in general has experienced a fewer number of missed fires than the dry upland forest potential vegetation group but a greater number than the cold upland forest potential vegetation group. As a result, the moist upland forest potential vegetation group tends to exhibit a relatively moderate amount of departure from the HRV.

In most cases, fire has become more frequent since 1980 than in the last 100 year time period. Some of this is possibly due to variations in the climate and some is due to the buildup in fuels and multi-storied, dense stands. The result of having the current, less frequent fire return interval in the dry vegetation types is that vegetation and fuel loading can build up and lead to more severe and larger fires than historical levels. At some point, this can reduce resiliency.

Table 241 displays the frequency and severity of fire for each national forest. These figures are based on the number of acres burned per year, with each year then categorized as normal, high, or severe.

Since 1980, approximately 22 percent of the years experienced high severity wildfires that burned between 2,500 to 50,000 acres per year. Approximately 11 percent of the years experienced severe wildfires that burned 50,000 acres or more per year. Approximately 67 percent of the years experienced normal severity wildfires that burned less than 2,500 acres per year. Since 1980, the average number of acres burned in wildfires per year in the Blue Mountains was approximately 22,000 acres. According to fire managers, the time period from 1980 to 2005 better represents potential fire behavior for future fires, compared to data since 1960, due to the build-up of fuels and recent climate change patterns. The data indicates that the amount of fire has increased since 1980, which has decreased fire return intervals. However, current fire return intervals continue to exceed the historical range of variability for natural fire return intervals associated with the different potential vegetation groups. The frequency of years with acres of fuel loading that would contribute to a severe fire has increased since 1980. Much of the fire that has occurred recently in the warm-dry systems has been high severity fire, as opposed to the low severity and some mixed severity fires that historically dominated these areas.

Table 241. Frequency of normal, high, and severe fire years for each national forest*

Fire Year Type	Last 45 Years			Last 25 Years			
	MAL	UMA	WAW	MAL	UMA	WAW	Blue Mts.
Normal	89	78	67	81	65	54	67
High	9	20	18	15	31	19	22
Severe	2	2	15	4	4	27	11

* Percent of years where fire acres burned was normal, high, or severe.

**Normal is less than or equal to 2,500 acres burned per year; high is 2,500 to 50,000 acres per year; severe is 50,000 acres or more per year.

Wildland Fire Severity

Fire severity, as discussed in this section, is a measure of the potential effects of fire on vegetation:

- **Low severity fire:** less than 25 percent mortality in the overstory vegetation.
- **Mixed severity fire:** 25 to 75 percent mortality in the overstory vegetation.
- **High severity fire:** greater than 75 percent mortality in the overstory vegetation.

Current vegetation survey (CVS) inventory plot data for the Blue Mountains plan area was used to estimate potential mortality from fire. The summary of CVS data for percent high severity fire at the scale of each national forest is summarized in table 242. Values were obtained using the FVS fire and fuels extension.

Table 242 displays the potential for high severity fire effects by potential vegetation group and national forest. Fire severity data indicate that under severe fire weather conditions (90th percentile), much of the analysis area has the potential for high severity fire effects. The moist upland forest potential vegetation group exhibits the least amount of departure from reference conditions. Currently, approximately 32 to 40 percent of the moist upland forest potential vegetation group in the three national forests has the potential for high severity fire, compared to a reference value of 35 percent. Approximately 52 to 55 percent of the cold upland forest potential vegetation group in the three national forests has the potential for high severity fire, compared to a reference value of 84 percent. Even though the cold and moist upland forest potential vegetation groups show the potential for a moderate to high amount of high severity fire,

this amount of fire is consistent with the mixed to infrequent high severity fire regimes that historically dominated these systems. Approximately 50 to 55 percent of the dry upland forest potential vegetation group has the potential for high severity fire, compared to a reference condition of 10 percent. This increased potential for high severity fire in the dry upland forest potential vegetation group results in a less resilient ecosystem. High potential for high severity fire can be attributed to stands that have canopy cover greater than the desired conditions, an abundance of small diameter understory trees that act as ladder fuels and carry wildfire from the ground into the overstory tree crowns, or a level of down woody material that exceeds the desired condition.

Table 242. Potential percent high severity fire by potential vegetation group* for each national forest

Potential Vegetation Group	LANDFIRE Reference Value (high severity fire)	MAL	UMA	WAW
Cold upland forest	84%	55%	52%	55%
Moist upland forest	35%	38%	40%	32%
Dry upland forest	10%	50%	55%	50%
Juniper woodland	37%	89%	100%	94%

* Value: percent of the potential vegetation group that has the potential (based on CVS data) for greater than 75 percent basal area loss in the event of a fire at 90th percentile conditions. Greater than 75 percent basal area mortality is defined as a high severity fire.

Fire Regime Condition Class

In 2003, fire regime condition class assessments were made nationally to assess vegetation conditions and the amount of departure from historical conditions (Hann et al. 2003). The fire regime condition class tool allows natural resource managers to compare historical natural vegetation, their associated disturbance regimes, and current vegetation succession class to inventory the amount of departure from historical conditions. Succession class is defined as a seral stage classification based on descriptions of structure and composition, disturbance processes, and pattern (Barrett et al. 2010). There are three condition classes for each fire regime and each classification is based on a relative amount of departure from the historical natural fire regime (Hann et al. 2003; see table 243). The departure score can be thought of as being a product of two major elements: the condition of vegetation succession class and fire frequency/severity. The existing departure of fire severity is described as a part of the affected environment, but is not described for each alternative as a quantitative part of condition class. In most cases, the departure of fire frequency overwhelms the departure of vegetation, making interpretation of changes in vegetation structure difficult. For the current analysis, the fire regime condition class modeling focuses on vegetation so that the effects of proposed management on vegetation attributes, such as structure, density, and species composition, can be displayed more easily and clearly.

Table 243. Description of fire regime condition classes

Fire Regime Condition Class	Description	Risk
Condition Class 1	Within the natural (historical) range of variability of vegetation characteristics, fuel composition, fire frequency, severity and pattern, and other associated disturbances. **Departure score is less than 33 percent.**	• Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. • Composition and structure of vegetation and fuels are similar to the structure that existed under the natural (historical) fire regime. • Risk of loss of key ecosystem components (e.g., native species, large trees, and soil) is low.
Condition Class 2	Moderate departure from the natural (historical) range of variability of vegetation characteristics, fuel composition, fire frequency, severity and pattern, and other associated disturbances. **Departure score is between 33 and 66 percent.**	• Fire behavior, effects, and other associated disturbances are moderately departed from HRV (more or less severe). • Composition and structure of vegetation and fuel are moderately altered. • Uncharacteristic conditions range from low to moderate. • Risk of loss of key ecosystem components is moderate.
Condition Class 3	High departure from the natural (historical) range of variability of vegetation characteristics, fuel composition, fire frequency, severity and pattern, and other associated disturbances. **Departure score is greater than 66 percent.**	• Fire behavior, effects, and other associated disturbances are highly departed from HRV (more or less severe). • Composition and structure of vegetation and fuel are highly altered. • Uncharacteristic conditions range from moderate to high. • Risk of loss of key ecosystem components is high.

Fire Regime Condition Class Estimates

The existing fire regime condition class succession class by potential vegetation group for each national forest was compared to the historical reference condition and is displayed in table 244. The difference (ecological similarity index) between those two values was then summarized into a condition class departure score based on the range of values in table 243. The results of condition class modeling by alternative are discussed in the effects section.

Table 245 displays the forestwide departure scores of the existing succession class versus the historical/reference succession class distribution. The higher the number, the greater the potential vegetation group or forest vegetation-fuel condition has departed from the HRV. Much of the landscape is currently moderately departed from historical conditions for vegetation-fuel conditions. This indicates a landscape that is currently less ecologically resilient than what occurred historically.

Table 244. Existing fire regime condition class succession class distribution for each national forest and the historical succession class for the Blue Mountains

Potential Vegetation Group	Succession Class Distribution (average)*				
	A	B	C	D	E
Malheur (existing condition)					
Cold UF	24%	8%	47%	17%	4%
Moist UF	1%	19%	28%	29%	23%
Dry UF	6%	22%	49%	5%	18%
Umatilla (existing condition)					
Cold UF	30%	24%	15%	9%	22%
Moist UF	9%	17%	20%	27%	28%
Dry UF	12%	56%	19%	2%	10%
Wallowa-Whitman (existing condition)					
Cold UF	15%	23%	27%	21%	14%
Moist UF	12%	41%	21%	8%	18%
Dry UF	14%	55%	17%	2%	12%
Blue Mountains national forests combined historical reference condition					
Cold UF	32%	33%	8%	3%	26%
Moist UF	25%	26%	15%	6%	28%
Dry UF	21%	4%	14%	53%	9%

*See definition for succession class (see page 93).

Table 245. Existing condition fire regime condition class vegetation departure score (zero-100) for each national forest

Potential Vegetation Group	MAL	UMA	WAW
Cold upland forest	54	13	37
Dry upland forest	62	60	56
Moist upland forest	36	23	23

The dry upland forest potential vegetation group consistently exhibits vegetation departure scores at the high end of fire regime condition class 2 with all three national forests, ranging from approximately 56 to 62. As table 243 displays, the departure for fire regime condition class 2 is between 33 and 66 percent. These fire regime condition class departure scores indicate that vegetation conditions are nearing a highly departed state, in comparison to the HRV, and are less ecologically resilient in the dry upland forest potential vegetation group. Based on available data, the amount of departure within the dry upland forest potential vegetation group is typically caused by an overabundance of shade tolerant tree species, overabundance of closed canopy conditions, overabundance of multi-storied stands, an overabundance of stands classified as fire regime condition class mid seral (understory reinitiation and stem exclusion) closed canopy, and a deficit of stands in the late seral fire regime condition class open condition (OFSS).

Within the moist upland forest potential vegetation group, fire regime condition class vegetation departure scores vary by national forest. Within the Umatilla and Wallowa-Whitman National Forests, vegetation departure scores are in fire regime condition class 1 (approximately 23) and within the HRV. These scores indicate that the composition and structure of vegetation and fuels are similar to the characteristics exhibited under the natural (historical) fire regime and are more

ecologically resilient in the moist upland forest potential vegetation group. However, within the Malheur National Forest, vegetation departure scores are in fire regime condition class 2 (approximately 36), which is within the lower range of moderate departure. This score indicates that the composition and structure of vegetation and fuels are becoming more departed from the characteristics exhibited under the natural (historical) fire regime and are becoming less ecologically resilient in the moist upland forest potential vegetation group within the Malheur National Forest.

Within the cold upland forest potential vegetation group, fire regime condition class vegetation departure scores also vary by national forest. Within the Umatilla National Forests, vegetation departure scores are in fire regime condition class 1 (approximately 13) and within the HRV. These scores indicate that the composition and structure of vegetation and fuels are similar to the characteristics exhibited under the natural (historical) fire regime and are more ecologically resilient. However, within the Wallowa-Whitman and Malheur National Forests, vegetation departure scores are in fire regime condition class 2 (approximately 37 and 54, respectively), which is within the range of moderate departure. These scores indicate that the composition and structure of vegetation and fuels are more departed from the characteristics exhibited under the natural (historical) fire regime and are less ecologically resilient.

The trend and existing conditions of vegetation in the Blue Mountains is similar to those described by Quigley (1996) and Macdonald et al. (2005). Data show that the Blue Mountains are dominated by ecosystems that evolved with frequent, low and mixed severity fire. Approximately 88 percent of the Blue Mountains are classified as historical Fire Regime 1, 2, or 3, which are the short to mixed return interval systems. Much of this landscape is currently moderately to highly departed from historical/reference conditions for vegetation and fuel conditions. The total percent of fire regime condition class 2 and 3 (moderate to high departure) ranges from 28 percent in the moist upland forest potential vegetation group to 100 percent in the dry upland forest potential vegetation group. Most of the condition class 1 (low departure) occur in the cold or moist upland forest types. The dry upland forest potential vegetation group exhibits the greatest departure from historical/reference conditions. The departure is caused by an abundance of stands classified as mid seral (understory reinitiation and stem exclusion) closed canopy and a deficit of stands in the late seral (old forest) open condition.

Insects and Disease

Beginning in the early 1900s, forest insects and diseases were traditionally considered pests in that control was aimed at reducing their effects on their hosts or at reducing their numbers to as low as possible (Scott and Schmitt 1996). This philosophy is still applied to nonnative insects and diseases, such as the balsam wooly adelgid and white pine blister rust (*Cronartium ribicola*), which were inadvertently introduced into the United States from other continents. In some situations, native insect populations can rapidly build in response to a major forest disturbance and threaten the loss of a resource or place other non-timber resources at high risk to damage or loss, thus prompting action to suppress these populations before they reach damaging levels.

Ecosystem management often strives to maintain an endemic level of insects and disease consistent with historical levels of activity within the natural range of variability for those plant communities. Insects and diseases play a natural role in the ecosystem. They create snags and down logs. Trees with decay and witches' brooms provide habitat for a variety of forest-dwelling flora and fauna including microbes, fungi, invertebrates, small animals, and cavity-nesting birds. The levels of these ecosystem components contributed by insects and diseases may sometimes far exceed the levels that would constitute a healthy ecosystem. During the past several decades, it

has become increasingly more common for levels of insect and disease -created habitats to exceed presettlement conditions (Scott and Schmitt 1996). According to Campbell (1996), several broad scale trends have been observed in the Blue Mountains.

- Outbreaks of defoliating insects, such as western spruce budworm and Douglas-fir tussock moth, are now larger, more intense, and more frequent than in the past.
- Bark beetle-related mortality, associated with tree stress and overstocked stands, is more prevalent.
- Drought in the late 1980s and early 1990s, coupled with overstocked stands, has contributed to increased mortality from bark beetles, other insects, fire, and disease.
- Many root diseases and dwarf mistletoes are more widespread and destructive because of past harvesting practices and the resulting changes in forest structure and species composition.

An insect and disease risk hazard assessment was conducted for the Malheur, Umatilla, and Wallowa-Whitman National Forests using CVS data and is available in the project record (Countryman 2009). This risk hazard assessment predicts the level of tree mortality over a period of 15 years. Protocols from the Oregon and Washington pest model risk assessment process were utilized as the basis for the process used by the plan revision team. A variety of factors, such as ecoclass, stand density, species composition, stand structure, and observations for insect and disease activity were used in the modeling process to predict tree mortality. Plots were classified into a risk rating for each of 24 risk models used. Each of the plots were then classified into a predicted mortality category by the percentage of volume loss and summarized by upland forest potential vegetation group, by national forest, and by structural stages.

Table 246 displays the percent of CVS plots within predicted mortality categories by upland forest potential vegetation group for the Malheur, Umatilla, and Wallowa-Whitman National Forests. Predicted mortality is described as a percentage of volume loss over a period of 15 years. The dry upland forest potential vegetation group exhibits the highest insect and disease risk hazard, compared to the other upland forest potential vegetation groups. Within the dry upland forest potential vegetation group, approximately 18 percent of the plots are in the 50 percent plus predicted mortality category. In other words, modeling predicts that nearly one-fifth of the plots within the dry upland forest potential vegetation group would lose over half of their volume to insect and disease-related mortality over the next 15 years. Within the dry upland forest potential vegetation group, approximately 23 percent of the plots are in the 25 to 50 percent predicted mortality category, predicting that nearly one-fourth of the plots within the dry upland forest potential vegetation group would lose between one-quarter to one-half of their volume to insect and disease-related mortality over the next 15 years. The dry upland forest potential vegetation group tends to exhibit the greatest amount of departure from historical forest conditions in terms of stand structure, density, and species composition due to the frequency of the historical fire regime and the greatest number of missed fires. Increased tree densities resulting from fire exclusion and suppression have resulted in overstocked stands, increased competition between trees for moisture, nutrients, and sunlight, decreased tree health, growth, and vigor, increased regeneration of shade-tolerant tree species, and altered species compositions and stand structures. Due to this alteration of stand conditions and the greater amount of departure from HRV, the dry upland forest potential vegetation group currently exhibits the highest insect and disease risk hazard, compared to other upland forest potential vegetation groups.

Table 246. Percent of CVS plots within predicted mortality categories (percentage of volume loss) by upland forest potential vegetation group within the Malheur, Umatilla, and Wallowa-Whitman National Forests

Potential Vegetation Group	Predicted Mortality Category (Percentage of Volume Loss)				
	0-5%	5-15%	15-25%	25-50%	50% Plus
	Percent of CVS Plots				
Dry upland forest	17	24	18	23	18
Cold upland forest	32	40	18	8	2
Moist upland forest	16	33	34	17	1

The cold upland forest potential vegetation group exhibits the lowest insect and disease risk hazard, compared with the other upland forest potential vegetation groups. Within the cold upland forest potential vegetation group, approximately 2 percent of the plots are in the 50 percent plus predicted mortality category and approximately 8 percent of the plots are in the 25 to 50 percent predicted mortality category. The greatest number of plots, approximately 72 percent, is in the 0-15 percent predicted mortality categories. As such, the cold upland forest potential vegetation group tends to exhibit less departure from historical forest conditions in terms of stand structure, density, and species composition. Under the historical fire regime, fires burned very infrequently. Due to fire exclusion and suppression, the cold upland forest potential vegetation group has experienced a fewer number of missed fires, in comparison to other potential vegetation groups.

Within the moist upland forest potential vegetation group, approximately 1 percent of the plots are in the 50 percent plus predicted mortality category and approximately 17 percent of the plots are in the 25 to 50 percent predicted mortality category. Within the moist upland forest potential vegetation group, the insect and disease risk hazard is higher than the cold upland forest potential vegetation group but lower than the dry upland forest potential vegetation group. In general, the moist upland forest potential vegetation group tends to exhibit more departure from HRV than the cold upland forest potential vegetation group due to the historical fire regime (mixed frequency and severity) and a greater number of missed fires.

Table 247 displays the percent of CVS plots within predicted mortality categories by national forest. Predicted mortality is described as a percentage of volume loss over a period of 15 years. The Malheur National Forest exhibits the highest insect and disease risk hazard, in comparison with the other national forests. Within the Malheur National Forest, approximately 28 percent of the plots are in the 50 percent plus predicted mortality category. Modeling predicts that approximately one-fourth of the plots within the Malheur National Forest would lose over half of their volume to insect and disease-related mortality over the next 15 years. Within the Malheur National Forest, approximately 20 percent of the plots are in the 25 to 50 percent predicted mortality category. Modeling predicts that approximately one-fifth of the plots within the Malheur National Forest would lose between one-quarter to one-half of their volume to insect and disease-related mortality over the next 15 years. The Malheur National Forest contains the highest percent of the landscape in the dry upland forest potential vegetation group and the lowest percent of the landscape in the cold upland forest potential vegetation group, in comparison to the other national forests.

Table 247. Percent of CVS plots within predicted mortality categories (percentage of volume loss) by national forest

	Predicted Mortality Category (Percentage of Volume Loss)				
	0-5%	5-15%	15-25%	25-50%	50% Plus
National Forest	**Percent of CVS Plots**				
Malheur	17	21	14	20	28
Umatilla	20	30	29	20	2
Wallowa-Whitman	21	35	24	19	2

Within the Umatilla and Wallowa-Whitman National Forests, only approximately 2 percent of the plots are in the 50 percent plus predicted mortality category. Within the Umatilla National Forest, approximately 20 percent of the plots are within the 25 to 50 percent predicted mortality category and approximately 29 percent of the plots are in the 15 to 25 percent predicted mortality category. Within the Wallowa-Whitman National Forest, approximately 19 percent of the plots are in the 25 to 50 percent predicted mortality category and approximately 24 percent of the plots are in the 15 to 25 percent predicted mortality category. Overall, the Wallowa-Whitman National Forest displays the lowest insect and disease risk hazard, with approximately 56 percent of the plots in 0 to 15 percent predicted mortality categories. This is because the Wallowa-Whitman National Forest contains the lowest percent of the landscape in the dry upland forest potential vegetation group and the highest percent of the landscape in the cold upland forest potential vegetation group.

Table 248 displays the percent of CVS plots within predicted mortality categories by structural stages for the Malheur, Umatilla, and Wallowa-Whitman National Forests. Predicted mortality is described as a percentage of volume loss over a period of 15 years. Structural stages that exhibit the highest insect and disease risk hazard include the old forest multi-story (OFMS) and stem exclusion (SE) stages, in comparison with other structural stages. Approximately 12 percent of OFMS plots are in the 50 percent plus predicted mortality category and 19 percent are in the 25 to 50 percent predicted mortality category. Approximately 17 percent of the stem exclusion plots are in the 50 percent plus predicted mortality category and 24 percent are in the 25 to 50 percent predicted mortality category. Much of the predicted mortality is the result of having a landscape with too many fir dominated stands and overly dense stands within the dry upland forest potential vegetation group. High stand densities and altered species compositions within the dry upland forest potential vegetation group are the result of fire exclusion and suppression. The stand initiation (SI) stage exhibits the lowest predicted mortality. Approximately 72 percent of the SI plots are in the 0 to 15 percent predicted mortality categories.

Table 248. Percent of CVS plots within predicted mortality categories (percentage of volume loss) by structural stage for the Malheur, Umatilla, and Wallowa-Whitman National Forests

	Predicted Mortality Category (Percentage of Volume Loss)				
	0-5%	5-15%	15-25%	25-50%	50% Plus
Structural Stage	**Percent of CVS Plots**				
OFMS	9	31	29	19	12
OFSS	4	29	29	31	7
SE	9	28	22	24	17
SI	52	20	7	14	7
UR	13	36	28	14	10

Characteristic levels of insect and disease activity consistent with the HRV would contribute to diverse landscape conditions and provide important wildlife habitat components, such as hollow trees, dead wood, and mistletoe brooms. The desired conditions for vegetation structure, stand density, and species composition would create stand conditions with low to moderate susceptibility to insects and diseases across the majority of the upland forest potential vegetation groups. These stand conditions result in resilient forests capable of absorbing disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

Timber Harvest

Figure 19 displays timber harvest volume in Baker, Grant, Harney, Union, Wallowa, and Wheeler counties from 1980 to 2000. The average annual harvest volume has declined significantly from 1990 forest plans' projected average for the Blue Mountains of 450 million board feet per year to the current level of less than 100 million board feet per year. The use of even-aged regeneration methods of timber harvest (clearcut, seed tree, and shelterwood) has been reduced to less than 5 percent of the acres that were projected in the1990 forest plans. Total harvested acres (even and uneven-aged management) between the three national forests in the Blue Mountains declined to 76,000 acres for the period of 1998 to 2002. The 1990 projected level for that time period was 260,000 acres. The number of acres planted has been declining since the early 1990s to levels that are 130,000 acres less than what was projected from 1990 to 2001. The focus for planting has shifted from acres needing regeneration after timber harvest to acres needing regeneration following wildfires.

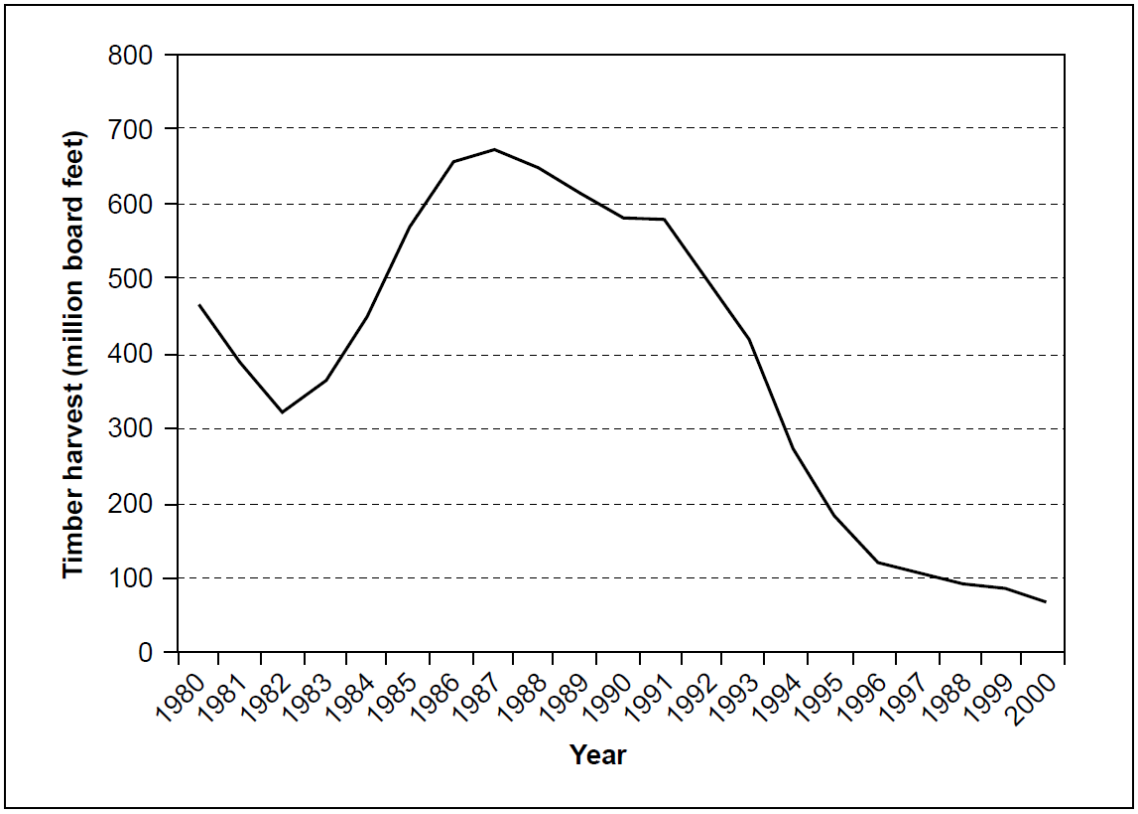

Figure 19. National forest harvests in Baker, Grant, Harney, Union, Wallowa, and Wheeler counties from 1980 to 2000 (3-year moving average) (Oregon Department of Forestry annual timber harvest reports)

Growth and Mortality

The analysis of tree volume, growth, and mortality was based on CVS inventory plot data and vegetation maps. The original establishment of CVS plots (occasion 1) occurred from 1994 to 1997. Re-measurement of plots (occasion 2) occurred from 1997 to 2005. The analysis file contains summaries of diameter class, species, annual growth and mortality for each forested potential vegetation group within the Malheur, Umatilla, and Wallowa-Whitman National Forests. A summary of the growth, mortality, volume, and number of trees for National Forest System lands within the Blue Mountains includes the following:

- The total live forest volume in the Blue Mountains on National Forest System lands is approximately 45 billion board feet.
- Live volume increased between sample periods for the dry upland forest potential vegetation group and increased or decreased for the moist and cold upland forest potential vegetation groups, depending on the national forest.
- The total number of live trees per acre increased in all diameter classes between sample periods.
- The greatest cause of death for trees that died between sample periods was insects and disease at 69 percent, followed by weather at 19 percent.
- Between sample periods, annual growth in the Blue Mountains was estimated at 800 million board feet and mortality was approximately 500 million.
- Between sample periods, annual mortality exceeded growth for subalpine fir and spruce, while growth exceeded mortality for the other species.
- Between sample periods, annual growth exceeded mortality for all diameter classes up to 27 inches. Mortality exceeded growth for diameter classes greater than 27 inches.
- Between sample periods, the percent of the landscape with more than 10 trees per acre greater than 21 inches d.b.h. increased from 24 to 31 percent.

Analysis Assumptions

The Blue Mountains forest plan revision analysis assumptions were guided by:

- Preliminary analysis of existing conditions in the Blue Mountains, as compared to the HRV or other historical/reference conditions and draft desired conditions.
- Draft wildlife viability/diversity modeling results.
- Recommendations and conclusions from the Interior Columbia Basin Ecosystem Management Project (current scientific information).
- Draft process and recommendations from the regional aquatic and riparian conservation strategy.
- Lessons learned from Eastside Screens.

Assumptions – Wildland Fire

Many different definitions exist for the wildland-urban interface (WUI), including those in the National Fire Plan (Grayzeck-Souter et al. 2009). In 2001, a list of wildland-urban interface communities was published in the Federal Register, identifying National Fire Plan communities of concern in each state (66 FR 43435, August 17, 2001). Local communities have also developed

boundaries of those areas that are critical to community stability, based on the healthy forest restoration act (HFRA) starting point definition of at-risk communities. These boundaries are displayed in county wildfire protection plans (CWPPs). CWPPs will define the wildland-urban interface for site-specific analysis and project implementation.

There are two types of wildland fire that will be discussed in this document: prescribed fires (planned fires) and wildfires (unplanned fires). Prescribed fires are ignited by a management action and are designed to meet specific land management objectives. These objectives include modifying stand structure (size and arrangement of trees), species composition, and stand density to better match desired conditions. Wildfires are those not ignited by management actions. Some wildfires may be managed to meet specific land management objectives. The use of wildland fire as a tool to meet land management objectives may occur on all acres in all alternatives, as long as those fires are moving the landscape towards or helping maintain the desired conditions.

Assumptions – Harvest Analysis Minimum Management Requirements

Resource Protection/Species Viability and Diversity

Because of a deficit of old forest structure in the Blue Mountains and viability concerns for species that depend on that resource, even-aged regeneration harvests would not occur within current old forest stands, and only minimal harvest of trees 21 inches d.b.h. and greater was assumed. Under alternatives B, E, and F, all old forest stands would be considered unsuitable for timber production, but still available for harvest to meet objectives other than timber production. With these alternatives, old forest stands could receive treatments to improve ecological resiliency, forest structure, species composition, or other desired conditions. Under alternative D, old forest would be considered suitable for timber production. With alternative C, old forest stands would be considered unsuitable for timber production and timber harvest; silvicultural treatments in old forest would be limited, consisting mostly of thinning trees smaller than 8 inches d.b.h.

To protect those wildlife species needing solitude, all areas within the inventory meeting the criteria for potential wilderness area designation were identified as unsuitable for timber production and included in a VDDT model group with minimal management activities. Minimal harvest would occur within these areas and no new roads would be built. Harvest would be allowed if used to meet primary objectives other than timber production.

Resource Protection/Riparian Areas/Soil and Water

All riparian management areas, as defined by each alternative, were included in a VDDT model group with low levels of management activities and were modeled as unsuitable for timber production.

Resource Protection/Soil and Water/Vegetation Manipulation/Silvicultural Practices

To protect soil and water resources, no timber harvest would be scheduled within areas determined to be unsuitable for timber production due to concerns about sensitive soils or difficulty regenerating sites within five years.

Other treatment assumptions or highlights between alternatives include:

- Even-aged regeneration harvests (clearcut, shelterwood, and seed tree) would not occur in old forest (allocated or unallocated to a management area), regardless of the VDDT model group in which old forest occurs.

- Even-aged regeneration harvests would only occur in the active forest management VDDT model group.
- Burning and harvesting treatments would improve ecological resiliency by favoring early seral species, such as ponderosa pine and western larch, by decreasing stand densities where and as needed, by decreasing the abundance of multi-layered stands on the landscape, and by increasing the percent of the landscape in larger-diameter stands.
- Under alternative A, regeneration harvests would be less than 5 percent of the total acres harvested.
- Under alternatives B, C, D, E, and F, regeneration harvests would increase to approximately 20 to 30 percent of the total acres harvested.
- Under alternative C, all old forest and riparian areas would be placed in a VDDT model group with minimal management activities. However, some understory thinning of trees generally less than 8 inches in diameter would be expected to occur. Additionally, wildland fire could still occur in those areas.

Treatments were prioritized by the following areas:

- Priority/key watersheds (based on ARCS modeling)
- Wildland urban interface
- Dry upland forest potential vegetation group (or areas most departed from the HRV/desired conditions)
- Areas with established road systems (primarily within MA 4A General Forest)

Areas where multiple factors overlap are a higher priority than those with only a single factor. Depending on cost sharing or other factors, lower priority work may still occur before higher priority work. Prioritization also recognizes the need for maintenance activities to prevent areas from becoming departed from the desired conditions and then needing more extensive restoration treatments.

Objectives and Design of the Alternatives

All planned activities (timber harvest, reforestation, mechanical fuels treatments, wildfire management, and prescribed fire) would have the following general ecological objectives: to maintain or improve ecological resiliency, stand structures, species composition, stand densities, landscape patterns, fire regime condition classes, and potential fire behavior. These activities are designed to move the landscape towards the desired conditions for vegetation. The activities include social objectives to protect critical resources, such as municipal watersheds, wildland-urban interface areas, and adjacent private property. Economic objectives include contributing to the maintenance of community infrastructure, such as lumber mills and ranches.

Description of Timber Harvest by Alternative

Table 249, table 250, and table 251 contain the estimated annual acres harvested for the planning period under each alternative within the Malheur, Umatilla, and Wallowa-Whitman National Forests. Based on harvest levels for the period 2007 to 2009, combined annual harvest for all three national forest would be expected to occur on 16,800 acres under alternative A (no action). The majority of this acreage would consist of uneven-aged management. Alternative A would contain the lowest percentage of even-aged treatments, compared to the action alternatives. Under alternative A, even-aged management would total approximately 500 acres within all three

national forests. Precommercial thinning would total approximately 5,600 acres. Planting would total approximately 300 acres. Alternative A would utilize the current forest plan standards and guidelines, including the Eastside Screens and PACFISH/INFISH. Alternative A would require a budget level similar to the current budget level.

Table 249. Annual acres of harvest for each alternative for the Malheur National Forest

Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Even-aged regeneration harvest	150	1,500	800	3,300	2,900	1,800
Uneven-aged management harvest	6,950	5,600	2,600	17,200	9,600	6,500
Total timber harvest	7,100	7,100	3,400	20,500	12,500	8,300
Planting	100	700	400	1,600	1,400	900
Precommercial thinning	1,400	1,400	1,000	3,000	1,400	1,400

Table 250. Annual acres of harvest for each alternative for the Umatilla National Forest

Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Even-aged regeneration harvest	260	1,200	500	2,600	2,400	1,500
Uneven-aged management harvest	4,940	4,000	1,800	13,000	8,200	4,900
Total timber harvest	5,200	5,200	2,300	15,600	10,600	6,400
Planting	150	600	200	1,300	1,200	700
Precommercial thinning	1,600	1,600	1,500	3,200	1,600	1,600

Table 251. Annual acres of harvest for each alternative for the Wallowa-Whitman National Forest

Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Even-aged regeneration harvest	90	1,000	500	2,500	2,000	1,400
Uneven-aged management harvest	4,410	3,550	1,550	13,750	7,350	4,650
Total timber harvest	4,500	4,550	2,050	16,250	9,350	6,050
Planting	50	500	200	1,200	1,000	700
Precommercial thinning	2,600	2,600	1,700	5,200	2,600	2,600

Alternative B is the proposed action, as modified based on public scoping. The total number of acres of timber harvest would be similar to alternative A. Implementation of alternative B would require a budget level similar to the current budget level. In comparison to alternative A, alternative B would increase the number of acres of even-aged management, which would also increase the amount of young forest (stand initiation). The number of acres of planting would also increase. In comparison to alternative A, alternative B would decrease the number of acres of uneven-aged management. The number of acres of precommercial thinning would remain the same as alternative A. Old forest and riparian management areas would be classified as unsuitable for timber production. Old forest stands would not be designated as management areas; instead, guidance for these structural stages would come from the forest plan components for desired conditions, objectives, standards, and guidelines. Alternative B would also include a guideline similar to the Eastside Screens that would emphasize retaining trees 21 inches d.b.h. and greater both within and outside of old forest. However, harvesting of trees 21 inches d.b.h. and greater would be allowed under specific conditions: to favor hardwood species such as aspen and cottonwoods; to manage species composition; to remove hazard trees; and to improve the effectiveness of fuel reductions in wildland-urban interfaces.

Alternative C was designed to be the most restrictive alternative in terms of timber harvest. This alternative responds to those who wanted to emphasize more passive forest management. Alternative C proposes the utilization of more wildfire managed for resource benefits to move vegetation towards the desired conditions. Alternative C would contain the greatest number of acres of preliminary administratively recommended wilderness areas. Alternative C would also contain wider riparian management areas and additional areas in wildlife corridor management areas. Additionally, old forest would be designated as a management area. All of these additional management areas would reduce the number of acres suitable for timber production. Therefore, alternative C would have the fewest proposed acres of annual timber harvest. In comparison to alternative A, alternative C would still increase the number of acres of even-aged management and planting. However, the number of acres of uneven-aged management would decrease substantially. Additionally, the number of acres of precommercial thinning would decrease, compared to alternatives A and B. The total number of acres of annual timber harvest would be less than half of the acres under alternatives A and B. Alternative C would require a budget level of approximately 45 to 50 percent less than the current budget level for vegetation management and approximately 25 to 55 percent less for fuels reduction. This alternative would include a standard that would prohibit the harvesting of trees 21 inches d.b.h. and greater both within and outside of old forest. Salvage harvest would not be allowed under this alternative.

Alternative D responds to those that wanted to see a greater emphasis on product removal. Alternative D would reduce the widths of riparian management areas and would not include additional acres of recommended wilderness. Additionally, old forest would be classified as suitable for timber production. In comparison to the other alternatives, alternative D would contain the greatest number of acres suitable for timber production and would have the highest number of acres harvested annually within each national forest. Alternative D would also require the highest budget levels. Alternative D would require an increase in budget from current levels of approximately 170 to 195 percent for vegetation management and an increase of approximately 5 to 20 percent for fuels reduction. Under alternative D, the total number of acres harvested annually would be approximately three times greater than alternatives A and B. The level of harvest would attempt to utilize a substantial portion of the net growth per year. As a response to the request for removal of a greater amount of product, this alternative would rely more on utilization of woody material instead of burning as a fuel reduction activity. Alternative D would not include prescribed burning outside of harvest units and would include only limited amounts of prescribed burning within harvest units. The majority of the fuels treatments within harvest units would be accomplished by removal or crushing, instead of burning. Additionally, alternative D would increase the number of acres of precommercial thinning and planting. Alternative D would not contain a standard or guideline regarding the management of trees 21 inches d.b.h. and greater. It is not anticipated that the lack of a large tree standard or guideline would substantially increase the number of large trees removed. Instead, it is intended to give more site-specific flexibility in achieving other desired conditions and objectives, such as species composition. Alternative D would have an increased emphasis on salvage harvest.

Under alternative E, the total number of acres harvested annually would be approximately double, compared to alternatives A and B. Alternative E would require a budget increase from current levels of approximately 65 to 80 percent in vegetation management and approximately 20 to 35 percent in fuels reduction. The total number of acres of planting would also increase. The number of acres of precommercial thinning would remain the same as alternatives A and B. Under alternative E, old forest and riparian management areas would be classified as unsuitable for timber production but would be available for timber harvest to meet other resource objectives. Old forest would not be designated as management areas. Instead, management of old forest

would be guided by the forest plan components for desired conditions, objectives, standards, and guidelines for structural stages, species composition, stand density, and fire regime condition class. This alternative would not contain a standard or guideline regarding the management of trees 21 inches d.b.h. and greater. Rather, alternative E would contain a guideline that emphasizes retaining live trees that exhibit certain old tree characteristics.

Under alternative F, the total number of acres harvested annually would increase by approximately 25 percent, compared to alternatives A and B. Alternative F would require a budget increase from current levels of approximately 15 to 20 percent in vegetation management and an increase of approximately 5 to 10 percent in fuels reduction. The total number of acres of planting would increase, in comparison to alternative A. The number of acres of precommercial thinning would remain the same as alternatives A and B. Under alternative F, old forest and riparian management areas would be classified as unsuitable for timber production but would be available for timber harvest to meet other resource objectives. Old forest would not be designated as management areas. Instead, management of old forest would be guided by the forest plan components for desired conditions, objectives, standards, and guidelines for structural stages, species composition, stand density, and fire regime condition class. Alternative F would contain a guideline that emphasizes retaining live trees greater than 150 years old, in most cases, rather than a size limit of 21 inches d.b.h.

Description of Fuels Management Activities by Alternative

For all alternatives, limitations to landscape-level fire management activities may include funding uncertainty, organizational capacity of the Forest Service, species at risk, wildland-urban interface issues, sensitive watershed concerns, and air quality issues related to smoke. Fuels treatments, including prescribed fire (planned ignitions) and management of wildfire (unplanned ignitions), would be utilized under all of the alternatives. However, the level and type of management activity would vary by alternative.

Table 252, table 253, and table 254 display the level of prescribed fire and mechanical fuel-reduction activity associated with each alternative by national forest. It was assumed in the design of each alternative that all activity-generated fuels would be reduced to levels meeting the desired conditions for down wood. The mix of fuels treatments would be a combination of thinning, removal of small diameter biomass, crushing, piling and burning, or just burning.

Table 252. Annual acres of fuels management for each alternative for the Malheur National Forest

Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Prescribed burning outside harvest units (without ground-based mechanical pretreatment)	9,500	9,500	9,500	0	9,500	9,500
Prescribed burning within harvest units, without mechanical pretreatment by ground-based equipment	5,300	5,300	2,500	5,100	9,400	6,200
Prescribed burning or removal of fuels within harvest units (could include treatment of fuels with ground-based equipment)	1,800	1,800	900	15,400	3,100	2,100

Table 253. Annual acres of fuels management for each alternative for the Umatilla National Forest

Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Prescribed burning outside harvest units (without ground-based mechanical pretreatment)	10,000	10,000	10,000	0	10,000	10,000
Prescribed burning within harvest units, without mechanical pretreatment by ground-based equipment	7,800	7,800	1,700	4,000	7,900	4,800
Prescribed burning or removal of fuels within harvest units (could include treatment of fuels with ground-based equipment)	1,300	1,300	600	12,000	2,700	1,600

Table 254. Annual acres of fuels management for each alternative for the Wallowa-Whitman National Forest

Activity	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Prescribed burning outside harvest units (without ground-based mechanical pretreatment)	10,500	10,500	10,500	0	10,500	10,500
Prescribed burning within harvest units, without mechanical pretreatment by ground-based equipment	3,400	3,450	1,550	4,300	7,050	4,550
Prescribed burning or removal of fuels within harvest units (could include treatment of fuels with ground-based equipment)	1,100	1,100	500	12,700	2,300	1,500

The level of prescribed burning outside of harvest units would not differ between the alternatives, except under alternative D. Under alternatives A, B, C, E, and F, prescribed burning outside of harvest units would continue at the current rate of approximately 30,000 acres per year within the three national forests, whereas the use of prescribed fire (planned ignitions) outside of harvest units would be eliminated under alternative D. Prescribed fire outside of timber harvest units may or may not utilize thinning or piling as a pretreatment, depending on anticipated fire effects in relation to the desired conditions (see desired fire regime; table 238). For example, a proposed prescribed fire in an area that has an abundance of multi-storied stands may have a high potential for high severity fire effects. However, if the desired condition for the area is low severity fire, it would be necessary to complete pretreatments to bring potential effects in alignment with the desired conditions.

Under alternatives A and B, prescribed burning and the treatment of fuels with ground-based equipment within harvest units would continue at the current rate of approximately 20,700 acres per year within the three national forests. Under alternative C, burning and the treatment of fuels with ground-based equipment within harvest units would decrease to approximately 7,750 acres within the three national forests due to the decrease in the level of timber harvest. With alternative D, the treatment of fuels within harvest units would increase substantially to approximately 53,500 acres per year due to the substantial increase in timber harvest proposed under this alternative. Under alternative D, the majority of the fuels treatments within the harvest units would be accomplished by removal or crushing, instead of burning. With alternative E, the treatment of fuels using fire and/or ground-based equipment within harvest units would increase

to approximately 32,450 acres within the three national forests. Under alternative F, the treatment of fuels using fire and/or ground-based equipment within harvest units would increase to approximately 20,750 acres within the three national forests. With all of the alternatives except alternative D, the majority of the fuels treatments within the harvest units would be accomplished using fire, instead of removal or crushing fuels.

In addition to the activities listed in table 252, table 253, and table 254, unplanned ignitions (wildfires) may also be managed to achieve desired conditions under all of the alternatives. The use of unplanned ignitions as a tool to meet resource objectives could occur on all acres under all alternatives, as long as those fires are moving the landscape towards, or helping maintain, the desired conditions for the area. However, only alternatives C, E, and F would contain specific objective statements in terms of the number of acres of wildfire managed for resource benefits per decade to achieve desired conditions for species composition, stand densities, structural stages, fire frequency, fire severity, and fire regime condition class. Management of unplanned ignitions is guided by a national forest's fire management plan. A fire management plan is a decision support tool required by federal fire policy that aids decision makers and fire personnel in the determination of management response to an unplanned ignition. Alternative C contains the greatest acreage objective of unplanned ignitions managed for resource benefits due to an increased emphasis on more passive forest management to achieve desired conditions. Alternatives B and D would not contain a specific acreage objective for unplanned ignitions managed for resource benefits; however, the use of unplanned ignitions managed for resource benefits would not be precluded. A complete list of objectives for each national forest is available in appendix A.

Environmental Consequences – Forested Vegetation, Timber Resources, and Wildland Fire

Effects Common to All Alternatives

Harvest Prescriptions and Effects

The following discussion describes the harvest and stand management prescriptions common to all alternatives. Timber harvest is a tool used to modify stand structures, species composition, stand density, landscape patterns, and potential fire behavior.

Precommercial Thinning Effects

Precommercial thinning is designed to improve the health and vigor of timber stands. It increases resilience, enhances shrub/forb layer diversity, accelerates development of sapling to pole-sized material, and promotes stand differentiation (different growth rates that allow trees to occupy different amounts of growing space, which improves the health of the stand) in stands otherwise displaying poor differentiation. By reducing the risk of disease or insect infestation, precommercial thinning is a useful tool for protecting and enhancing ecosystem health and restoration. Differentiated stands maintain a higher level of growth and vigor and a greater resistance to damaging agents, such as insects, disease, snow, and wind. Site-specific prescriptions would adopt specifications that are compatible with wildlife, recreation, and scenery objectives.

In the absence of precommercial thinning, poorly differentiated stands can stagnate or experience height repression. Height repression refers to a stand condition where overcrowding reduces tree

height and diameter growth and slows the process of stand differentiation.[3] Diameter growth is more sensitive to competition. A tree will maintain height growth after diameter has slowed, resulting in an unstable tree. Height repression occurs by degree across a range, from the nearly stagnated stand where height repression is severe, to the differentiating stand where height is reduced only slightly. With an increasing degree of height repression, a stand would experience reduced vigor, increased susceptibility to insect and disease problems, and would develop at a slower rate. Precommercial thinning extends the opportunity to increase the percentage of ponderosa pine and western larch (two species that have decreased across their historical range) where they occur in dense, mixed-species stands.

Precommercial thinning would result in decreased tree densities, decreased competition between trees for moisture, nutrients, and sunlight, increased nitrogen, carbon, and water uptake by individual trees, and improved tree health, growth, and vigor of residual trees. With less soil-moisture stress, a tree's natural defense mechanisms, such as the production of pitch, would be enhanced and trees would be better equipped to ward off attack by insects, such as bark beetles, and disease. In most cases, precommercial thinning would result in an increase in the average stand diameter by removing smaller diameter trees. Areas that are precommercially thinned would more rapidly move toward larger tree structure in the future. The stocking level control accomplished by precommercial thinning would more rapidly move the stands from sapling and small pole sizes toward large pole and small tree sizes. Because of this effect, thinning would be beneficial to the long-term development of old forest structure. Precommercial thinning would also result in increased sunlight to the forest floor, which would increase the productivity and diversity of herbaceous and/or shrub layers and stimulate forage production for increased wildlife habitat values. An ecological drawback of precommercial thinning would be that, if done too late after saplings and small poles have already self-pruned their lower branches, it can reduce wildlife cover. In the short-term, increased fuel levels from harvest activities would make the areas more prone to damage by fire and insects. Freshly created slash can increase the risk of bark beetle activity if the thinning is done at the wrong time of year. For example, thinning in ponderosa pine or lodgepole pine in the early spring can increase the risk of Ips beetle activity. In the long-term, lower stand densities would foster use of prescribed fire to manage fuel loadings where species that are more fire resistant occur.

Uneven-aged Management (Single-tree or Small Group Selection) Effects

Uneven-aged management is intended to perpetuate uneven-aged stands composed of intermingled trees of differing ages, species, and sizes. Individually selected trees would be removed to maintain a desired range of tree sizes for a prescribed diameter distribution. Cyclic entries would be designed to control the structure and species composition, and to provide the openings necessary for the establishment and growth of the continuously occurring regeneration that are a function of site quality and resource considerations.

Single-tree selection cutting would create favorable conditions for rapid growth on remaining trees. The treatments would decrease tree densities; decrease competition between trees for moisture, nutrients, and sunlight; increase nitrogen, carbon, and water uptake by individual trees; improve tree health, growth, and vigor; and increase resilience. With less soil-moisture stress, a tree's natural defense mechanisms, such as the production of pitch, would be enhanced and trees would be better equipped to ward off attack by insects and disease.

[3] Stand differentiation: Different growth rates that allow trees to occupy different amounts of growing space. This improves the health of the stand.

Single-tree selection cutting would reduce stand densities and canopy cover, thereby favoring the growth of shade intolerant species such as ponderosa pine and western larch where it occurs in the overstory. Group selection cutting would encourage regeneration of these more shade-intolerant species in the understory where seed sources are available, where canopy cover is more open, and/or where openings are larger in size. Regeneration of shade-intolerant tree species is necessary for the achievement of the desired conditions for species composition and structural stages, especially within the dry upland forest potential vegetation group. Decreased stand densities would also increase sunlight to the forest floor, thereby increasing understory productivity and enhancing the diversity of the grass/shrub/forb layer. Diversity is important in maintaining long-term site productivity (Perry et al. 1989).

In the short term, removing dead and dying trees and some of the small- and medium-sized trees that make up vegetative ladder fuels would decrease overall fuel loadings, making the areas slightly less prone to damage by wildfire. In the long term, lower stand densities would foster use of prescribed fires and wildfires to manage fuel loadings where species that are more fire-resistant occur. The reduction in stocking levels accomplished by single-tree selection would more rapidly move all existing structure classes toward the next larger class. Because of this effect, these treatments would be beneficial to the long-term development of old forest. Cumulative effects of continuing the uneven-aged management scenario would coincide with the vegetation management goals of sustaining ecosystem function on a landscape basis. Single-tree, uneven-aged selection systems maintain viable, multi-layered, and diverse structures well into the future.

Potential ecological impacts would include: soil compaction that reduces soil fertility and productivity; root disease, which infects untreated stumps and spreads to residual trees; residual tree wounding, which increases susceptibility to insects and diseases; introduction of exotic species that reduce biodiversity; removing biomass, which reduces nutrient cycling; and reduction of down woody material, which reduces soil-moisture retention.

Commercial and Intermediate Thinning Effects

The purpose of commercial thinning is to improve stand health, growth, and vigor, increase resilience, enhance shrub/forb-layer diversity, reduce the potential of major stand-replacing disturbance events, accelerate the development of late seral structures, thereby protecting and enhancing ecosystem health and restoration. By commercially thinning stands, the threat of insect and disease infestation would decrease from a high susceptibility rating to a low rating. Residual tree densities would be chosen to optimize stand vigor and health, allow for the future functioning of natural fire, and maintain marginal thermal cover. Thermal cover is cover used by animals to ameliorate effects of weather.

The resulting lower tree density from commercial thinning would create favorable conditions for rapid growth on remaining trees similar to the effects previously described for uneven-aged management. This activity could occur within all upland forest potential vegetation groups.

Salvage Harvest Effects

Salvage harvest could occur after an insect, disease, fire, or other event that causes substantial amounts of mortality. Salvage would reduce the density of snags and would potentially reduce the future amount of down wood.

Even-aged Regeneration (Shelterwood/Seed Tree, Clearcut) Harvest Effects

Even-aged regeneration harvest would only occur in those stands that have generally achieved the culmination of mean annual increment (CMAI), except for those circumstances allowed under the

National Forest System Land and Resource Management Planning 1982 Rule (Sec. 219.16). CMAI is the maximum level of the average growth of a stand up to the age in question. All alternatives assume a continued deficit of old forest during the planning horizon. Therefore, shelterwood or seed tree harvests would not occur in old forest. Even-aged regeneration harvests would generally occur in mid-aged stands that are in excess of what is needed to develop old forest to meet the desired conditions for structural stages. These harvests would alter the existing stand structure, resulting in a stand initiation stage and would require reforestation with either natural regeneration or planting. This type of harvest may reduce the number of snags and down wood, but only indirectly if snags and down wood are not specifically targeted for removal. Even-aged regeneration harvests may also change fire behavior on the landscape, increase shrubs, grasses, and forbs, and increase soil temperature. This type of harvest could occur within all of the upland forest potential vegetation groups except the xeric ponderosa pine type.

Planting Effects

Planting of conifers could occur in areas that have been reduced below the minimum desired tree density by timber harvest, insects, disease, or fire. Each site would be evaluated to determine if the desired tree species may seed in naturally within the required period of time. Sites that do not have the potential to reforest naturally would be planted.

Planting would result in an increase in the percent of the landscape in the stand initiation stage and an increase in the forested land base. Planting conifer seedlings could result in a more desirable species composition.

Wildland Fire Effects

For all of the alternatives, the reintroduction of fire is vital to the health, functioning, and sustainability of the ecosystem. Fire contributes to multiple ecological functions and processes, with effects varying depending on fire intensity, severity, and frequency. Intensity, severity, and frequency are the defining factors of a fire regime. The use of both planned ignitions (prescribed fire) and unplanned ignitions (wildfire managed for resource benefits) may result in the following effects on vegetation:

Moderate to High Severity Fire Effects

- Varying levels of mortality in both overstory and understory trees, which results in reduced tree densities, decreased competition between trees for moisture, nutrients, and sunlight, and increased tree health, growth, and vigor of the residual trees.
- Creation of snags and logs, which improves wildlife habitat values.
- Restoration and/or maintenance of meadow inclusions, grasslands, and shrublands where conifers have encroached due to fire suppression/exclusion.
- Stimulation of prolific vegetative regeneration and expansion of tree species such as aspen.

Low to Moderate Severity Fire Effects

- Modified species composition, favoring more fire tolerant tree species with thicker bark (ponderosa pine, older grand fir and Douglas-fir).
- Thinning of seedlings and smaller diameter trees.
- Maintenance of historical, low- and mixed-severity fire regimes by periodic reduction of accumulated biomass and downed woody debris.

- Scorched tree bark, which can attract bark beetles and increase the risk of attack and mortality in the short-term.
- Scorched lower branches of tree crowns, thereby increasing crown base height, decreasing the potential for ground fires to transition to crown fires, and reducing fire severity.
- Favoring the spread or deterring the establishment and proliferation of noxious weeds, depending on fire frequency, severity, and timing.
- Stimulated vegetative shoot/bud initiation (provided soil moisture remains favorable) that results in a more leafy and palatable forage regrowth.
- Sanitizing effect on trees infected with dwarf mistletoe by scorching brooms in the lower crowns or by completely killing heavily infected trees.

Litter and duff can have an insulating effect on soil, which acts to lower soil temperatures and delay spring growth and herbage. Increased litter and duff can also result in decreased growing space for plants and decreased understory productivity. Fire results in reduced litter and duff accumulations. Fire, especially in combination with reduced stand densities, results in changes in the microclimate on the forest floor, specifically increased sunlight penetration, increased soil temperatures, and increased understory productivity. Fire has been shown to result in substantial increases in understory productivity and diversity. Fire is essential to nutrient cycling in fire adapted ecosystems. Fire has a fertilizer effect on the soil by increasing ammonium and nitrogen levels, resulting in increased nutrient levels in both understory and overstory vegetation. Fire rejuvenates desirable grasses, depending on the species response to disturbance. Fire may also increase seedling establishment by aiding in seed bed and site preparation. By decreasing litter and duff accumulation, fire also decreases fuel loadings in general and aids in the maintenance of lower fire severity ratings.

Within the dry upland forest potential vegetation group, tree densities may be reduced by fire, although not always in a uniform way. Low-severity fire may result in a tree arrangement consisting of clumps of trees interspersed with openings. Low severity fire is necessary to the maintenance of open, park-like stands dominated by shade intolerant species, such as ponderosa pine. Low to mixed severity fire in mixed size and multi-storied stands could favor larger diameter trees and create stands with minimal amounts of understory, which perpetuates low severity fire.

Within the moist upland forest potential vegetation group, planned and unplanned ignitions may result in mixed-severity fire events. Mixed-severity fire alternates between stand-replacing crown fires that kill all trees and nonlethal, low-intensity surface fires that leave patches of living trees. Due to complex burning patterns, this type of fire tends to create a mosaic pattern across the landscape. Large openings created by stand-replacing crown fires result in regeneration of more shade-intolerant/fire tolerant and early seral tree species.

Within the cold upland forest potential vegetation group, planned and unplanned ignitions may result in stand-replacing fire events. Stand-replacing fire events are characterized by crown fire that kills most or all of both the overstory and understory trees across large areas. Stands are regenerated in this way, resulting in an increased percent of the landscape in the stand initiation stage.

The use of mechanical fuels treatments (thinning, crushing, piling, grinding) combined with removal of fuels would reduce the total amount of woody fuel on a site and reduce the potential fire severity effects on the soil. These activities would also be designed to reduce the average

distance between ground fuels (reduced ladder fuels) and the lower crown of the trees, thereby reducing the potential for crown fire (Agee 2005). Thinning of small diameter trees in the understory could also reduce average stand density, favor early seral species, and increase the average tree diameter within a stand. These treatments could increase resiliency by increasing the probability of fire effects that are considered nonlethal, reducing moisture stress on remaining trees, and reducing the probability of certain types of insect activity.

The emphasis on treating National Forest System lands adjacent to wildland-urban interface areas would continue into the foreseeable future. The wildland-urban interface has been defined and identified through national efforts and additional wildland-urban interface would continue to be identified and refined through completion of community wildfire protection plans. Treatments in highly departed fire regime condition classes would occur in all alternatives. Effects on forest management related to unplanned ignitions do not vary widely among the alternatives. For all of the alternatives, the appropriate protection response would be taken where life or values are at risk, while meeting the desired conditions.

Effects from Each Alternative

In order to compare the effectiveness of each of the alternatives in achieving the desired conditions for forested structural stages, the amount of variation from the desired condition range was determined for each individual structural stage (stand initiation, stem exclusion, understory reinitiation, old forest single-story, and old forest multi-story). The amount of variation for each structural stage was then added together to obtain a summed total amount of variation for each alternative. This same method was used to compare the effectiveness of each of the alternatives in achieving the desired conditions for stand density and species composition.

Using the Malheur cold upland forest potential vegetation group as an example, alternative A would result in 33 percent of the potential vegetation group in the SI stage, 14 percent in the SE stage, 30 percent in the UR stage, 6 percent in the OFSS stage, and 17 percent in the OFMS stage at year 50 (see table 252). The desired conditions ranges for each structural stage are displayed in table 252. Under alternative A, the percent of the Malheur dry upland forest potential vegetation group in the SI stage (33 percent) would be within the desired condition range (20 to 45 percent) at year 50. The percent of the potential vegetation group in the SE stage (14 percent) would vary from the desired condition range (15 to 30 percent) by 1 percent at year 50. The percent of the potential vegetation group in the UR stage (30 percent) would vary from the desired condition range (10 to 25 percent) by 5 percent at year 50. The percent of the potential vegetation group in the OFSS stage (6 percent) would be within the desired condition range (5 to 20 percent) at year 50. The percent of the potential vegetation group in the OFMS stage (17 percent) would be within the desired condition range (10 to 25 percent) at year 50. All values were treated as positive, regardless of whether the structural stage fell above or below the desired condition range. If a value fell within the desired condition range, then there was no variation and a value of zero was assigned. For those stages that are outside of the desired condition ranges at year 50, the amount of variation for each structural stage was added together to obtain a summed total for each alternative. In the previous example, under alternative A, the projected percent of the cold upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 6 percent at year 50.

Forested Structural Stages Effects

Forested structural stages can be changed through a variety of mechanisms, such as insects, disease, fire, growth, wind storms, and timber harvest. The following section describes the

changes in vegetation based on both natural and human actions for each of the alternatives. The landscape composition of forested structural stages can have an effect on ecological resiliency. A landscape that contains a diversity of structural stages would be more sustainable and able to perpetuate itself through time because, as older age classes succumb to mortality, younger age classes would be available to replace them. A landscape that consists of a diversity of diameter classes would also be at decreased risk of attack from bark beetles that favor certain diameter classes. The alternatives that result in the closest achievement of the desired conditions for forested structural stages would result in forest structures that are more ecologically resilient within the particular upland forest potential vegetation group because the desired conditions are based on the HRV. By maintaining and/or restoring a forest structure similar to that which occurred and evolved prior to interruption of the historical fire regime, ecosystems would be better able to absorb disturbances while retaining the same basic structure and ways of functioning and would have a greater capacity to adapt to stress and change.

Malheur National Forest

Table 255 through table 257 display the percent of each upland forest potential vegetation group in each of the forested structural stages by alternative projected over 50 years within the Malheur National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Malheur cold upland forest potential vegetation group, very little timber harvest would occur. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group. The cold upland forest potential vegetation group in general exhibits the least amount of departure from the HRV for structural stages. The historical fire regime was characterized by infrequent fires and therefore this forest type has experienced the fewest number of missed fires.

Under alternatives D, E, and F, the projected percent of the cold upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 2 to 3 percent at year 50. Under alternatives A, B, and C, the projected percent of the cold upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 5 to 6 percent at year 50. The percent of the cold upland forest potential vegetation group in the SI stage would increase the most under alternatives D and E and would slightly exceed the desired conditions range at year 50. Under alternative F, the percent of the cold upland forest potential vegetation group in the SI stage would be within the desired conditions range at year 50. Under all of the alternatives, the percent of the cold upland forest potential vegetation group in the SE stage would increase and be within the desired conditions range at year 20. However, only alternative D would maintain the percent of the cold upland forest potential vegetation group in the SE stage within the desired conditions range at year 50. Under alternatives D, E, and F, the percent of the cold upland forest potential vegetation group in the UR stage would decrease and be within the desired conditions range at year 50. Under the other alternatives, the percent of cold upland forest potential vegetation group in the UR stage would remain above the desired conditions range.

Table 255. Forested structural stages, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/SI	20-45	24	22 (0)	33 (0)	23 (0)	37 (0)	23 (0)	36 (0)	28 (0)	48 (3)	26 (0)	46 (1)	25 (0)	42 (0)
Cold/SE	15-30	12	19 (0)	14 (1)	18 (0)	13 (2)	19 (0)	13 (2)	19 (0)	15 (0)	19 (0)	14 (1)	18 (0)	13 (2)
Cold/UR	10-25	44	30 (5)	30 (5)	29 (4)	28 (3)	30 (5)	29 (4)	27 (2)	21 (0)	28 (3)	22 (0)	28 (3)	25 (0)
Cold/OFSS	5-20	1	3 (2)	6 (0)	4 (1)	6 (0)	4 (1)	7 (0)	3 (2)	5 (0)	4 (1)	5 (0)	4 (1)	5 (0)
Cold/OFMS	10-25	20	26 (1)	17 (0)	26 (1)	17 (0)	24 (0)	16 (0)	22 (0)	12 (0)	23 (0)	13 (0)	24 (0)	14 (0)
Summed Total Amount of Variation			(8)	(6)	(6)	(5)	(6)	(6)	(4)	(3)	(4)	(2)	(4)	(2)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

While all of the alternatives would achieve the desired conditions for the percent of the cold upland forest potential vegetation group in the OFSS stage at year 50, alternative C would slightly exceed the other alternatives (by approximately 1 to 2 percent). All of the alternatives would also achieve the desired conditions for the percent of the cold upland forest potential vegetation group in the OFMS stage at year 50. However, alternatives A and B would result in the highest percent of the cold upland forest potential vegetation group in the OFMS stage at year 50, exceeding the other alternatives by approximately 1 to 5 percent. The percent of the cold upland forest potential vegetation group in the OFMS stage at year 50 would be lower than existing conditions under all of the alternatives due to mortality caused by wildfire and insects. This structural stage may be difficult to maintain within the desired condition range, especially with climate change potentially increasing the level of stand-replacing wildfire. For more information, see the cumulative effects section.

Dry Upland Forest Potential Vegetation Group – Within the Malheur dry upland forest potential vegetation group, the different alternatives would result in a substantial difference in the percent of the landscape in each of the forested structural stages because approximately 60 to 90 percent of the forest's timber harvest would occur in the dry upland forest potential vegetation group. The dry upland forest potential vegetation group, in general, exhibits the greatest amount of departure from the HRV for forested structural stages. The historical fire regime was characterized by more frequent fire; therefore this potential vegetation group has experienced the greatest number of missed fires.

Table 256. Forested structural stages, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/SI	15-30	6	7 (8)	11 (4)	10 (5)	14 (1)	9 (6)	13 (2)	12 (3)	19 (0)	12 (3)	18 (0)	10 (5)	16 (0)
Dry/SE	10-20	18	29 (9)	30 (10)	28 (8)	29 (9)	27 (7)	28 (8)	25 (5)	29 (9)	33 (13)	35 (15)	29 (9)	31 (11)
Dry/UR	0-5	54	35 (30)	26 (21)	35 (30)	35 (30)	36 (31)	28 (23)	36 (31)	20 (15)	28 (23)	16 (11)	33 (28)	23 (18)
Dry/OFSS	40-65	3	7 (33)	13 (27)	6 (34)	11 (29)	6 (34)	10 (30)	10 (30)	16 (24)	8 (32)	16 (24)	7 (33)	12 (28)
Dry/OFMS	1-15	20	22 (7)	20 (5)	22 (7)	20 (5)	22 (7)	22 (7)	18 (3)	16 (1)	19 (4)	15 (0)	21 (6)	19 (4)
Summed Total Amount of Variation			(87)	(67)	(84)	(74)	(85)	(70)	(72)	(49)	(75)	(50)	(81)	(61)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

Alternatives D and E would result in the closest achievement of the desired conditions for forested structural stages at year 50 because of the increased levels of timber harvest activities associated with these alternatives. Under alternative D, the projected percent of the dry upland forest potential vegetation group in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 49 percent. Under alternative E, the projected percent of the dry upland forest potential vegetation group in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 50 percent.

Alternatives B and C would be the least effective alternatives in achieving the desired conditions for structural stages in the Malheur dry upland forest potential vegetation group. Under alternatives B and C, the percent of the dry upland forest potential vegetation group in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 74 percent and 70 percent, respectively, at year 50.

The percent of the dry upland forest potential vegetation group in the SI stage would increase the most under alternatives D and E and would be within the desired conditions range at year 50 due to the increased levels of timber harvest activities associated with these alternatives. Under alternative F, the percent of the dry upland forest potential vegetation group in the SI stage would also be within the desired conditions range at year 50. Under all of the alternatives, the percent of the dry upland forest potential vegetation group in the SE stage would increase and exceed the desired conditions range at year 50. This would be a combined result of timber harvest activities and/or fire removing and killing smaller diameter trees within multi-storied stands. Under all of the alternatives, the percent of the dry upland forest potential vegetation group in the UR stage would decrease but would continue to exceed the desired conditions range at year 50. Alternatives D and E would result in the greatest reductions in the UR stage because of the increased levels of timber harvest activities associated with these alternatives.

None of the alternatives would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the OFSS stage by year 50 due to the large amount of variation between existing and desired conditions and the amount of time required to develop old forest. However, alternatives D and E would result in the greatest increase in the OFSS stage at year 50, exceeding other alternatives by approximately 3 to 6 percent. This would be the result of increased timber harvest activities associated with these alternatives and the conversion of OFMS to OFSS within the dry upland forest potential vegetation group. Most of the decrease in OFMS would be a shift into the OFSS stage due to timber harvest activities or fire. Only alternative E would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the OFMS stage at year 50. However, alternative D would only vary from the desired condition range by approximately 1 percent at year 50. Alternative C would result in the highest percent of the dry upland forest potential vegetation group in the OFMS stage.

Moist Upland Forest Potential Vegetation Group – Within the Malheur moist upland forest potential vegetation group, alternative D would result in the closest achievement of the desired conditions for forested structural stages at year 50. Under alternative D, the projected percent of the moist upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 28 percent at year 50. Alternative E would be the second most effective alternative in achieving the desired condition ranges for forested structural stages at year 50. Under alternative E, the projected percent of the moist upland forest potential vegetation group in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 39 percent at year 50.

Table 257. Forested structural stages, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/SI	20-30	1	3 (17)	7 (13)	4 (16)	9 (11)	4 (16)	9 (11)	8 (12)	20 (0)	6 (14)	16 (4)	4 (16)	12 (8)
Moist/SE	20-30	5	0 (20)	11 (9)	8 (12)	9 (11)	7 (13)	9 (11)	9 (11)	13 (7)	8 (12)	11 (9)	8 (12)	9 (11)
Moist/UR	15-25	41	36 (11)	41 (16)	35 (10)	41 (16)	36 (11)	43 (18)	33 (8)	32 (7)	34 (9)	36 (11)	36 (11)	40 (15)
Moist/OFSS	10-20	5	6 (14)	7 (13)	6 (4)	5 (5)	6 (4)	6 (4)	6 (4)	6 (4)	6 (4)	6 (4)	6 (4)	6 (4)
Moist/OFMS	15-20	47	47 (27)	34 (14)	47 (27)	35 (15)	47 (27)	35 (15)	44 (24)	30 (10)	46 (26)	31 (11)	47 (27)	33 (13)
Summed Total Amount of Variation			(89)	(65)	(69)	(58)	(71)	(59)	(59)	(28)	(65)	(39)	(70)	(51)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

Alternatives C and B would be the least effective alternatives in achieving the desired conditions for structural stages in the moist upland forest potential vegetation group. Under alternatives C and B, the percent of the moist upland forest potential vegetation group in each of the structural

stages would vary from the desired condition ranges by a summed total of approximately 59 percent and 58 percent, respectively, at year 50.

The percent of the moist upland forest potential vegetation group in the SI stage would increase the most under alternative D and would be within the desired conditions range at year 50 due to the increased levels of timber harvest activities associated with this alternative. Under alternative E, the percent of the moist upland forest potential vegetation group in the SI stage would also increase substantially but would remain slightly below the desired conditions range at year 50. Under all of the alternatives, the percent of the moist upland forest potential vegetation group in the SE stage would increase due to a combined result of timber harvest activities and/or fire removing and killing smaller diameter trees within multi-storied stands. However, the percent of the moist upland forest potential vegetation group in the SE stage would remain below the desired conditions range at year 50. Alternatives D and E would result in the greatest increases in the percent of the moist upland forest potential vegetation group in the SE stage. Alternatives D and E would result in the greatest reductions in the UR stage in the moist upland forest potential vegetation group because of the increased levels of timber harvest associated with these alternatives but would continue to exceed the desired conditions range at year 50.

None of the alternatives would achieve the desired conditions for the percent of the moist upland forest potential vegetation group in the OFSS or OFMS stages by year 50. Under all of the alternatives, the percent of the potential vegetation group in the OFMS stage would decrease from existing conditions to year 50 due to mortality caused by insects, disease, and fire. Alternatives D and E would come closest to achieving the desired conditions for the percent of the moist upland forest potential vegetation group in the OFMS stage at year 50.

Umatilla National Forest

Table 258 through table 260 display the percent of each upland forest potential vegetation group in each of the forested structural stages by alternative projected over 50 years within the Umatilla National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Umatilla cold upland forest potential vegetation group, very little timber harvest would occur. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within this potential vegetation group. The cold upland forest potential vegetation group in general exhibits the least amount of departure from the HRV for structural stages. The historical fire regime was characterized by infrequent fires and therefore this forest type has experienced the fewest number of missed fires.

Under alternatives A, B, and C, the projected percent of the cold upland forest potential vegetation group in each of the forested structural stages would be within the desired condition ranges at year 50, and alternatives D, E, and F would only vary from the desired condition ranges by a summed total of approximately 1 to 5 percent at year 50.

The percent of the cold upland forest potential vegetation group in the SI stage would increase the most under alternatives D, E, and F and would slightly exceed the desired condition range at year 50. Under alternatives A, B, and C, the percent of the cold upland forest potential vegetation group in the SI stage would be within the desired condition range at year 50. Under all of the alternatives, the percent of the cold upland forest potential vegetation group in the SE stage would increase at year 20 and be slightly above the desired condition range, but would then decrease and

be within the desired condition range at year 50. Under all of the alternatives, the percent of the cold upland forest potential vegetation group in the UR stage would remain within the desired condition range at year 50.

Table 258. Forested structural stages, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/SI	20-45	30	28 (0)	43 (0)	28 (0)	45 (0)	28 (0)	45 (0)	31 (0)	49 (4)	29 (0)	46 (1)	29 (0)	46 (1)
Cold/SE	15-30	21	31 (1)	19 (0)	31 (1)	19 (0)	31 (1)	18 (0)	31 (1)	21 (0)	31 (1)	22 (0)	31 (1)	19 (0)
Cold/UR	10-25	18	20 (0)	20 (0)	20 (0)	19 (0)	20 (0)	19 (0)	18 (0)	13 (0)	19 (0)	16 (0)	20 (0)	18 (0)
Cold/OFSS	5-20	0	2 (3)	7 (0)	2 (3)	7 (0)	2 (3)	8 (0)	2 (3)	7 (0)	2 (3)	7 (0)	2 (3)	7 (0)
Cold/OFMS	10-25	30	20 (0)	11 (0)	19 (0)	11 (0)	19 (0)	10 (0)	18 (0)	9 (1)	18 (0)	9 (1)	19 (0)	10 (0)
Summed Total Amount of Variation			(4)	(0)	(4)	(0)	(4)	(0)	(4)	(5)	(4)	(2)	(4)	(1)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

While all of the alternatives would achieve the desired condition for the percent of the cold upland forest potential vegetation group in the OFSS stage at year 50, alternative C would exceed the other alternatives by approximately 1 percent. All of the alternatives would also achieve the desired conditions for the percent of the cold upland forest potential vegetation group in the OFMS stage at year 20. However, the percent of the cold upland forest potential vegetation group in the OFMS stage would decrease from existing conditions to year 50 under all of the alternatives due to mortality caused by wildfire and insects. This structural stage may be difficult to maintain within the desired condition range, especially with climate change potentially increasing the level of stand-replacing wildfire. For more information, see the cumulative effects section.

Dry Upland Forest Potential Vegetation Group – Within the Umatilla dry upland forest potential vegetation group, the alternatives would result in a substantial difference in the percent of the dry upland forest potential vegetation group in each of the forested structural stages because more timber harvest would occur this potential vegetation group. Approximately 60 to 90 percent of the harvest activities would occur within the dry upland forest potential vegetation group. Additionally, the dry upland forest potential vegetation group in general exhibits the greatest amount of departure from the HRV for structural stages. The historical fire regime was characterized by more frequent fire; therefore; this potential vegetation group has experienced the greatest number of missed fires.

Table 259. Forested structural stages, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/SI	15-30	12	11 (4)	12 (3)	13 (2)	17 (0)	11 (4)	14 (1)	16 (0)	21 (0)	17 (0)	21 (0)	14 (1)	18 (0)
Dry/SE	10-20	26	39 (19)	41 (21)	37 (17)	40 (20)	36 (16)	38 (18)	40 (20)	41 (21)	40 (20)	43 (23)	38 (18)	40 (20)
Dry/UR	0-5	50	31 (26)	21 (16)	32 (27)	21 (16)	35 (30)	25 (20)	26 (21)	16 (11)	26 (21)	14 (9)	30 (25)	19 (14)
Dry/OFSS	40-65	4	7 (33)	15 (25)	7 (33)	12 (28)	6 (34)	11 (29)	9 (31)	14 (26)	8 (32)	15 (25)	7 (33)	13 (27)
Dry/OFMS	1-15	8	11 (0)	10 (0)	11 (0)	10 (0)	12 (0)	12 (0)	9 (0)	8 (0)	10 (0)	7 (0)	10 (0)	9 (0)
Summed Total Amount of Variation			(82)	(65)	(79)	(64)	(84)	(68)	(72)	(58)	(73)	(57)	(77)	(61)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

Alternatives E and D would result in the closest achievement of the desired conditions for forested structural stages at year 50 due to the increased levels of timber harvest activities associated with these alternatives. Under alternative E, the projected percent of the dry upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 57 percent at year 50. Under alternative D, the projected percent of the dry upland forest potential vegetation group in each of the forest structural stages would vary from the desired condition ranges by a summed total of approximately 58 percent at year 50.

Alternative C would be the least effective alternative in achieving the desired conditions for forested structural stages in the dry upland forest potential vegetation group due to the decreased levels of timber harvest activities associated with this alternative. Under alternative C, the percent of the dry upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 68 percent at year 50.

The percent of the dry upland forest potential vegetation group in the SI stage would increase the most under alternatives D and E and would be within the desired condition range at year 50 due to the increased levels of timber harvest associated with these alternatives. Under alternatives B and F, the percent of the dry upland forest potential vegetation group in the SI stage would also be within the desired condition range at year 50. Under all of the alternatives, the percent of the dry upland forest potential vegetation group in the SE stage would increase and exceed the desired conditions range at year 50 due to a combined result of timber harvest activities and/or fire removing and killing smaller diameter trees within multi-storied stands. Under all of the alternatives, the percent of the dry upland forest potential vegetation group in the UR stage would decrease but would continue to exceed the desired conditions range at year 50. Alternatives D and E would result in the greatest reductions in the dry upland forest potential vegetation group UR

stage because of the increased levels of timber harvest activities associated with these alternatives.

None of the alternatives would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the OFSS stage by year 50 due to the large variation between existing and desired conditions and the amount of time required to develop old forest. However, alternatives A, D, and E would result in the greatest increase in the OFSS stage in the dry upland forest potential vegetation group at year 50, exceeding other alternatives by approximately 1 to 4 percent. Alternatives D and E would result in increased timber harvest activities and the conversion of OFMS to OFSS within the dry upland forest potential vegetation group. Most of the decrease in the OFMS stage would be a shift into the OFSS stage by timber harvest or fire. All of the alternatives would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the OFMS stage at years 20 and 50.

Moist Upland Forest Potential Vegetation Group – Within the Umatilla moist upland forest potential vegetation group, alternative E would result in the closest achievement of the desired conditions for forested structural stages at year 50. Under alternative E, the projected percent of the moist upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 21 percent at year 50. Alternative D would be the second most effective alternative in achieving the desired conditions for forested structural stages, within the moist upland forest potential vegetation group at year 50. Under alternative D, the projected percent of the moist upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 26 percent at year 50.

Table 260. Forested structural stages, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/SI	20-30	9	7 (13)	8 (12)	8 (12)	11 (9)	8 (12)	9 (11)	11 (9)	17 (3)	10 (20)	16 (4)	9 (11)	12 (8)
Moist/SE	20-30	10	14 (6)	18 (2)	13 (7)	16 (4)	14 (6)	16 (4)	14 (6)	20 (0)	14 (6)	17 (3)	14 (6)	16 (4)
Moist/UR	15-25	26	27 (2)	36 (11)	27 (2)	36 (11)	27 (2)	37 (12)	25 (0)	8 (7)	25 (0)	30 (5)	26 (1)	34 (9)
Moist/OFSS	10-20	23	15 (0)	9 (1)	14 (0)	8 (2)	16 (0)	10 (0)	15 (0)	28 (8)	16 (0)	9 (1)	15 (0)	9 (1)
Moist/OFMS	15-20	32	37 (17)	29 (9)	37 (17)	29 (9)	37 (17)	29 (9)	36 (16)	28 (8)	35 (15)	28 (8)	36 (16)	28 (8)
Summed Total Amount of Variation			(38)	(35)	(38)	(35)	(37)	(36)	(31)	(26)	(41)	(21)	(34)	(30)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

Alternatives A, B, and C would be the least effective alternatives in achieving the desired conditions for forested structural stages within the moist upland forest potential vegetation group. Under alternatives A, B, and C, the percent of the moist upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 35 to 36 percent at year 50.

Alternatives D and E would result in the greatest increase in the percent of the moist upland forest potential vegetation group in the SI stage due to increased levels of timber harvest activities associated with these alternatives. However, the percent of the moist upland forest potential vegetation group in the SI stage would continue to be below the desired condition range at year 50. Alternative D would result in the greatest increase in the percent of the moist upland forest potential vegetation group in the SE stage and would achieve the desired conditions at year 50. This would be the result of timber harvest activities removing smaller diameter trees within multi-storied stands. Alternative D would result in the greatest reduction in the moist upland forest potential vegetation group UR stage and would achieve the desired conditions at year 50 because of the increased levels of timber harvest activities associated with this alternative.

All of the alternatives would achieve the desired conditions for the percent of the moist upland forest potential vegetation group in the OFSS stage at year 20. However, with all the alternatives except alternative D, the percent of the moist upland forest potential vegetation group in the OFSS stage would continue to decrease between years 20 and 50 due to mortality caused by insects and fire. Under alternative D, the percent of the moist upland forest potential vegetation group in the OFSS stage would increase to approximately 28 percent at year 50 and exceed the desired condition range. This would be the result of increased timber harvest activities associated with this alternative, which would result in more open stand densities, improved forest health, and decreased fire severity. The alternatives would not result in a substantial difference in the percent of the moist upland forest potential vegetation group in the OFMS stage. Under all of the alternatives, the percent of the potential vegetation group in the OFMS stage would be slightly lower than existing conditions at year 50 due to mortality from fire, insects, and disease. However, all of the alternatives would exceed the desired condition range for the percent of the moist upland forest potential vegetation group in the OFMS stage at year 50.

Wallowa-Whitman National Forest

Table 261 through table 263 display the percent of each upland forest potential vegetation group in each of the forested structural stages by alternative projected over 50 years within the Wallowa-Whitman National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman, very little timber harvest would occur. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within this potential vegetation group. The cold upland forest potential vegetation group in general exhibits the least amount of departure from the HRV for structural stages. The historical fire regime was characterized by infrequent fire; therefore this forest type has experienced the fewest number of missed fires.

Table 261. Forested structural stages, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/SI	20-45	14	20 (0)	33 (0)	21 (0)	34 (0)	20 (0)	33 (0)	22 (0)	36 (0)	21 (0)	35 (0)	21 (0)	34 (0)
Cold/SE	15-30	10	14 (1)	10 (5)	14 (1)	10 (5)	14 (1)	10 (5)	14 (1)	11 (4)	14 (1)	11 (4)	14 (1)	10 (5)
Cold/UR	10-25	41	35 (10)	32 (7)	35 (10)	34 (9)	36 (11)	32 (7)	34 (9)	28 (3)	34 (9)	29 (4)	35 (10)	31 (6)
Cold/OFSS	5-20	1	3 (2)	5 (0)	3 (2)	5 (0)	3 (2)	5 (0)	3 (2)	5 (0)	3 (2)	5 (0)	3 (2)	5 (0)
Cold/OFMS	10-25	34	27 (2)	20 (0)	28 (3)	20 (0)	27 (2)	20 (0)	27 (2)	20 (0)	27 (2)	20 (0)	27 (2)	20 (0)
Summed Total Amount of Variation			(15)	(12)	(16)	(14)	(16)	(12)	(14)	(7)	(14)	(8)	(15)	(11)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

Under alternatives D and E, the projected percent of the cold upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 7 percent and 8 percent, respectively, at year 50.

Alternative B would be the least effective in achieving the desired conditions for forested structural stages in the cold upland forest potential vegetation group. Under alternative B, the percent of the cold upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 14 percent at year 50.

The percent of the cold upland forest potential vegetation group in the SI stage would increase the most under alternatives D and E. However, all of the alternatives would achieve the desired conditions for the percent of the cold upland forest potential vegetation group in the SI stage at year 50. Under all of the alternatives, the percent of the cold upland forest potential vegetation group in the SE stage would increase at year 20, but would then decrease and be below the desired conditions range at year 50. Alternatives D and E would come closest to achieving the desired conditions for the percent of the cold upland forest potential vegetation group in the UR stage at year 50, but would remain slightly above the desired condition range.

All of the alternatives would achieve the desired conditions for the percent of the cold upland forest potential vegetation group in the OFSS and OFMS stages at year 50. The percent of the cold upland forest potential vegetation group in the OFMS stage would decrease from existing conditions to year 50 under all of the alternatives due to mortality caused by wildfire, insects, and disease. This structural stage may be difficult to maintain within the desired condition range, especially with climate change potentially increasing the level of stand-replacing wildfire. For more information, see the cumulative effects section.

Dry Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman dry upland forest potential vegetation group, the alternatives would result in a substantial difference in the percent of dry upland forest potential vegetation group in each of the forested structural stages because approximately 60 to 90 percent of the timber harvest activities would occur in this potential vegetation group. The dry upland forest potential vegetation group in general exhibits the greatest amount of departure from the HRV for forested structural stages. The historical fire regime was characterized by more frequent fire; therefore this potential vegetation group has experienced the greatest number of missed fires.

Table 262. Forested structural stages, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/SI	15-30	14	11 (4)	12 (3)	13 (2)	15 (0)	12 (3)	14 (1)	16 (0)	18 (0)	16 (0)	19 (0)	14 (1)	17 (0)
Dry/SE	10-20	16	37 (17)	44 (24)	35 (15)	42 (22)	34 (14)	39 (19)	36 (16)	43 (23)	39 (19)	46 (26)	36 (16)	43 (23)
Dry/UR	0-5	54	34 (29)	25 (20)	34 (29)	25 (20)	37 (32)	29 (24)	31 (26)	19 (14)	28 (23)	16 (11)	33 (28)	22 (17)
Dry/OFSS	40-65	1	4 (36)	9 (31)	4 (36)	8 (32)	4 (36)	7 (33)	6 (34)	11 (29)	5 (35)	11 (29)	4 (36)	9 (31)
Dry/OFMS	1-15	14	13 (0)	11 (0)	13 (0)	11 (0)	14 (0)	12 (0)	11 (0)	8 (0)	11 (0)	8 (0)	13 (0)	9 (0)
Summed Total Amount of Variation			(86)	(78)	(82)	(74)	(85)	(77)	(76)	(66)	(77)	(66)	(81)	(71)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

Alternatives D and E most closely achieve the desired conditions for forested structural stages at year 50. Under alternatives D and E, the projected percent of the dry upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 66 percent at year 50.

Alternatives A and C would be the least effective alternatives in achieving the desired conditions for forested structural stages in the Wallowa-Whitman dry upland forest potential vegetation group. Under alternatives A and C, the percent of the dry upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 78 percent and 77 percent, respectively, at year 50.

The percent of the dry upland forest potential vegetation group in the SI stage would increase the most under alternatives D and E and would be within the desired condition range at year 50 due to the increased levels of timber harvest activities associated with these alternatives. Under alternatives B and F, the percent of the dry upland forest potential vegetation group in the SI stage would also be within the desired condition range at year 50. Under all of the alternatives, the percent of the dry upland forest potential vegetation group in the SE stage would increase and

exceed the desired condition range at year 50 due to a combined result of timber harvest activities and/or fire removing and killing smaller diameter trees within multi-storied stands. Alternative C would most closely achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the SE stage because this alternative would result in the fewest number of acres of timber harvest and the smallest percent increase in the SE stage. Under all of the alternatives, the percent of the dry upland forest potential vegetation group in the UR stage would decrease, but would continue to exceed the desired condition range at year 50. This would be due to the large amount of variation between the existing and desired conditions. Alternatives D and E would result in the greatest reductions in the UR stage because of the increased levels of timber harvest activities associated with these alternatives.

None of the alternatives would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in the OFSS stage by year 50 due to the large amount of variation between existing and desired conditions and the amount of time required to develop old forest. However, alternatives D and E would result in the greatest increase in the OFSS stage within the dry upland forest potential vegetation group at year 50, exceeding other alternatives by approximately 2 to 4 percent. Alternatives D and E would result in increased timber harvest activities, which would convert more of the OFMS to OFSS stage. All of the alternatives would achieve the desired conditions for the percent of the dry upland forest potential vegetation group in OFMS stage at years 20 and 50. Most of the decrease in the OFMS stage would be a shift into the OFSS stage as the result of timber harvest activities or fire.

Moist Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman moist upland forest potential vegetation group, alternatives D and E would most closely achieve the desired conditions for forested structural stages at year 50. Under alternatives D and E, the projected percent of the moist upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 12 percent and 14 percent, respectively, at year 50.

Alternatives A and C would be the least effective alternatives in achieving the desired conditions for forested structural stages within the moist upland forest potential vegetation group. Under alternatives A and C, the percent of the moist upland forest potential vegetation group in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 32 percent at year 50.

Alternatives D and E would result in the greatest increase in the percent of the moist upland forest potential vegetation group in the SI stage due to the increased levels of timber harvest activities associated with these alternatives. Under alternative D, the percent of the moist upland forest potential vegetation group in the SI stage would be within the desired condition range at year 50. Alternative E would be slightly below the desired condition range at year 50. Because of timber harvest activities removing smaller diameter trees within multi-storied stands, alternative D would result in the greatest increase in the percent of the moist upland forest potential vegetation group in the SE stage and would achieve the desired conditions at year 50. However, all of the alternatives would achieve the desired condition for the percent of the moist upland forest potential vegetation group in the SE stage at year 50. Alternative D would result in the greatest reduction in the UR stage because of the increased levels of timber harvest activities associated with this alternative, but would continue to exceed the desired condition range at year 50 due to the large amount of variation between existing and desired conditions. Alternative C would result in the highest amount of variation from desired conditions for the percent of the moist upland

forest potential vegetation group in the UR stage at year 50 due to decreased levels of timber harvest activities associated with this alternative.

Table 263. Forested structural stages, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Structural Stage	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/SI	20-30	12	9 (11)	10 (10)	10 (10)	13 (7)	10 (10)	12 (8)	14 (6)	22 (0)	13 (7)	19 (1)	11 (9)	16 (4)
Moist/SE	20-30	11	20 (0)	23 (0)	19 (1)	21 (0)	18 (2)	20 (0)	21 (0)	26 (0)	21 (0)	23 (0)	19 (1)	21 (0)
Moist/UR	15-25	50	44 (19)	43 (18)	44 (19)	43 (18)	45 (20)	45 (20)	40 (15)	32 (7)	40 (15)	35 (10)	43 (18)	40 (15)
Moist/OFSS	10-20	1	4 (6)	6 (4)	3 (7)	5 (5)	4 (6)	6 (4)	3 (7)	5 (5)	5 (5)	7 (3)	4 (6)	6 (4)
Moist/OFMS	15-20	25	23 (3)	17 (0)	23 (3)	17 (0)	23 (3)	17 (0)	22 (2)	15 (0)	21 (1)	16 (0)	22 (2)	17 (2)
Summed Total Amount of Variation			(39)	(32)	(40)	(30)	(41)	(32)	(30)	(12)	(28)	(14)	(36)	(25)

PVG = potential vegetation group; DC = desired condition; EC = existing condition; SI = stand initiation; SE = stem exclusion; UR = understory reinitiation; OFSS = old forest single story; OFMS = old forest multi-story

Alternative E would result in the greatest percent of the moist upland forest potential vegetation group in the OFSS stage at year 50, but would be slightly below the desired condition range. Under all of the alternatives, the percent of the potential vegetation group in the OFMS stage would be lower than existing conditions at year 50 due to mortality caused by fire, insects, and disease. However, all of the alternatives would achieve the desired condition for the percent of the moist upland forest potential vegetation group in the OFMS stage at year 50.

Species Composition Effects

The alternatives that result in the closest achievement of the desired conditions for species composition would result in vegetation that is more ecologically resilient within the particular upland forest potential vegetation group because the desired conditions are based on the HRV. By maintaining and/or restoring the balance of shade tolerant/intolerant/mixed tolerance species that occurred and evolved on a site prior to interruption of the historical fire regime, species would be better adapted to temperature, moisture, and disturbance regimes.

Malheur National Forest

Table 264, table 265, and table 266 display species composition as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Malheur National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Malheur cold upland forest potential vegetation group, none of the alternatives would achieve the desired conditions for species composition. This is because very little timber harvest would occur in the cold upland

forest potential vegetation group. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within this potential vegetation group.

Under alternatives B, C, E, and F, the projected percent of the cold upland forest potential vegetation group in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 23 percent. Under alternatives A and D, the projected percent of the cold upland forest potential vegetation group in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 24 percent and 25 percent, respectively, at year 50.

Table 264. Forested species composition, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/ shade intolerant	40-60	63	61 (1)	61 (1)	62 (2)	62 (2)	61 (1)	61 (1)	63 (3)	67 (7)	63 (3)	65 (5)	62 (2)	63 (3)
Cold/ mixed tolerance	5-20	31	30 (10)	29 (9)	30 (10)	27 (7)	30 (10)	28 (8)	28 (8)	23 (3)	28 (8)	24 (4)	28 (8)	26 (6)
Cold/ shade tolerant	25-50	7	9 (16)	11 (14)	9 (16)	11 (14)	9 (16)	11 (14)	9 (16)	10 (15)	9 (16)	11 (14)	9 (16)	11 (14)
Summed Total Amount of Variation			(27)	(24)	(28)	(23)	(27)	(23)	(27)	(25)	(27)	(23)	(26)	(23)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Under all of the alternatives:

- the projected percent of the cold upland forest potential vegetation group in shade intolerant species would range from approximately 61 to 67 percent at year 50, exceeding the desired conditions range of 40 to 60 percent.
- the percent of the cold upland forest potential vegetation group in mixed tolerance species would range from approximately 23 to 29 percent at year 50, exceeding the desired condition range of 5 to 20 percent.
- the percent of the cold upland forest potential vegetation group in shade tolerant species would range from approximately 10 to11 percent at year 50, falling below the desired condition range of 25 to 50 percent.
- species composition tolerance classes would remain slightly outside the HRV/desired conditions ranges at year 50, which may result in decreased ecological resiliency within the cold upland forest potential vegetation group.

Species composition tolerance classes would remain slightly outside the desired conditions ranges at year 50, which may result in decreased ecological resiliency within the cold upland forest potential vegetation group. Species may be less suited to temperature, moisture, and fire regimes and insects and diseases within the cold upland forest potential vegetation group and therefore experience increased levels of mortality related to insects, disease, fire, and moisture stress.

Dry Upland Forest Potential Vegetation Group – Within the Malheur National Forest dry upland forest potential vegetation group, alternative D would achieve the desired conditions for species composition at year 50. Alternative E would be the second most effective alternative in achieving the desired conditions for species composition, with the projected percent of the dry upland forest potential vegetation group in each of the species composition tolerance classes varying from the desired condition ranges by a summed total of approximately 2 percent at year 50. Alternatives D and E would most closely achieve desired conditions for species composition in the dry upland forest potential vegetation group due to the increased level of timber harvest associated with these alternatives. Under alternatives D and E, the percent of the dry upland forest potential vegetation group in shade intolerant species classes would be approximately 80 percent and 78 percent, respectively, at year 50. The higher percent of the dry upland forest potential vegetation group in shade intolerant species would result in improved ecological resilience. Shade intolerant tree species such as ponderosa pine tend to have thicker bark and are better adapted to frequent fire regimes. Ponderosa pine also self-prune their lower branches, which increases their crown base height, increases the wind speed required to initiate a crown fire, and results in decreased fire severity. Ponderosa pine is also more drought tolerant, making it better adapted to moisture stress and drier conditions. Species that better withstand moisture stress are also less susceptible to attack by bark beetles because of natural defense mechanisms, such as the production of pitch.

Table 265. Forested species composition, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/ shade intolerant	75-90	76	75 (0)	74 (1)	75 (0)	75 (0)	75 (0)	73 (2)	77 (0)	80 (0)	77 (0)	78 (0)	76 (0)	76 (0)
Dry/ shade tolerant	5-20	24	25 (5)	26 (6)	25 (5)	25 (5)	26 (6)	28 (8)	23 (3)	20 (0)	23 (3)	22 (2)	24 (4)	24 (4)
Summed Total Amount of Variation			(5)	(7)	(5)	(5)	(6)	(10)	(3)	(0)	(3)	(2)	(4)	(4)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternative C would be the least effective alternative in achieving the desired conditions for species composition, with the projected percent of the dry upland forest potential vegetation group in each of the species composition tolerance classes varying from the desired condition ranges by a summed total of approximately 10 percent at year 50. Alternative C would exhibit a lower percent of shade intolerant species and a higher percent of shade tolerant species classes in the dry upland forest potential vegetation group at year 50. Under alternative C, the projected percent of the dry upland forest potential vegetation group in shade intolerant species would be approximately 73 percent at year 50, while the shade tolerant species would be approximately 28 percent at year 50. The decreased levels of timber harvest activities associated with alternative C would result in more closed canopy stand conditions and increased regeneration of shade tolerant tree species.

Under alternatives A, B, C, E, and F, the projected percent of the dry upland forest potential vegetation group in shade tolerant species would range from approximately 22 to 28 percent at

year 50, exceeding the desired conditions range of 5 to 20 percent. The higher percent of the dry upland forest potential vegetation group in shade tolerant species would result in decreased ecological resilience. Shade tolerant tree species such as grand fir tend to have thinner bark, are less able to withstand fire, and are less adapted to frequent fire regimes. Shade tolerant tree species also tend to retain their lower branches, which decreases their crown base height, decreases the wind speed required to initiate a crown fire, and results in increased fire severity. Shade tolerant tree species such as grand fir also tend to be less drought-tolerant, making them more prone to moisture stress and less adapted to drier site conditions. Species that are more prone to moisture stress are also more susceptible to attack by insects such as bark beetles because of a lack of natural defense mechanisms, such as the production of pitch.

Moist Upland Forest Potential Vegetation Group – Within the Malheur National Forest moist upland forest potential vegetation group, alternative D would result in the closest achievement of desired conditions for species composition. Under alternative D, the projected percent of the moist upland forest potential vegetation group in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 48 percent at year 50. Alternative E would be the second most effective alternative in achieving the desired conditions for species composition, with the projected percent of the moist upland forest potential vegetation group in each of the species composition tolerance classes varying from desired condition ranges by a summed total of approximately 51 percent at year 50. Alternatives D and E would result in the closest achievement of desired conditions for species composition in the moist upland forest potential vegetation group because the increased levels of timber harvest associated with these alternatives would result in more open stand densities and regeneration of more shade intolerant tree species. With alternatives D and E, the percent of the moist upland forest potential vegetation group in shade intolerant species would increase by approximately 5 percent and 3 percent, respectively, over 50 years as the result of regeneration harvests and other timber harvest activities. Under alternatives D and E, the projected percent of the moist upland forest potential vegetation group in shade intolerant species would be approximately 26 percent and 24 percent, respectively, at year 50, falling below the desired condition range of 30 to 60 percent.

Table 266. Forested species composition, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/ shade intolerant	30-60	21	20 (10)	20 (10)	20 (10)	21 (9)	20 (10)	21 (9)	21 (9)	26 (4)	21 (9)	24 (6)	21 (9)	22 (8)
Moist/ mixed tolerance	20-40	6	8 (12)	11 (9)	8 (12)	10 (10)	8 (12)	10 (10)	8 (12)	10 (10)	9 (11)	11 (9)	8 (12)	10 (10)
Moist/ shade tolerant	10-30	73	71 (41)	69 (39)	71 (41)	69 (39)	72 (42)	69 (39)	70 (40)	64 (34)	71 (41)	66 (36)	71 (41)	68 (38)
Summed Total Amount of Variation			(63)	(58)	(63)	(58)	(64)	(58)	(61)	(48)	(61)	(51)	(62)	(56)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternatives A, B, and C would be the least effective alternatives in achieving the desired conditions for species composition, with the projected percent of the moist upland forest potential vegetation group in each of the species composition tolerance classes varying from desired condition ranges by a summed total of approximately 58 percent at year 50. Under alternatives A, B, and C, the projected percent of the moist upland forest potential vegetation group in shade intolerant species would range from approximately 20 percent to 21 percent at year 50, falling below the desired condition range of 30 to 60 percent.

Under all of the alternatives, the percent of the moist upland forest potential vegetation group in shade tolerant species would range from approximately 64 to 69 percent at year 50, exceeding the desired condition range of 10 to 30 percent. The high percent of the moist upland forest potential vegetation group in shade tolerant species would result in decreased ecological resiliency. Shade tolerant tree species tend to be less able to withstand fire due to thinner bark. These species also tend to retain their lower branches, which decreases their crown base height, decreases the wind speed required to initiate a crown fire, and results in increased fire severity. Shade tolerant tree species also tend to be less drought tolerant, making them less able to withstand moisture stress and more susceptible to attack by insects such as bark beetles because of a lack of natural defense mechanisms, such as the production of pitch.

Umatilla National Forest

Table 267, table 268, and table 269 display species composition as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Umatilla National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Umatilla cold upland forest potential vegetation group, none of the alternatives would completely achieve the desired conditions for species composition because very little timber harvest would occur in this potential vegetation group. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities for this forest would occur within the cold upland forest potential vegetation group.

Table 267. Forested species composition, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/ shade intolerant	40-60	70	66 (6)	66 (6)	66 (6)	66 (6)	67 (7)	66 (6)	67 (7)	68 (8)	67 (7)	67 (7)	67 (7)	67 (7)
Cold/ mixed tolerance	5-20	10	13 (0)	15 (0)	13 (0)	15 (0)	13 (0)	15 (0)	12 (0)	13 (0)	13 (0)	14 (0)	13 (0)	14 (0)
Cold/ shade tolerant	25-50	20	21 (4)	19 (6)	21 (4)	19 (6)	20 (5)	19 (6)	20 (5)	19 (6)	20 (5)	19 (6)	20 (5)	19 (6)
Summed Total Amount of Variation			(10)	(12)	(10)	(12)	(12)	(12)	(12)	(14)	(12)	(13)	(12)	(13)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Under alternatives A, B, and C, the projected percent of the cold upland forest potential vegetation group in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 12 percent. Under alternatives D, E, and F, the percent in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 14 percent, 13 percent, and 13 percent, respectively, at year 50. Under all of the alternatives:

- the projected percent of the cold upland forest potential vegetation group in shade intolerant species would range from approximately 66 to 68 percent at year 50, exceeding the desired conditions range of 40 to 60 percent.
- the projected percent of the cold upland forest potential vegetation group in mixed tolerance species would range from approximately 13 to 15 percent at year 50, which would be within the desired conditions range of 5 to 20 percent.
- the projected percent of the cold upland forest potential vegetation group in shade tolerant species would be approximately 19 percent, falling below the desired conditions range of 25 percent to 50 percent.
- species composition tolerance classes would remain slightly outside the HRV/desired conditions ranges at year 50, which may result in decreased ecological resiliency within the cold upland forest potential vegetation group.

Species composition tolerance classes would remain slightly outside the desired conditions ranges at year 50, which may result in decreased ecological resiliency within the cold upland forest potential vegetation group. Species may be less suited to temperature, moisture, and fire regimes and insects and diseases within the cold upland forest potential vegetation group and therefore experience increased levels of mortality related to insects, disease, fire, and moisture stress.

Dry Upland Forest Potential Vegetation Group – Within the Umatilla dry upland forest potential vegetation group, alternatives D and E would result in the closest achievement of the desired conditions for species composition at year 50, with the projected percent of the dry upland forest potential vegetation group varying from the desired conditions ranges by a summed total of approximately 19 percent and 31 percent, respectively, at year 50. Alternatives D and E would most closely achieve the desired conditions for species composition in the dry upland forest potential vegetation group due to the increased level of timber harvest associated with these alternatives. Under Alternatives D and E, the projected percent of the dry upland forest potential vegetation group in shade intolerant species would be approximately 68 percent and 62 percent, respectively, at year 50, falling below the desired conditions range of 75 to 90 percent. The higher percent of the dry upland forest potential vegetation group in shade intolerant species would result in improved ecological resilience, compared to the other alternatives. Shade intolerant tree species such as ponderosa pine tend to have thicker bark and are better adapted to frequent fire regimes. Ponderosa pine also self-prune their lower branches, which increases their crown base height, increases the wind speed required to initiate a crown fire, and results in decreased fire severity. Ponderosa pine is also more drought tolerant, making them better adapted to moisture stress and drier conditions. Species that better withstand moisture stress are also less susceptible to attack by bark beetles because of natural defense mechanisms, such as the production of pitch.

Table 268. Forested species composition, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/ shade intolerant	75-90	45	50 (25)	55 (20)	50 (25)	56 (19)	47 (28)	48 (27)	56 (19)	68 (7)	53 (22)	62 (13)	50 (25)	58 (17)
Dry/ shade tolerant	5-20	55	50 (30)	45 (25)	50 (30)	44 (24)	54 (34)	52 (32)	44 (24)	32 (12)	47 (27)	38 (18)	50 (30)	42 (22)
Summed Total Amount of Variation			(55)	(45)	(55)	(43)	(62)	(59)	(43)	(19)	(49)	(31)	(55)	(39)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Under the other alternatives, the projected percent of the dry upland forest potential vegetation group in shade tolerant species would range from approximately 42 to 52 percent at year 50, exceeding the desired conditions range of 5 to 20 percent. Alternative C would be the least effective alternative in achieving the desired conditions for species composition, with the projected percent of the dry upland forest potential vegetation group in each of the species composition tolerance classes varying from the desired condition ranges by a summed total of approximately 59 percent at year 50. Alternative C would exhibit a lower percent of shade intolerant species classes and a higher percent of shade tolerant species classes at year 50. The projected percent of the dry upland forest potential vegetation group in shade intolerant species would be approximately 48 percent at year 50, while the shade tolerant species would be approximately 52 percent at year 50. This would be due to the decreased levels of timber harvest activities associated with alternative C resulting in more closed canopy stand conditions and regeneration of more shade tolerant tree species. A higher percent of the dry upland forest potential vegetation group in shade tolerant species would result in decreased ecological resilience. Shade tolerant tree species such as grand fir tend to have thinner bark, are less able to withstand fire, and are less adapted to frequent fire regimes. Shade tolerant tree species also tend to retain their lower branches, which decreases their crown base height, decreases the wind speed required to initiate a crown fire, and results in increased fire severity. Shade-tolerant tree species such as grand fir also tend to be less drought-tolerant, making them more prone to moisture stress and less adapted to drier conditions. Species that are more prone to moisture stress are also more susceptible to attack by insects such as bark beetles because of a lack of natural defense mechanisms, such as the production of pitch.

Moist Upland Forest Potential Vegetation Group – Within the Umatilla National Forest moist upland forest potential vegetation group, alternatives D and E would most closely achieve the desired conditions for species composition, with the projected percent of species composition tolerance classes varying from the desired condition ranges by a summed total of approximately 40 percent at year 50. This would be due to more open stand densities resulting from the increased levels of timber harvest activities associated with these alternatives. Under alternatives D and E, the percent of the moist upland forest potential vegetation group in shade intolerant species would increase by approximately 5 percent over 50 years as the result of regeneration harvests and other timber harvest activities to approximately 20 percent at year 50, falling below the desired condition range of 30 to 60 percent. Under Alternatives D and E, the projected percent of the moist upland forest potential vegetation group in mixed tolerance species would be

approximately 20 percent at year 50, which would be within the desired condition range of 20 to 40 percent. The projected percent of the moist upland forest potential vegetation group in shade tolerant species would be approximately 60 percent at year 50, which would exceed the desired condition range of 10 to 30 percent.

Table 269. Forested species composition, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/ shade intolerant	30-60	15	14 (16)	15 (15)	14 (16)	16 (14)	15 (15)	16 (14)	16 (14)	20 (10)	15 (15)	20 (10)	15 (15)	17 (13)
Moist/ mixed tolerance	20-40	21	21 (0)	21 (0)	21 (0)	20 (0)	21 (0)	21 (0)	20 (0)	20 (0)	21 (0)	20 (0)	21 (0)	20 (0)
Moist/ shade tolerant	10-30	65	65 (35)	64 (34)	65 (35)	63 (33)	66 (36)	65 (35)	64 (34)	60 (30)	64 (34)	60 (30)	65 (35)	63 (33)
Summed Total Amount of Variation			(51)	(49)	(51)	(47)	(51)	(49)	(48)	(40)	(49)	(40)	(50)	(46)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternatives A and C would be the least effective alternatives in achieving the desired conditions for species composition within the moist upland forest potential vegetation group, with the projected percent of species composition tolerance classes varying from desired condition ranges by a summed total of approximately 49 percent at year 50. Under alternatives A and C, the projected percent of the moist upland forest potential vegetation group in shade intolerant species would be approximately 16 percent at year 50, which would be below the desired condition range of 30 to 60 percent.

Under all of the alternatives, the percent of the moist upland forest potential vegetation group in shade tolerant species would range from approximately 60 to 65 percent at year 50, exceeding the desired condition range of 10 to 30 percent. The high percent of the moist upland forest potential vegetation group in shade tolerant species would result in decreased ecological resilience. Shade tolerant tree species tend to be less able to withstand fire due to thinner bark. These species also tend to retain their lower branches, which decreases their crown base height, decreases torching indices, and results in increased fire severity. Shade tolerant tree species also tend to be less drought tolerant, making them less able to withstand moisture stress and more susceptible to attack by insects such as bark beetles because of a lack of natural defense mechanisms, such as the production of pitch.

Wallowa-Whitman National Forest

Table 270, table 271, and table 272 display species composition as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Wallowa-Whitman National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman cold upland forest potential vegetation group, none of the alternatives would completely achieve the desired conditions for species composition because very little timber harvest would occur in the cold

upland forest potential vegetation group. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group.

Table 270. Forested species composition, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/ shade intolerant	40-60	38	39 (1)	45 (0)	39 (0)	45 (0)	39 (1)	45 (0)	40 (0)	47 (0)	40 (0)	46 (0)	39 (1)	45 (0)
Cold/ mixed tolerance	5-20	24	24 (4)	23 (3)	24 (4)	23 (3)	24 (4)	23 (3)	23 (3)	21 (1)	24 (4)	22 (2)	24 (4)	22 (2)
Cold/ shade tolerant	25-50	38	37 (0)	32 (0)	37 (0)	32 (0)	37 (0)	32 (0)	36 (0)	32 (0)	37 (0)	32 (0)	37 (0)	32 (0)
Summed Total Amount of Variation			(5)	(3)	(4)	(3)	(5)	(3)	(3)	(1)	(4)	(2)	(5)	(2)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Under alternative D, the projected percent of the cold upland forest potential vegetation group in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 1 percent at year 50. Under the other alternatives, the projected percent of the cold upland forest potential vegetation group in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 2 to3 percent at year 50. Under all of the alternatives:

- the projected percent of the cold upland forest potential vegetation group in shade intolerant species would range from approximately 45 to 47 percent at year 50, which falls within the desired conditions range of 40 to 60 percent.
- the projected percent of the cold upland forest potential vegetation group in mixed tolerance species would range from approximately 21 to 23 percent at year 50, slightly exceeding the desired condition range of 5 to 20 percent.
- the percent of the cold upland forest potential vegetation group in shade tolerant species would be approximately 32 percent at year 50, falling within the desired condition range of 25 to 50 percent.
- species compositions would be very similar to the HRV/desired conditions, resulting in increased ecological resiliency within the cold upland forest potential vegetation group.
- Species compositions would be very similar to the desired conditions, resulting in increased ecological resiliency within the cold upland forest potential vegetation group. Species would be more suited to temperature, moisture, and fire regimes and insects and diseases within the Wallowa-Whitman cold upland forest potential vegetation group.
- **Dry Upland Forest Potential Vegetation Group** – Within the Wallowa-Whitman National Forest dry upland forest potential vegetation group, alternative D would result in the closest achievement of the desired conditions for species composition. Under alternative D, the

projected percent of the dry upland forest potential vegetation group in each of the species composition tolerance classes would vary from the desired condition ranges by approximately 21 percent at year 50. Alternative E would be the second most effective alternative in achieving the desired conditions for species composition, with the projected percent of the dry upland forest potential vegetation group in each of the species composition tolerance classes varying from the desired condition ranges by approximately 35 percent at year 50. Alternatives D and E would result in the closest achievement of desired conditions for species composition in the Wallowa-Whitman dry upland forest potential vegetation group because the increased levels of timber harvest activities associated with these alternatives would result in more open stand densities and regeneration of more shade intolerant tree species. Under alternatives D and E, the percent of the dry upland forest potential vegetation group in shade intolerant species classes would be approximately 67 percent and 60 percent, respectively, at year 50. The higher percent of the dry upland forest potential vegetation group in shade intolerant species would result in improved ecological resilience. Shade intolerant tree species such as ponderosa pine tend to have thicker bark and are better adapted to frequent fire regimes. Ponderosa pine also self-prune their lower branches, which increases their crown base height, increases the wind speed required to initiate a crown fire, and results in decreased fire severity. Ponderosa pine is also more drought tolerant, making them better adapted to moisture stress and drier conditions. Species that better withstand moisture stress are also less susceptible to attack by bark beetles because of natural defense mechanisms, such as the production of pitch.

Table 271. Forested species composition, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/ shade intolerant	75-90	45	49 (26)	53 (22)	49 (26)	54 (21)	47 (28)	48 (27)	55 (20)	67 (8)	52 (23)	60 (15)	50 (25)	56 (19)
Dry/ shade tolerant	5-20	55	51 (31)	47 (27)	50 (30)	45 (25)	53 (33)	52 (32)	45 (20)	33 (13)	48 (28)	40 (20)	50 (30)	44 (24)
Summed Total Amount of Variation			(57)	(49)	(56)	(46)	(61)	(59)	(45)	(21)	(51)	(35)	(55)	(43)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Under alternatives D and E, the projected percent of the dry upland forest potential vegetation group in shade tolerant species would be approximately 33 percent and 40 percent, respectively, at year 50, exceeding the desired conditions range of 5 to 20 percent. Under the other alternatives, the projected percent of the dry upland forest potential vegetation group in shade tolerant species would range from approximately 44 to 52 percent at year 50, exceeding the desired conditions range of 5 to 20 percent.

Alternative C would be the least effective alternative in achieving the desired conditions for species composition, with the projected percent of the dry upland forest potential vegetation group in each of the species composition tolerance classes varying from the desired condition ranges by approximately 59 percent at year 50. Alternative C would exhibit a lower percent of shade intolerant species classes and a higher percent of shade tolerant species classes at year 50.

Under alternative C, the projected percent of the dry upland forest potential vegetation group in shade intolerant species would be approximately 48 percent at year 50, while the shade tolerant species would be approximately 52 percent at year 50. This would be due to the decreased levels of timber harvest activities associated with alternative C resulting in more closed canopy stand conditions in the dry upland forest potential vegetation group.

A higher percent of the dry upland forest potential vegetation group in shade tolerant species would result in decreased ecological resilience. Shade tolerant tree species such as grand fir tend to have thinner bark, are less able to withstand fire, and are less adapted to frequent fire regimes. Shade tolerant tree species also tend to retain their lower branches, which decreases their crown base height, decreases the wind speed required to initiate a crown fire, and results in increased fire severity. Shade tolerant tree species such as grand fir also tend to be less drought-tolerant, making them more prone to moisture stress and less adapted to drier conditions. Species that are more prone to moisture stress are also more susceptible to attack by insects such as bark beetles because of a lack of natural defense mechanisms, such as the production of pitch.

Moist Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman National Forest moist upland forest potential vegetation group, alternative D would most closely achieve desired conditions for species composition. Under alternative D, the projected percent of the moist upland forest potential vegetation group in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 12 percent at year 50. Alternative E would be the second most effective alternative in achieving the desired conditions for species composition, with the projected percent of species composition tolerance classes varying from the desired condition ranges by a summed total of approximately 13 percent at year 50. Alternatives D and E would result in the closest achievement of desired conditions for species composition in the Wallowa-Whitman moist upland forest potential vegetation group due to more open stand densities resulting from the increased levels of timber harvest activities associated with these alternatives. Under alternatives D and E, the percent of the moist upland forest potential vegetation group in shade intolerant species would increase by approximately 6 percent and 5 percent, respectively, over 50 years as the result of regeneration harvests and other timber harvest activities to approximately 33 percent and 32 percent, respectively, and within the desired condition range of 30 to 60 percent.

Table 272. Forested species composition, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Species Composition	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/ shade intolerant	30-60	27	26 (4)	26 (4)	26 (4)	27 (3)	26 (4)	26 (4)	28 (2)	33 (0)	28 (2)	32 (0)	27 (3)	29 (1)
Moist/ mixed tolerance	20-40	27	27 (0)	27 (0)	27 (0)	26 (0)	27 (0)	27 (0)	27 (0)	25 (0)	26 (0)	25 (0)	27 (0)	25 (0)
Moist/ shade tolerant	10-30	46	47 (17)	47 (17)	46 (16)	46 (16)	47 (17)	47 (17)	45 (15)	42 (12)	46 (16)	43 (13)	46 (16)	45 (15)
Summed Total Amount of Variation			(21)	(21)	(20)	(19)	(21)	(21)	(17)	(12)	(18)	(13)	(19)	(16)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternatives A, B, and C would be the least effective alternatives in achieving the desired conditions for species composition, with the projected percent of the moist upland forest potential vegetation group in each of the species composition tolerance classes varying from the desired condition ranges by a summed total of approximately 19 to 21 percent at year 50. This would be due to the decreased levels of timber harvest activities associated with these alternatives. Under alternatives A, B, and C, the projected percent of the moist upland forest potential vegetation group in shade intolerant species would range from approximately 26 to 27 percent at year 50, falling below the desired condition range of 30 to 60 percent. Under all of the alternatives, the percent of the moist upland forest potential vegetation group in shade tolerant species would range from approximately 42 to 47 percent at year 50, exceeding the desired condition range of 10 to 30 percent. The high percent of the moist upland forest potential vegetation group in shade tolerant species would result in decreased ecological resiliency. Shade tolerant tree species tend to be less able to withstand fire due to thinner bark. These species also tend to retain their lower branches, which decreases their crown base height, decreases the wind speed required to initiate a crown fire, and results in increased fire severity. Shade tolerant tree species also tend to be less drought tolerant, making them less able to withstand moisture stress and more susceptible to attack by insects such as bark beetles because of a lack of natural defense mechanisms, such as the production of pitch.

Aspen

According to Shirley and Erickson (2001), a landscape approach to restoring aspen requires a variety of techniques, including the construction of large herbivore exclosures, prescribed fire, establishment of new aspen stands using containerized planting stock, simulation of natural refugia (jackstrawing), and the use of genetic variation data to guide management decisions. Shepperd (2004) states that vegetative regeneration of declining aspen can be initiated through manipulations that provide three critical elements defined as the aspen regeneration triangle: 1) hormonal stimulation, 2) proper growth environment, and 3) sucker protection. Soils and site productivity, competition from other vegetation, and the potential impact of browsing animals upon new regeneration should all be considered. Treatments may include doing nothing, removal of existing aspen trees, removal of competing conifers or other vegetation, prescribed burning, mechanical root stimulation (ripping), and browse protection (Shepperd 2004). The best available science should be used to guide the restoration and management of aspen.

Within all three national forests, alternative E would result in the greatest overall improvement in the health, vigor, and sustainability of aspen populations, followed by alternative F. Alternatives E and F would result in decreased conifer encroachment within aspen clones due to the increased number of acres of timber harvest activities associated with these alternatives. Alternative E would combine the greatest number of acres of conifer removal through timber harvest activities with the greatest number of acres of prescribed burning. While alternatives E and F would place restrictions on the harvesting of older trees, this restriction would not be anticipated to restrict aspen restoration activities substantially because conifers that are generally targeted for removal would be those which have encroached due to fire suppression (< 150 years old). Aspen are relatively shade-intolerant. Removal of conifer encroachment combined with prescribed burning would result in increased aspen regeneration, increased aspen densities, improved aspen health, growth, and vigor, and improved successional dynamics. However, under all of the alternatives, aspen regeneration would require protection from ungulate browsing for a minimum of approximately 10 to 20 years. Protection may include fencing, logs/downed woody debris (jackstrawing), or the use of chemical repellents to deter browsing by large ungulates.

Under alternative B, there would be no restrictions on the harvesting of trees 21 inches d.b.h. and greater to favor aspen. However, alternative B would contain fewer acres of timber harvest activities, in comparison with alternatives E and F, resulting in less acres of conifers removed and more closed stand densities. However, alternative B would contain approximately the same number of acres of prescribed burning as alternative F, which would result in some stimulation of aspen sprouting in areas with open stand densities.

Under alternative D, there would be no restrictions on the harvesting of trees 21 inches d.b.h. Alternative D would result in the greatest number of acres of timber harvest activities and the greatest increase in the percent of the landscape in open stand densities. The removal of conifer encroachment from aspen clones would result in improved aspen health, growth, and vigor and likely some improvement in aspen regeneration. Although alternative D emphasizes the utilization of woody material instead of burning as a fuel reduction activity within harvest units, the use of prescribed burning to stimulate aspen regeneration would not be prohibited. However, because aspen clones tend to occur as smaller, scattered patches across the landscape, prescribed burning solely for the purpose of increasing regeneration within aspen clones may be difficult to implement due to logistical considerations and costs. The amount of prescribed burning that is likely to occur in aspen clones under alternative D would be substantially less than under alternative E. Therefore, alternative D would be expected to result in substantially less aspen regeneration, in comparison to alternatives E and F.

Under alternative C, there would be an absolute restriction on the harvesting of trees 21 inches d.b.h. and greater. This alternative would limit the ability to remove larger diameter conifer encroachment in aspen clones. Alternative C would result in the greatest percent of the landscape in closed stand densities, resulting in decreased aspen health, growth, and vigor. Aspen are relatively shade-intolerant and require full sunlight for maximum sprouting. Although alternative C emphasizes the use of fire, aspen regeneration would be decreased due to the increased percent of the landscape in closed stand densities.

Whitebark Pine

Under all of the alternatives, the desired conditions for whitebark pine would be no net loss in whitebark pine habitat on National Forest System lands. Degraded habitat and connectivity would be restored wherever necessary, including in designated wilderness. Genetic diversity would be conserved across the landscape. Populations would exhibit an increase in age class diversity. The risk of mortality from mountain pine beetle and stand-replacing fire would be reduced. Resistance to white pine blister rust would be increased. Fire would be used as one tool to achieve these desired conditions. However, it would be important to minimize the negative impacts to whitebark pine resulting from fire suppression activities.

Under alternatives C, E, and F, additional areas would be allocated to MA 1B (PARWA) within the Wallowa-Whitman National Forest. Under alternative C, an additional 57,640 acres would be preliminarily recommended for designation and inclusion in the National Wilderness Preservation System. Under alternatives E and F, approximately 9,530 acres of PARWA in the Twin Mountain area would be designated. Until a decision is made by Congress, this area would be managed to protect wilderness characteristics. The designation of PARWA may have a negative impact on the ability to restore whitebark pine in this area by limiting the ability to conduct more active management, such as tree harvesting. Restoration would have to rely heavily on burning, which could result in increased mortality of whitebark pine. The use of fire alone would not allow managers to select for rust resistance in whitebark pine populations and could actually result in the mortality of some rust-resistant trees. Large, high-severity fires have the potential to severely

reduce or even eliminate cone-bearing whitebark pine across an extensive landscape (Aubry et al. 2008). If a fire becomes intense and widespread enough that most or all cone-bearing whitebark pines within the fire perimeter are killed, seed from unburned stands within nutcracker caching range may be available to regenerate in the burned area. If there is no such seed source, natural regeneration would be extremely slow or whitebark pine may become locally extirpated (Aubry et al. 2008).

Restrictions on the harvesting of larger diameter conifers could potentially affect the ability to conduct restoration treatments within whitebark pine populations by limiting the removal of some competing vegetation. Under alternatives B and C, there would be restrictions on the harvesting of trees 21 inches d.b.h. and greater. These alternatives would limit the ability to remove larger diameter trees competing with whitebark pine. While alternatives E and F would place restrictions on the harvesting of older trees, this restriction would not be anticipated to restrict whitebark pine restoration activities substantially because conifers that are generally targeted for removal would be those which have encroached due to fire suppression (less than approximately 150 years old). Under alternative D, there would be no restrictions on the harvesting of trees 21 inches d.b.h.

Stand Density Effects

Malheur National Forest

Table 273, table 274, and table 275 display forested stand density classes as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Malheur National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Malheur National Forest cold upland forest potential vegetation group, none of the alternatives would achieve the desired conditions for the percent of the cold upland forest potential vegetation group in open and closed forest at year 50 due to the large amount of variation between existing and desired conditions. Currently, approximately 88 percent of the cold upland forest potential vegetation group is in open stand densities. The desired condition would be to reduce the percent of the cold upland forest potential vegetation group in open stand densities to 20 to 30 percent and increase the percent of the cold upland forest potential vegetation group in closed stand densities to 65 to 80 percent. Under all of the alternatives, the percent of the cold upland forest potential vegetation group in open forest would remain above the desired condition range at year 50. Much of this would be due to mortality from fire, insects, and disease exceeding growth rates. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group.

Alternatives A and C would result in the closest achievement of the desired conditions for stand densities at year 50 because of the lower levels of timber harvest activities associated with these alternatives. The projected percent of the cold upland forest potential vegetation group in open and closed forest under these alternatives would vary from the desired condition ranges by a summed total of approximately 31 percent. Alternative D would be the least effective alternative in achieving the desired conditions for stand densities within the cold upland forest potential vegetation group. Under alternative D, the projected percent of the cold upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 43 percent at year 50.

Table 273. Forested stand density class, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/ open	20-30	88	46 (16)	48 (18)	53 (23)	49 (19)	46 (16)	48 (18)	53 (23)	54 (24)	51 (21)	53 (23)	49 (19)	50 (20)
Cold/ closed	65-80	12	54 (11)	52 (13)	47 (18)	51 (14)	54 (11)	52 (13)	47 (18)	46 (19)	49 (16)	47 (18)	51 (14)	50 (15)
Summed Total Amount of Variation			(27)	(31)	(41)	(33)	(27)	(31)	(41)	(43)	(37)	(41)	(33)	(35)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Dry Upland Forest Potential Vegetation Group – Within the Malheur National Forest dry upland forest potential vegetation group, alternative D would result in the closest achievement of the desired conditions for stand densities. Under alternative D, the projected percent of the dry upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 16 percent at year 50. Alternative E would be the second most effective alternative in achieving the desired conditions for stand densities, with the projected percent of the dry upland forest potential vegetation group in open and closed forest varying from the desired condition ranges by a summed total of approximately 22 percent at year 50. Alternatives D and E would result in the greatest increase in ecological resiliency within the Malheur dry upland forest potential vegetation group by decreasing stand densities and creating a more open forest structure that more closely resembles the historical forest structure that existed prior to interruption of the historical frequent fire regime. A more open forest structure would result in decreased competition between trees for moisture, nutrients, and sunlight, increased tree health, growth, and vigor, decreased risk of insect attack and mortality, improved forest health, increased heterogeneity, decreased crown continuity, and decreased fire severity. Decreased stand densities would also result in increased regeneration of more shade intolerant tree species and closer achievement of the desired conditions for species composition within the Malheur National Forest dry upland forest potential vegetation group. The increased percent of the dry upland forest potential vegetation group in open stand densities would also aid in the reintroduction of low severity surface fire into the ecosystem.

Because alternatives D and E would result in an increased percent of the dry upland forest potential vegetation group in open stand densities as the result of an increased number of acres of timber harvest activities, there would be an increase in opportunities to manage wildfires for resource benefits, compared to alternative C. More open stand densities would result in decreased fire-related mortality and an increased likelihood of achieving other desired conditions. As more fire is reintroduced into the ecosystem, ecosystem processes would be restored and the dry upland forest potential vegetation group would become more ecologically resilient.

Table 274. Forested stand density classes, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/open	80-90	60	55 (25)	57 (23)	56 (24)	56 (24)	52 (28)	51 (29)	64 (16)	72 (8)	61 (19)	69 (11)	56 (24)	59 (21)
Dry/closed	5-20	40	45 (25)	43 (23)	44 (24)	44 (24)	49 (29)	50 (30)	36 (16)	28 (8)	39 (19)	31 (11)	44 (24)	41 (21)
Summed Total Amount of Variation			(50)	(46)	(48)	(48)	(57)	(59)	(32)	(16)	(38)	(22)	(48)	(42)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternative C would be the least effective alternative in achieving the desired conditions for stand densities, with the projected percent of the dry upland forest potential vegetation group in open and closed forest varying from the desired condition ranges by a summed total of approximately 59 percent at year 50. Under alternative C, approximately half of the Malheur National Forest dry upland forest potential vegetation group would be in closed stand density conditions at year 50. Increased stand densities would result in increased crown continuity, increased fuel loading, decreased wind speeds required to initiate and sustain a crown fire, and increased fire severity. Increased stand densities would also result in regeneration of more shade tolerant/fire intolerant tree species. Additionally, increased stand densities would result in increased competition between trees for moisture, nutrients, and sunlight, decreased tree health, growth, and vigor, and grow larger trees at a slower rate. Smaller diameter trees tend to have thinner bark that is less resistant to fire mortality.

Alternative C would rely mainly on the use of fire (planned and unplanned ignitions) to reduce stand densities. Rather than harvesting trees to reduce tree densities, trees would be thinned by fire under alternative C. Due to the high percent of the landscape in closed stand densities and the potential for very high levels of mortality, the window or time frame under which fire could and would be managed to achieve the desired conditions for stand densities, structural stages, and species composition would be limited and unrealistic based on current conditions and the inability to reintroduce low severity fire effects. Additionally, the levels of smoke emissions generated under alternative C would be substantially increased, further limiting burn windows and the amount of acres that could be burned due to the increased levels of particulate matter generated. Impacts to public health from the likelihood of exceeding air quality standards would also substantially limit the amount of acres that could be burned under alternative C. Alternative C would likely result in increased fire severity, decreased ecological resiliency, and loss of key ecosystem components and functions due to scope and scale of fire severity outside that which historically occurred within the dry upland forest potential vegetation group. The result would be substantially fewer acres treated and restored by fire under alternative C.

Moist Upland Forest Potential Vegetation Group – Within the Malheur National Forest moist upland forest potential vegetation group, alternatives A, B, C, and F would all achieve the desired conditions for stand densities. The projected percent of the moist upland forest potential vegetation group in open and closed forest would be within the desired condition ranges at year

50. Under alternative E, the projected percent of the moist upland forest potential vegetation group of open and closed forest would vary from the desired condition ranges by approximately 1 percent at year 50. Alternative D would be the least effective alternative in achieving the desired conditions for stand densities within the moist upland forest potential vegetation group. Under alternative D, the projected percent of the moist upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 10 percent at year 50.

Table 275. Forested stand density classes, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Malheur National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/open	30-40	58	33 (0)	35 (0)	38 (0)	33 (0)	31 (0)	33 (0)	41 (1)	45 (5)	36 (0)	41 (1)	34 (0)	37 (0)
Moist/closed	60-80	42	67 (0)	65 (0)	62 (0)	67 (0)	69 (0)	68 (0)	58 (2)	55 (5)	64 (0)	60 (0)	66 (0)	63 (3)
Summed Total Amount of Variation			(0)	(0)	(0)	(0)	(0)	(0)	(3)	(10)	(0)	(1)	(0)	(3)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Umatilla National Forest

Table 276, table 277, and table 278 display forested stand density classes as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Umatilla National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Umatilla National Forest cold upland forest potential vegetation group, none of the alternatives would achieve the desired conditions for the percent of the cold upland forest potential vegetation group in open and closed forest at year 50. Under all of the alternatives, the percent of the cold upland forest potential vegetation group in open forest would remain above the desired condition range at year 50. Much of this would be due to mortality from fire, insects, and disease exceeding growth rates. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group.

Alternatives C and A would result in the closest achievement of desired conditions for stand densities at year 50 due to lower levels of timber harvest activities associated with these alternatives. The projected percent of the cold upland forest potential vegetation group in open and closed forest under each of these alternatives would vary from the desired condition ranges by a summed total of approximately 34 percent and 35 percent, respectively, at year 50. However, Alternatives B and F would vary from the desired condition ranges by a summed total of approximately 37 percent at year 50.

Table 276. Forested stand density classes, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/ open	20-30	44	34 (4)	50 (20)	35 (5)	51 (21)	35 (5)	50 (20)	39 (9)	59 (29)	38 (8)	57 (27)	36 (6)	51 (21)
Cold/ closed	65-80	56	65 (0)	50 (15)	65 (0)	49 (16)	65 (0)	51 (14)	60 (5)	41 (24)	62 (3)	43 (22)	64 (1)	49 (16)
Summed Total Amount of Variation			(4)	(35)	(5)	(37)	(5)	(34)	(14)	(53)	(11)	(49)	(7)	(37)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternative D would be the least effective alternative in achieving the desired conditions for stand densities within the cold upland forest potential vegetation group. Under alternative D, the projected percent of the cold upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 53 percent at year 50.

Dry Upland Forest Potential Vegetation Group – Within the Umatilla National Forest dry upland forest potential vegetation group, none of the alternatives would achieve the desired conditions for stand densities due to the substantial amount of variation between the existing and desired conditions. Historically, this fire regime was characterized by more frequent fire; therefore this potential vegetation group has experienced a greater number of missed fires.

Table 277. Forested stand density classes, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/open	80-90	30	46 (34)	60 (20)	45 (35)	59 (21)	39 (41)	49 (31)	60 (20)	77 (3)	55 (25)	70 (10)	47 (33)	63 (17)
Dry/closed	5-20	70	54 (34)	40 (20)	55 (35)	41 (21)	61 (41)	52 (32)	40 (20)	23 (3)	45 (25)	30 (10)	53 (33)	38 (18)
Summed Total Amount of Variation			(68)	(40)	(70)	(42)	(82)	(63)	(40)	(6)	(50)	(20)	(66)	(35)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternative D would result in the closest achievement of the desired conditions for stand densities due to the increased levels of timber harvest activities associated with this alternative. Under alternative D, the projected percent of the dry upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 6 percent at year 50. Alternative E would be the second most effective alternative

in achieving the desired conditions for stand densities, with the projected percent of the dry upland forest potential vegetation group varying from the desired condition ranges by a summed total of approximately 20 percent at year 50. Alternatives D and E would result in the greatest increase in ecological resiliency within the Umatilla dry upland forest potential vegetation group by decreasing stand densities and creating a more open forest structure that more closely resembles the historical forest structure that existed prior to interruption of the historical frequent fire regime. A more open forest structure would result in decreased competition between trees for moisture, nutrients, and sunlight, increased tree health, growth, and vigor, decreased risk of insect attack and mortality, improved forest health, increased heterogeneity, decreased crown continuity, and decreased fire severity. Decreased stand densities would also result in increased regeneration of more shade intolerant tree species and closer achievement of the desired conditions for species composition within the dry upland forest potential vegetation group.

The increased percent of the dry upland forest potential vegetation group in open stand densities would also aid in the reintroduction of low severity surface fire into the ecosystem. Because alternatives D and E would result in an increased percent of the dry upland forest potential vegetation group in open stand densities as the result of an increased number of acres of timber harvest activities, there would be an increase in opportunities to manage wildfires for resource benefits, compared to alternative C. More open stand densities would result in decreased fire-related mortality and an increased likelihood of achieving other desired conditions. As more fire is reintroduced into the ecosystem, ecosystem processes would be restored and the dry upland forest potential vegetation group would become more ecologically resilient.

Alternative C would be the least effective alternative in achieving the desired conditions for stand densities, with the projected percent of the dry upland forest potential vegetation group in open and closed forest varying from the desired condition ranges by a summed total of approximately 63 percent at year 50. Under alternative C, over half of the Umatilla National Forest dry upland forest potential vegetation group would be in closed stand density conditions at year 50. Increased stand densities would result in increased crown continuity, increased fuel loading, decreased wind speeds required to initiate and sustain a crown fire, and increased fire severity. Increased stand densities would also result in regeneration of more shade tolerant/fire intolerant tree species. Additionally, increased stand densities would result in increased competition between trees for moisture, nutrients, and sunlight, decreased tree health, growth, and vigor, and grow larger trees at a slower rate. Smaller diameter trees tend to have thinner bark that is less resistant to fire mortality.

Alternative C would rely mainly on the use of fire (planned and unplanned ignitions) to reduce stand densities. Rather than harvesting trees, trees would be thinned by fire under alternative C. Due to the high percent of the landscape in closed stand densities and the potential for very high levels of mortality, the window or time frame under which fire could and would be managed to achieve the desired conditions for stand densities, structural stages, and species composition would be limited and unrealistic based on current conditions and the inability to reintroduce low severity fire effects. Additionally, the levels of smoke emissions and particulate matter generated under alternative C would be substantially increased, further limiting burn windows and the amount of acres that could be burned due to impacts to public health from the likelihood of exceeding air quality standards. Alternative C would likely result in increased fire severity, decreased ecological resiliency, and loss of key ecosystem components and functions due to scope and scale of fire severity outside that which historically occurred within the dry upland forest potential vegetation group. The result would be substantially fewer acres treated and restored by fire under alternative C.

Moist Upland Forest Potential Vegetation Group – Within the Umatilla moist upland forest potential vegetation group, alternatives A, B, C, and F would achieve the desired conditions for stand densities due to the lower levels of timber harvest activities associated with these alternatives. The projected percent of the moist upland forest potential vegetation group in open and closed forest would be within the desired condition ranges at year 50.

Table 278. Forested stand density classes, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Umatilla National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/open	30-40	55	35 (0)	39 (0)	35 (0)	37 (0)	35 (0)	36 (0)	41 (1)	49 (9)	39 (0)	45 (5)	36 (0)	38 (0)
Moist/closed	60-80	45	65 (0)	61 (0)	65 (0)	63 (0)	66 (0)	65 (0)	59 (1)	51 (9)	61 (0)	54 (6)	64 (0)	62 (0)
Summed Total Amount of Variation			(0)	(0)	(0)	(0)	(0)	(0)	(2)	(18)	(0)	(11)	(0)	(0)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Under alternative E, the projected percent of the moist upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 11 percent at year 50.

Alternative D would be the least effective alternative in achieving the desired conditions for stand densities within the moist upland forest potential vegetation group due to the increased levels of timber harvest activities associated with this alternative. Under alternative D, the projected percent of the moist upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 18 percent at year 50.

Wallowa-Whitman National Forest

Table 279, table 280, and table 281 display forested stand density classes as a percent of each upland forest potential vegetation group by alternative projected over 50 years within the Wallowa-Whitman National Forest.

Cold Upland Forest Potential Vegetation Group – Under all of the alternatives, the projected percent of the cold upland forest potential vegetation group in open forest would remain above the desired condition range at year 50. Much of this would be due to mortality from fire, insects, and disease exceeding growth rates. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group.

Table 279. Forested stand density classes, as a percent of the cold upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Cold/ open	20-30	62	48 (18)	47 (17)	48 (18)	46 (16)	48 (18)	46 (16)	52 (22)	51 (21)	50 (20)	50 (20)	48 (18)	47 (17)
Cold/ closed	65-80	38	52 (13)	53 (12)	52 (13)	53 (12)	52 (13)	54 (11)	48 (17)	49 (16)	50 (15)	50 (15)	51 (14)	53 (12)
Summed Total Amount of Variation			(31)	(29)	(31)	(28)	(31)	(27)	(39)	(37)	(35)	(35)	(32)	(29)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternatives A, B, C and F would result in the closest achievement of desired conditions for stand densities at year 50. The projected percent of the cold upland forest potential vegetation group in open and closed forest under these alternatives would vary from the desired condition ranges by a summed total of approximately 27 to 29 percent at year 50.

Alternatives D and E would be the least effective alternatives in achieving the desired conditions for stand densities within the cold upland forest potential vegetation group. Under alternatives D and E, the projected percent of the cold upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 37 percent and 35 percent, respectively, at year 50.

Dry Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman dry upland forest potential vegetation group, the alternatives would result in a substantial difference in the percent of dry upland forest potential vegetation group in open and closed forest because more timber harvest would occur in the dry upland forest potential vegetation group. Approximately 60 to 90 percent of the harvest activities would occur within the dry upland forest potential vegetation group. Additionally, stand densities within the dry upland forest potential vegetation group tend to exhibit a greater amount of departure from the HRV. Historically, this fire regime was characterized by more frequent fire and therefore this forest type has experienced a greater number of missed fires.

Alternative D would result in the closest achievement of the desired conditions for stand densities. Under alternative D, the projected percent of the dry upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 6 percent at year 50. Alternative E would be the second most effective alternative in achieving the desired conditions for stand densities, with the projected percent of the dry upland forest potential vegetation group varying from the desired condition ranges by a summed total of approximately 22 percent at year 50. Alternatives D and E would most closely achieve the desired conditions for stand densities at year 50 because of the increased levels of timber harvest activities associated with these alternatives and would result in the greatest increase in ecological resiliency by decreasing stand densities and creating a more open forest structure. This more open forest structure more closely resembles the forest structure that existed prior to interruption of the historical frequent fire regime. A more open forest structure would

result in decreased competition between trees for moisture, nutrients, and sunlight, increased tree health, growth, and vigor, decreased risk of insect attack and mortality, improved forest health, increased heterogeneity, decreased crown continuity, and decreased fire severity. Decreased stand densities would also result in increased regeneration of more shade intolerant tree species and closer achievement of the desired conditions for species composition within the dry upland forest potential vegetation group.

Table 280. Forested stand density classes, as a percent of the dry upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Dry/open	80-90	32	44 (36)	56 (24)	44 (36)	56 (24)	39 (41)	46 (34)	57 (23)	77 (3)	52 (28)	69 (11)	46 (34)	59 (21)
Dry/closed	5-20	67	56 (36)	44 (24)	56 (36)	44 (24)	61 (41)	54 (34)	43 (23)	23 (3)	48 (28)	31 (11)	54 (34)	41 (21)
Summed Total Amount of Variation			(72)	(48)	(72)	(48)	(82)	(68)	(46)	(6)	(56)	(22)	(68)	(42)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

The increased percent of the dry upland forest potential vegetation group in open stand densities would also aid in the reintroduction of low severity surface fire into the ecosystem. Because alternatives D and E would result in an increased percent of the dry upland forest potential vegetation group in open stand densities as the result of an increased number of acres of timber harvest activities, there would be an increase in opportunities to manage wildfires for resource benefits, compared to alternative C. More open stand densities would result in decreased fire-related mortality and an increased likelihood of achieving other desired conditions. As more fire is reintroduced into the ecosystem, ecosystem processes would be restored and the dry upland forest potential vegetation group would become more ecologically resilient.

Alternative C would be the least effective alternative in achieving the desired conditions for stand densities, with the projected percent of the dry upland forest potential vegetation group in open and closed forest varying from the desired condition ranges by a summed total of approximately 68 percent at year 50. Under alternative C, over half of the Wallowa-Whitman dry upland forest potential vegetation group would be in closed stand density conditions at year 50. Increased stand densities would result in increased crown continuity, increased fuel loading, decreased wind speeds required to initiate and sustain a crown fire, and increased fire severity. Increased stand densities would also result in regeneration of more shade tolerant/fire intolerant tree species. Additionally, increased stand densities would result in increased competition between trees for moisture, nutrients, and sunlight, decreased tree health, growth, and vigor, and grow larger trees at a slower rate Rather than harvesting trees, alternative C would rely mainly on the use of fire (planned and unplanned ignitions) to thin trees and reduce stand densities. Due to the high percent of the landscape in closed stand densities and the potential for very high levels of mortality, the window or time frame under which fire could and would be managed to achieve the desired conditions for stand densities, structural stages, and species composition would be limited and unrealistic based on current conditions and the inability to reintroduce low severity fire effects.

Additionally, the levels of smoke emissions generated under alternative C would be substantially increased, further limiting burn windows and the amount of acres that could be burned due to the increased levels of particulate matter generated. Impacts to public health from the likelihood of exceeding air quality standards would also substantially limit the amount of acres that could be burned under alternative C. Alternative C would likely result in increased fire severity, decreased ecological resiliency, and loss of key ecosystem components and functions due to scope and scale of fire severity outside that which historically occurred within the dry upland forest potential vegetation group. The result would be substantially fewer acres treated and restored by fire under alternative C.

Moist Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman moist upland forest potential vegetation group, alternative C would result in closest achievement of the desired conditions for stand densities. Under alternative C, the projected percent of the moist upland forest potential vegetation group in open and closed forest would be within the desired condition ranges at year 50. Alternatives B and A would be the second and third most effective alternatives in achieving the desired conditions for stand densities. Under alternatives B and A, the projected percent of the moist upland forest potential vegetation group in open and closed forest would vary from the desired condition ranges by a summed total of approximately 2 percent and 4 percent, respectively, at year 50.

Table 281. Forested stand density classes, as a percent of the moist upland forest potential vegetation group (with amount of variation from desired condition range in parentheses) by alternative within the Wallowa-Whitman National Forest

Upland Forest PVG/ Stand Density	DC	EC	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50	Yr. 20	Yr. 50
Moist/open	30-40	41	28 (2)	42 (2)	28 (2)	41 (1)	26 (4)	39 (0)	36 (0)	53 (13)	33 (0)	49 (9)	29 (1)	43 (3)
Moist/closed	60-80	59	72 (0)	58 (2)	72 (0)	59 (1)	74 (0)	61 (0)	64 (0)	47 (13)	66 (0)	51 (9)	70 (0)	57 (3)
Summed Total Amount of Variation			(2)	(4)	(2)	(2)	(4)	(0)	(0)	(26)	(0)	(18)	(1)	(6)

PVG = potential vegetation group; DC= desired condition; EC = existing condition

Alternative D would be the least effective alternative in achieving the desired conditions for stand densities within the moist upland forest potential vegetation group, with the projected percent of the moist upland forest potential vegetation group in open and closed forest varying from the desired condition ranges by a summed total of approximately 26 percent at year 50.

Fire Regime Condition Class Effects

The changes in fire regime condition class under each of the alternatives would vary depending on the combined amount of management activities, including prescribed fire, timber harvest, mechanical fuels treatments, and natural changes such as tree growth and succession, insect and disease-related mortality, and mortality due to wildfire.

The departure values for fire regime condition class are based on a score of zero to 100, with a departure score of zero indicating the least amount of departure between the existing conditions and the HRV and a departure score of one hundred indicating the maximum amount of departure

between the existing conditions and the HRV. A score of less than 33 would be considered low departure from the HRV (condition class 1). A departure score of 33 to 66 would be considered moderate departure from the HRV (condition class 2). A departure score of greater than 66 would be considered high departure from the HRV (condition class 3).

Malheur National Forest

Table 282, table 283, and table 284 display the fire regime condition class departure scores by potential vegetation group under each of the alternatives projected over 50 years within the Malheur National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Malheur cold upland forest potential vegetation group, all of the alternatives would result in achievement of the desired conditions for fire regime condition class (class 1) at year 50. Under all of the alternatives, the fire regime condition class departure scores would range from approximately 14 to 26 at year 50. Under all of the alternatives, fire regime condition class departure scores would be reduced because vegetation structure and fuels composition would be altered as the result of mortality caused by wildfire, insects, and/or disease. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group.

Table 282. Malheur National Forest fire regime condition class departure score (0 to 100) for the cold upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	54	54	54	54	54	54
Year 20	21	25	20	21	21	20
Year 50	14	17	15	26	24	23

Dry Upland Forest Potential Vegetation Group – Within the Malheur dry upland forest potential vegetation group, all of the alternatives would result in moderate departure of fire regime condition class (class 2) at year 50 due to the relatively large amount of departure between existing conditions and the HRV. However, alternatives D and E would result in the greatest improvement in fire regime condition class departure scores at year 50. Under alternatives D and E, the fire regime condition class departure scores would be approximately 33 and 36, respectively, at year 50. Under Alternative D, vegetation within the dry upland forest potential vegetation group would be very close to low departure (fire regime condition class 1) at year 50 at the scale of the Malheur National Forest. However, condition class 1 may be achieved sooner in some individual watersheds that currently have significant amounts of large mid-aged forests that are more than 100 years old. For many areas that currently have 80 to 100 year old forests, it would take more than 50 years for those forests to grow into the larger and older age and size classes commonly associated with the definition of old forest.

Under alternatives D and E, departure scores would be lower due to the increased levels of timber harvest activities, mechanical fuels treatments, and/or prescribed burning associated with these alternatives. Alternatives D and E would also show improvement at a faster rate because of the increased harvesting of smaller trees within the old forest, which may decrease mortality in older age classes due to decreased moisture stress and fire severity and modification of closed canopy to open canopy. However, alternative D would not include prescribed burning outside of harvest

units and would include decreased amounts of prescribed burning within harvest units. Under alternative D, the majority of fuels treatments within harvest units would be accomplished by removal or crushing instead of burning.

Table 283. Malheur National Forest fire regime condition class departure score (zero to 100) for the dry upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	62	62	62	62	62	62
Year 20	55	53	56	47	50	53
Year 50	47	45	48	33	36	43

Because alternative E includes the reintroduction of fire to the ecosystem in addition to reducing the amount of departure in the dry upland forest vegetation, this alternative would be expected to result in increased ecological resiliency in the Malheur dry upland forest potential vegetation group because fuel composition, fire frequency, severity, pattern, and other associated disturbances would more closely resemble the HRV. Under alternative E, the risk of fire behavior, effects and associated disturbances would be similar to those that occurred prior to interruption of the historical low severity frequent fire regime. Although the risk of loss of key ecosystem components, such as native species, large trees, and soil, would be lower under both alternatives D and E, the lack of fire under alternative D would inhibit other ecological processes. Fire is essential to nutrient cycling in fire-adapted ecosystems. Fire has a fertilizer effect on the soil by increasing ammonium levels and microbial nitrogen mineralization, resulting in increased nutrient levels in both understory and overstory vegetation. Fire rejuvenates desirable grasses, depending on the species response to disturbance (i.e., sprouters, prolific seeders, and species with strong rhizome extension respond favorably to fire). Especially in combination with reduced stand densities, fire results in changes in the microclimate on the forest floor, specifically increased sunlight penetration, increased soil temperatures, and increased understory productivity. Fire has been shown to result in significant increases in herbaceous biomass, species richness, and understory productivity and diversity. Depending on timing, fire may also increase seedling establishment by aiding in seedbed and site preparation. Fire would also aid in the creation of openings for regeneration.

Under alternative C, the fire regime condition class departure score would be approximately 48 at year 50, the highest fire regime condition class departure score among alternatives. Conditions would be more highly departed from the HRV under alternative C due to increased stand densities and altered species compositions resulting from the lower levels of timber harvest and prescribed burning associated with this alternative. Vegetation characteristics and other conditions would least resemble the HRV under alternative C, resulting in decreased ecological resiliency in the Malheur dry upland forest potential vegetation group. The risk of loss of key ecosystem components, such as native species, large trees, and soil, would be greatest under alternative C due to an increased risk of uncharacteristically severe fire behavior.

Moist Upland Forest Potential Vegetation Group – Within the Malheur moist upland forest potential vegetation group, all of the alternatives would result in achievement of the desired conditions for fire regime condition class (class 1) at year 50.This is because the degree of departure between the existing conditions and the HRV is relatively small. Under all of the alternatives, the fire regime condition class departure scores would range from approximately 13 to 19 at year 50.

Table 284. Malheur National Forest fire regime condition class departure score (zero to 100) for the moist upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	36	36	36	36	36	36
Year 20	23	22	24	17	20	23
Year 50	19	17	18	13	13	13

Umatilla National Forest

Table 285, table 286, and table 287 display the fire regime condition class departure scores by potential vegetation group under each of the alternatives projected over 50 years within the Umatilla National Forest.

Cold Upland Forest Potential Vegetation Group – Within the Umatilla cold upland forest potential vegetation group, all of the alternatives would result in moderate departure of fire regime condition class (condition class 2) at year 50 . Under all of the alternatives, the fire regime condition class departure scores would range from approximately 39 to 50 at year 50. Under all of the alternatives, fire regime condition class departure scores would be reduced from existing conditions because vegetation structure and fuels composition would be altered as the result of mortality caused by wildfire, insects, and/or disease. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group.

Table 285. Umatilla National Forest fire regime condition class departure score (zero-100) for the cold upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	60	60	60	60	60	60
Year 20	56	55	57	49	50	53
Year 50	48	46	50	39	39	43

Dry Upland Forest Potential Vegetation Group – Within the Umatilla dry upland forest potential vegetation group, all of the alternatives would result in moderate departure of fire regime condition class (class 2) at year 50 due to the relatively large amount of departure between the existing conditions and the HRV. However, alternatives D and E would result in the greatest improvement in fire regime condition class departure scores at year 50. Under alternatives D and E, the fire regime condition class departure scores would be approximately 39 at year 50. Under alternatives D and E, vegetation within the dry upland forest potential vegetation group would be close to achieving low departure from the HRV (condition class 1) at the scale of the Umatilla National Forest. However, condition class 1 may be achieved sooner in some individual watersheds that currently have significant amounts of large mid-aged forests that are more than 100 years old. For many areas that currently have 80 to 100 year old forests, it would take more than 50 years for those forests to grow into the larger and older age and size classes commonly associated with the definition of old forest.

Table 286. Umatilla National Forest fire regime condition class departure score (zero-100) for the dry upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	60	60	60	60	60	60
Year 20	56	55	57	49	50	53
Year 50	48	46	50	39	39	43

Under alternatives D and E, departure scores would be lower due to the increased levels of timber harvest activities, mechanical fuels treatments, and/or prescribed burning associated with these alternatives. Alternatives D and E would also show improvement at a faster rate because of the increased harvesting of smaller trees within old forest, which may decrease mortality in older age classes (due to decreased moisture stress and fire severity) and modification of closed canopy to open canopy. However, Alternative D would not include prescribed burning outside of harvest units and would include decreased amounts of prescribed burning within harvest units. Under alternative D, the majority of fuels treatments within harvest units would be accomplished by removal or crushing instead of burning.

Because alternative E includes the reintroduction of fire to the ecosystem in addition to reducing the amount of departure in the dry upland forest vegetation, alternative E would be expected to result in increased ecological resiliency in the Umatilla dry upland forest potential vegetation group. Fuel composition, fire frequency, severity, pattern, and other associated disturbances would more closely resemble the HRV. Under alternative E, the risk of fire behavior, effects and associated disturbances would be similar to those that occurred prior to interruption of the historical low severity frequent fire regime. Although the risk of loss of key ecosystem components, such as native species, large trees, and soil, would be lower under both alternatives D and E, the lack of fire under alternative D would inhibit other ecological processes. Fire is essential to nutrient cycling in fire adapted ecosystems. Fire has a fertilizer effect on the soil by increasing ammonium levels and microbial nitrogen mineralization, resulting in increased nutrient levels in both understory and overstory vegetation. Fire rejuvenates desirable grasses, depending on the species response to disturbance (i.e., sprouters, prolific seeders, and species with strong rhizome extension respond favorably to fire). Especially in combination with reduced stand densities, fire results in changes in the microclimate on the forest floor, specifically increased sunlight penetration, increased soil temperatures, and increased understory productivity. Fire has been shown to result in significant increases in herbaceous biomass, species richness, and understory productivity and diversity. Depending on timing, fire may also increase seedling establishment by aiding in seed bed and site preparation. Fire would also aid in the creation of openings for regeneration.

Under alternative C, the fire regime condition class departure score would be approximately 50 at year 50, the highest among the alternatives. Conditions would be more highly departed from the desired conditions/HRV under alternative C due to increased stand densities and altered species compositions resulting from the lower levels of timber harvest and prescribed burning associated with this alternative. Alternative C would result in decreased ecological resiliency in the Umatilla dry upland forest potential vegetation group because vegetation characteristics and other conditions would least resemble the HRV. The risk of loss of key ecosystem components, such as native species, large trees, and soil, would be greatest under alternative C due to an increased risk of uncharacteristically severe fire behavior.

Moist Upland Forest Potential Vegetation Group – Within the Umatilla moist upland forest potential vegetation group, all of the alternatives would result in achievement of the desired conditions for fire regime condition class (class 1) at year 50. This is because the amount of departure between the existing conditions and the HRV is low. Under all of the alternatives, the fire regime condition class departure scores would range from approximately 13 to 17 at year 50.

Table 287. Umatilla National Forest fire regime condition class departure score (zero-100) for the moist upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	26	26	26	26	26	26
Year 20	19	19	20	16	17	18
Year 50	17	15	16	17	14	13

Wallowa-Whitman National Forest

Table 288, table 289, and table 290 display the fire regime condition class departure scores by potential vegetation group under each of the alternatives projected over 50 years within the Wallowa-Whitman National Forest.

Cold Upland Forest P Potential Vegetation Group – Within the Wallowa-Whitman cold upland forest potential vegetation group, all of the alternatives would result in achievement of the desired conditions for fire regime condition class (class 1) at year 50.Under all of the alternatives, the fire regime condition class departure scores would range from approximately 14 to 19 at year 50.Under all of the alternatives, fire regime condition class departure scores would be reduced because vegetation structure and fuels composition would be altered as the result of mortality caused by wildfire, insects, and/or disease. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group.

Table 288. Wallowa-Whitman National Forest fire regime condition class departure score (zero-100) for the cold upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	37	37	37	37	37	37
Year 20	22	23	24	26	25	24
Year 50	15	15	14	19	18	16

Dry Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman dry upland forest potential vegetation group, all of the alternatives would result in moderate departure of fire regime condition class (class 2) at year 50 due to the relatively large amount of departure between existing conditions and the HRV. However, alternatives D and E would result in the greatest improvement in fire regime condition class departure scores at year 50. Under alternatives D and E, the fire regime condition class departure scores would be approximately 47 at year 50.

Table 289. Wallowa-Whitman National Forest fire regime condition class departure score (zero-100) for the dry upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	56	56	56	56	56	56
Year 20	57	57	58	52	54	56
Year 50	53	52	54	47	47	50

Under alternatives D and E, departure scores would be lower due to the increased levels of timber harvest activities, mechanical fuels treatments, and/or prescribed burning associated with these alternatives. Alternatives D and E would also show improvement at a faster rate because of the increased harvesting of smaller trees within the old forest, which may decrease mortality in older age classes (due to decreased moisture stress and fire severity) and modify closed canopy to open canopy. However, alternative D would not include prescribed burning outside of harvest units and would include decreased amounts of prescribed burning within harvest units. Under this alternative, the majority of fuels treatments within harvest units would be accomplished by removal or crushing instead of burning. Because alternative E includes the reintroduction of fire to the ecosystem in addition to reducing the amount of departure in the dry upland forest vegetation, alternative E would be expected to result in increased ecological resiliency in the Wallowa-Whitman dry upland forest potential vegetation group. With this alternative, fuel composition, fire frequency, severity, pattern, and other associated disturbances would more closely resemble the HRV. Under alternative E, the risk of fire behavior, effects and associated disturbances would be similar to those that occurred prior to interruption of the historical low severity fire regime. Although the risk of loss of key ecosystem components, such as native species, large trees, and soil, would be lower under both alternatives D and E, the lack of fire under alternative D would inhibit other ecological processes. Fire is essential to nutrient cycling in fire adapted ecosystems. Fire has a fertilizer effect on the soil by increasing ammonium levels and microbial nitrogen mineralization, resulting in increased nutrient levels in both understory and overstory vegetation. Fire rejuvenates desirable grasses, depending on the species response to disturbance (i.e., sprouters, prolific seeders, and species with strong rhizome extension respond favorably to fire). Especially in combination with reduced stand densities, fire results in changes in the microclimate on the forest floor, specifically increased sunlight penetration, increased soil temperatures, and increased understory productivity. Fire has been shown to result in significant increases in herbaceous biomass, species richness, and understory productivity and diversity. Depending on timing, fire may also increase seedling establishment by aiding in seed bed and site preparation. Fire would also aid in the creation of openings for regeneration.

Under alternative C, the fire regime condition class departure score would be 54 at year 50, the highest departure score among the alternatives. Conditions would be more highly departed from the HRV under alternative C due to increased stand densities and altered species compositions resulting from the lower levels of timber harvest and prescribed burning associated with this alternative. Alternative C would result in decreased ecological resiliency in the Wallowa-Whitman dry upland forest potential vegetation group because vegetation characteristics and other conditions would least resemble the HRV. The risk of loss of key ecosystem components, such as native species, large trees, and soil, would be greatest under alternative C due to an increased risk of uncharacteristically severe fire behavior.

Moist Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman moist upland forest potential vegetation group, all of the alternatives would result in achievement of the desired conditions for fire regime condition class (class 1) at year 50. This is because the amount of

departure between the existing conditions and the HRV is low. Under all of the alternatives, the fire regime condition class departure scores would range from approximately 18 to 26 at year 50.

Table 290. Wallowa-Whitman National Forest fire regime condition class departure score (zero-100) for the moist upland forest potential vegetation group

Timeframe	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Existing Condition	23	23	23	23	23	23
Year 20	24	22	23	21	21	22
Year 50	26	23	20	18	18	21

Fire Severity Effects

All of the alternatives would have the potential to influence the number of acres of wildfire and the associated distribution of severity classes. The VDDT model as used is nonspatial, so no analysis of the effects of treatments on fire size was completed. In reality, the spatial location of treatment acres relative to landscape and vegetation patterns can influence the size of fires (Finney 2001, Reinhardt 2008). It is assumed that the actual treatments implemented would be strategically located to leverage the benefit that they would provide in managing towards the desired conditions for fire severities and frequencies. Vegetation types that consist of smaller diameter, dense, multi-storied, and thinner bark species (alpine fir, spruce) would have a higher probability of a mixed or high severity fire.

Fire return intervals are now much longer than those estimated to have occurred historically. These changes are most apparent in the dry upland forest potential vegetation group. Data indicates that the amount of fire has increased in the last 25 year period. Much of the fire that has occurred in the warm-dry systems has been high severity fire, as opposed to the low severity fires that historically dominated these areas.

Fire severity data indicates that, under severe fire weather conditions, much of the area has the potential for high severity fire (based on CVS data and the forest vegetation simulator-fire/fuel extension modeling). The current potential for high severity fire within the cold and moist upland forest potential vegetation groups exhibits the least amount of departure from historical/reference values. Even though the cold and moist upland forest potential vegetation groups show the potential for a moderate to high amount of high severity fire (32 to 55 percent of each potential vegetation group), this amount of fire is consistent with the mixed to infrequent high severity fires that historically dominated these systems. Within the dry upland forest potential vegetation group, the potential for high severity fire ranges from approximately 50 to 55 percent, which indicates a moderate to high increase in high severity fires, compared to historical/reference conditions. This current increase in potential fire severity reduces landscape resiliency, especially with the potential for longer fire seasons with increased fire severity effects due to climate change.

Under all of the alternatives, the VDDT predicted acres burned in the fifth decade decreased slightly when comparing the acres burned in the second decade. The average acres burned (since 1980, based on actual wildland fire history data) on National Forest System lands in the Blue Mountains was about 22,000 acres. With the model, the predicted acres burned increased to 25,000 acres per year in the second decade, and then decreased slightly to 16,000 acres per year.

Cold Upland Forest Potential Vegetation Group

Within the cold upland forest potential vegetation group, all of the alternatives would result in a high proportion of high severity fire through time within all three national forests. This would be within the HRV/desired condition range for the percent of high severity fire within the cold upland forest potential vegetation group. High severity fire is the historical fire regime within the cold upland forest potential vegetation group. Because only 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group, fire severity would not be substantially altered as a result of the alternatives. All of the alternatives would utilize wildfire for resource benefits (unplanned ignitions) within the cold upland forest potential vegetation group.

Moist Upland Forest Potential Vegetation Group

Within the moist upland forest potential vegetation group, alternatives D and E would result in the closest achievement of the desired conditions for fire severity within all three national forests. The potential for high severity fire would be reduced the most under alternatives D and E due to the increased levels of timber harvest activities, mechanical fuels treatments, and/or use of fire associated with these alternatives. The increased levels of harvesting activities under alternatives D and E would result in an increased percent of the landscape in open stand densities. Decreased stand densities result in decreased crown continuity, decreased fuel loadings, increased wind speeds required to initiate and sustain a crown fire, and decreased fire severity. Decreased stand densities would also result in regeneration of more shade intolerant/fire tolerant tree species. Although there would be substantial reductions in the potential for high severity fire under alternatives D and E, mixed severity fire would maintain a role in the moist upland forest potential vegetation group. Mixed severity fire is the historical fire regime within the moist upland forest potential vegetation group.

Dry Upland Forest Potential Vegetation Group

Within the dry upland forest potential vegetation group within all three national forests, alternatives D and E would most closely achieve the desired conditions for fire severity within each of the three national forests. The potential for high severity fire would be reduced the most under alternatives D and E due to the increased levels of timber harvest activities, mechanical fuels treatments, and/or fire associated with these alternatives. The increased levels of harvesting activities under alternatives D and E would result in an increased percent of the landscape in open stand densities and would create a more open forest structure that more closely resembles the forest structure that existed prior to interruption of the historical frequent fire regime. A more open forest structure would result in decreased competition between trees for moisture, nutrients, and sunlight, increased tree health, growth, and vigor, decreased risk of insect attack and mortality, increased spatial heterogeneity, decreased crown continuity, decreased fuel loadings, increased wind speeds required to initiate and sustain a crown fire, and decreased fire severity. Decreased stand densities would also result in increased regeneration of more shade intolerant tree species and closer achievement of the desired conditions for species composition. Shade intolerant tree species such as ponderosa pine are better adapted to a frequent fire regime, better able to withstand low severity fire, and result in a lower fire hazard. Alternatives D and E would result in increased ecological resiliency in the dry upland forest potential vegetation group by decreasing fire severity across the landscape. The increased percent of the landscape in open stand densities would also aid in the reintroduction of low severity surface fire into the ecosystem. Because alternatives D and E would result in an increased number of acres of timber harvest activities and an increased percent of the landscape in open stand densities, there would be more opportunities to use wildfire for resource benefits, in comparison to alternative C.

Within the dry upland forest potential vegetation group within all three national forests, the potential for high severity fire would be highest under alternative C due to the decreased levels of timber harvest activities associated with this alternative. Alternative C would result in an increased percent of the landscape in closed stand densities. Increased stand densities would result in increased crown continuity, increased fuel loading, decreased wind speeds required to initiate and sustain a crown fire, and increased fire severity. Increased stand densities would also result in regeneration of more shade tolerant/fire intolerant tree species. In theory, alternative C would rely mainly on the use of fire (planned and unplanned ignitions) to reduce stand densities. Rather than harvesting trees to reduce tree densities, trees would be thinned by fire under alternative C. However, due to the high percent of the landscape in closed stand densities and the potential for very high levels of mortality and high severity fire effects to other resources such as soils, the window or time frame under which fire could and would be managed to achieve the desired conditions for stand densities, structural stages, and species composition would be limited and unrealistic based on current conditions and the inability to reintroduce low severity fire effects. Additionally, the levels of smoke emissions generated under alternative C would be substantially increased, further limiting burn windows and the amount of acres that could be burned due to the increased levels of particulate matter generated. Impacts to public health from the likelihood of exceeding air quality standards would also substantially limit the amount of acres that could be burned under alternative C. Alternative C would likely result in increased fire severity, decreased ecological resiliency, and loss of key ecosystem components and functions due to scope and scale of fire severity outside that which historically occurred within the dry upland forest potential vegetation group.

Insect and Disease Effects

The alternatives that would result in the closest achievement of the HRV/desired conditions for structural stages, species composition, and stand densities would result in the greatest reduction in insect and disease risk hazard. Insects such as bark beetles tend to favor a particular age or size class. A landscape that contains a diversity of structural stages consistent with that which evolved within the historic disturbance regime would be more resilient to perturbation by disturbance agents, such as insects, disease, and fire. Additionally, as older age classes succumb to insects and disease, younger age classes would be available to take their place, thus ensuring a sustainable forest structure over time.

Lower stand densities and a more open forest structure would result in decreased competition between trees for moisture, nutrients, and sunlight, which would increase tree health, growth, and vigor, decrease susceptibility to insects and diseases, decrease the risk of insect attack and mortality, decrease continuity of preferred tree species and age and size classes, and improve overall forest health. A tree’s natural defense mechanisms, such as the production of pitch, would also be intact and trees would be better able to withstand or ward off attack from insects such as bark beetles. A more open forest structure would also aid in the dispersal of pheromones released by bark beetles that signal other bark beetles to aggregate and attack trees in an area. Openings within a stand also inhibit the spread of diseases such as dwarf mistletoe.

Species composition also affects insect and disease risk. Different insects and diseases tend to favor a particular tree species. A landscape that contains a diversity of species consistent with the HRV would be more resilient to perturbation from insects and disease. Species that evolved over time and occurred on a site historically would be better adapted to site conditions in terms of moisture, drought, soil characteristics, fire, insect, and disease tolerance. Off-site species that have encroached into other forest types over the past century due to fire suppression would be less drought- and fire-tolerant and more susceptible to moisture stress and damage by fire, insect

attack, and disease. As temperatures increase with anticipated climate changes, off-site species would be more prone to moisture stress, at increased risk of insect attack and mortality, and less adapted to warmer temperatures and lower precipitation.

Malheur National Forest

Cold Upland Forest Potential Vegetation Group – Within the Malheur cold upland forest potential vegetation group, very little active management would occur in this potential vegetation group. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group. Much of the potential vegetation group would be wilderness, roadless, or backcountry areas. Additionally, the cold upland forest potential vegetation group, in general, tends to exhibit the least amount of departure from the HRV. The historical fire regime was characterized by infrequent fire; therefore this forest type has experienced the fewest number of missed fires.

Under alternatives D, E, and F, the projected percent of the landscape in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 2 to 3 percent at year 50 (table 255). Under alternatives A, B, and C, the projected percent of the landscape in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 5 to 6 percent at year 50 (table 255). Under alternatives B, C, E, and F, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 23 percent (table 264). Under alternatives A and D, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 24 percent and 25 percent, respectively, at year 50 (table 264).

None of the alternatives would achieve the desired conditions for stand densities at year 50 due to the large variation between existing and desired conditions. Currently, approximately 88 percent of the cold upland forest potential vegetation group is in open stand densities (table 273). The desired condition would be to reduce the percent of the cold upland forest potential vegetation group in open stand densities to 20 to 30 percent and increase the percent of the cold upland forest potential vegetation group in closed stand densities to 65 to 80 percent. Under all of the alternatives, the percent of the landscape in open forest would remain above the desired condition range at year 50 due to mortality from wildfire, insects, and disease exceeding growth rates. Under alternatives A and C, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 31 percent at year 50 (table 273). Under alternatives B, D, E, and F, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 33 to 43 percent at year 50 (table 273).

With little active management occurring in the cold upland forest potential vegetation group under any of the alternatives to substantially alter structural stages, species composition, and stand densities, mortality from insects, disease, and wildfire would be expected to continue to result in stand-replacing events consistent with the historic disturbance regimes.

Dry Upland Forest Potential Vegetation Group – Within the Malheur dry upland forest potential vegetation group, the alternatives would result in a substantial difference in the reduction of insect and disease risk hazard because more active management would occur in the dry upland forest potential vegetation group. Approximately 60 to 90 percent of the harvest activities would occur within the dry upland forest potential vegetation group. Additionally, the

dry upland forest potential vegetation group in general tends to exhibit the greatest amount of departure from the HRV. The historical fire regime was characterized by more frequent fire; therefore these forest types have experienced the greatest number of missed fires.

At year 50, alternatives D and E would result in the greatest reduction in insect and disease risk hazard and greatest improvement in overall forest health because these alternatives would result in the closest achievement of the desired conditions for forested structural stages, species composition, and stand densities within the Malheur dry upland forest potential vegetation group. Alternatives D and E would result in increased ecological resiliency within the Malheur dry upland forest potential vegetation group by decreasing stand densities and creating a more open forest structure that more closely resembles the historical forest structure and species composition that existed prior to interruption of the historical frequent fire regime. This is because of the increased levels of timber harvest activities associated with these alternatives. Under alternatives D and E, the projected percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 49 percent and 50 percent, respectively, at year 50 (table 256). Alternative D would result in achievement of the desired conditions for species composition at year 50 (table 265). Under alternative E, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 2 percent at year 50 (table 265). Under alternatives D and E, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 16 percent and 22 percent, respectively, at year 50 (table 274).

Within the Malheur dry upland forest potential vegetation group, alternative C would be the least effective alternative in reducing the insect and disease risk hazard because this alternative would result in the greatest amount of variation from the desired conditions for structural stages (table 256), species composition (table 265), and stand densities (table 274) at year 50. Under alternative C, the percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 70 percent at year 50. Under alternative C, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 10 percent at year 50. Under alternative C, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 59 percent at year 50. Alternative C would result in the least amount of improvement in overall forest health and ecological resiliency within the Malheur dry upland forest potential vegetation group by maintaining higher stand densities and a more departed forest structure that less resembles the historical forest structure and species composition that existed prior to interruption of the historical frequent fire regime.

Moist Upland Forest Potential Vegetation Group – Within the Malheur moist upland forest potential vegetation group, the alternatives would result in a difference in the reduction of insect and disease risk hazard. However, the difference between the alternatives would not be as substantial as in the dry upland forest potential vegetation group. The moist upland forest potential vegetation group would be less actively managed than the dry upland forest potential vegetation group. Only approximately 10 to 30 percent of the harvest activities would occur within the moist upland forest potential vegetation group. Additionally, in comparison to the dry upland forest potential vegetation group, the moist upland forest potential vegetation group in general exhibits a lesser amount of departure from the HRV because the historical fire regime was characterized by fires of mixed frequency and severity. Therefore, these forest types have experienced a fewer number of missed fires.

All of the alternatives would result in a general reduction in insect and disease risk hazard due to decreased stand densities (table 275). Alternatives A, B, C, and F would all result in the achievement of the desired conditions for stand densities. The projected percent of the landscape in open and closed forest would be within the desired condition ranges at year 50. However, under alternative E, the projected percent of the landscape of open and closed forest would only vary from the desired condition ranges by a summed total of approximately 1 percent at year 50. Under alternative D, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 10 percent at year 50. Alternative D would result in slightly more open stand conditions at year 50 than the HRV/desired condition range. When taken in the context of climate change, slightly more open stand conditions may be desirable to reduce insect and disease risk hazards that are anticipated to increase with increasing temperatures.

Within the Malheur moist upland forest potential vegetation group, alternatives D and E, would result in a further reduction in insect and disease risk hazard by year 50 because these alternatives result in the closest achievement of the desired conditions for forested structural stages (table 257) and species composition (table 266). This is because of the increased levels of timber harvest activities associated with these alternatives. Under alternatives D and E, the projected percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 28 percent and 39 percent, respectively, at year 50. Under alternatives D and E, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 48 percent and 51 percent, respectively, at year 50.

Within the Malheur moist upland forest potential vegetation group, alternatives A, B, and C would be less effective at reducing the insect and disease risk hazard because these alternatives would result in a greater amount of variation from the desired conditions for structural stages (table 257) and species composition (table 266) at year 50. Under alternatives A, B, and C, the percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 55 to 59 percent at year 50. Under alternatives A, B, and C, the projected percent of the landscape in each of the species composition tolerance classes would vary from desired condition ranges by a summed total of approximately 58 percent at year 50.

Umatilla National Forest

Cold Upland Forest Potential Vegetation Group – Within the Umatilla cold upland forest potential vegetation group, very little active management would occur in this potential vegetation group. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Additionally, the cold upland forest potential vegetation group in general tends to exhibit the least amount of departure from the HRV because the historical fire regime was characterized by infrequent fire; therefore this forest type has experienced the fewest number of missed fires.

Under alternatives A, B, and C, the projected percent of the landscape in each of the forested structural stages would be within the desired condition ranges at year 50 (table 258). However, under alternatives D, E, and F, the projected percent of the landscape in each of the forested structural stages would only vary from the desired condition ranges by a summed total of approximately 1 to 5 percent of the landscape at year 50. Under alternatives A, B, and C, the projected percent of the landscape in each of the species composition tolerance classes would

vary from the desired condition ranges by a summed total of approximately 12 percent (table 267). Under alternatives D, E, and F, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 14 percent, 13 percent, and 13 percent, respectively, at year 50.

None of the alternatives would achieve the desired conditions for stand densities at year 50. Under all of the alternatives, the percent of the landscape in open forest would remain above the desired condition range at year 50 due to mortality from wildfire, insects, and disease exceeding growth rates. With little active management occurring in the cold upland forest potential vegetation group under all of the alternatives which would alter structural stages, species composition, and stand densities, mortality from insects, disease, and wildfire would be expected to continue to result in stand-replacing events consistent with the historic disturbance regimes.

Dry Upland Forest Potential Vegetation Group – Within the Umatilla dry upland forest potential vegetation group, the alternatives would result in a substantial difference in the reduction of insect and disease risk hazard because more active management would occur in the dry upland forest potential vegetation group. Approximately 60 to 90 percent of the harvest activities would occur within the dry upland forest potential vegetation group. Additionally, the dry upland forest potential vegetation group in general tends to exhibit the greatest amount of departure from the HRV. The historical fire regime was characterized by more frequent fire; therefore these forest types have experienced the greatest number of missed fires.

At year 50, alternatives D and E would result in the greatest reduction in insect and disease risk hazard and greatest improvement in overall forest health because these alternatives would result in the closest achievement of the desired conditions for forested structural stages (table 259), species composition (table 268), and stand densities (table 277) within the Umatilla dry upland forest potential vegetation group. Alternatives D and E would result in increased ecological resiliency within the Umatilla dry upland forest potential vegetation group by decreasing stand densities and creating a more open forest structure that more closely resembles the historical forest structure and species composition that existed prior to interruption of the historical frequent fire regime. This is because of the increased levels of timber harvest activities associated with these alternatives. Under alternatives E and D, the projected percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 57 percent and 58 percent, respectively, at year 50. Under alternatives D and E, the projected percent of species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 19 percent and 31 percent, respectively, at year 50. Under alternatives D and E, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 6 percent and 20 percent, respectively, at year 50.

Within the Umatilla dry upland forest potential vegetation group, alternative C would be the least effective alternative in reducing the insect and disease risk hazard because this alternative would result in the greatest amount of variation from the desired conditions for structural stages (table 259), species composition (table 268), and stand densities (table 277) at year 50. Under alternative C, at year 50, the percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 68 percent; the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 59 percent; and, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 63 percent . Alternative C would result in the least amount of

improvement in overall forest health and ecological resiliency within the Umatilla dry upland forest potential vegetation group by maintaining higher stand densities and a more departed forest structure that less resembles the historical forest structure and species composition that existed prior to interruption of the historical frequent fire regime.

Moist Upland Forest Potential Vegetation Group – Within the Umatilla moist upland forest potential vegetation group, the alternatives would result in a difference in the reduction of insect and disease risk hazard. However, the difference between the alternatives would not be as substantial as in the dry upland forest potential vegetation group. The moist upland forest potential vegetation group would be less actively managed than the dry upland forest potential vegetation group. Only approximately 10 to 30 percent of the harvest activities would occur within the moist upland forest potential vegetation group. Additionally, in comparison to the dry upland forest potential vegetation group, the moist upland forest potential vegetation group in general exhibits a lesser amount of departure from the HRV because the historical fire regime was characterized by fires that burned with mixed frequency and severity. Therefore, these forest types have experienced a fewer number of missed fires.

All of the alternatives would result in a general reduction in insect and disease risk hazard due to decreased stand densities (table 278). Alternatives A, B, C, and F would result in the achievement of the desired conditions for stand densities. The projected percent of the landscape in open and closed forest would be within the desired condition ranges at year 50. Under alternatives D and E, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 18 percent and 11 percent, respectively, at year 50. Alternatives D and E would result in slightly more open stand conditions at year 50 than the HRV/desired condition range. When taken in the context of climate change, slightly more open stand conditions may be desirable to reduce insect and disease risk hazards that are anticipated to increase with increasing temperatures.

Within the Umatilla moist upland forest potential vegetation group, alternatives D and E would result in further reduction in insect and disease risk hazard by year 50 because these alternatives result in the closest achievement of the desired conditions for forested structural stages (table 260) and species composition (table 269). This is because of the increased levels of timber harvest activities associated with these alternatives. Under alternatives D and E, the projected percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 26 percent and 21 percent, respectively, at year 50. Under alternatives D and E, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 40 percent at year 50.

Within the Umatilla moist upland forest potential vegetation group, alternatives A and C would be less effective at reducing the insect and disease risk hazard because these alternatives would result in a greater amount of variation from the desired conditions for structural stages (table 260) and species composition (table 269) at year 50. Under alternatives A and C, the percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 35 to 36 percent at year 50. Under alternatives A and C, the projected percent of the landscape in each of the species composition tolerance classes would vary from desired condition ranges by a summed total of approximately 49 percent at year 50.

Wallowa-Whitman National Forest

Cold Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman cold upland forest potential vegetation group, very little active management would occur in the cold upland forest potential vegetation group. Only approximately 5 to 10 percent of the harvest activities would occur within the cold upland forest potential vegetation group. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Additionally, the cold upland forest potential vegetation group in general tends to exhibit the least amount of departure from the HRV. The historical fire regime was characterized by infrequent fire; therefore this forest type has experienced the fewest number of missed fires.

Under alternatives D and E, the projected percent of the landscape in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 7 percent and 8 percent, respectively, at year 50 (table 261). However, under alternatives A, B, C, and F, the projected percent of the landscape in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 11 to 14 percent at year 50. Under all of the alternatives, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 1 to 3 percent at year 50 (table 270).

None of the alternatives would achieve the desired conditions for stand densities at year 50 (table 279). Under all of the alternatives, the percent of the landscape in open forest would remain above the desired condition range at year 50 due to mortality from wildfire, insects, and disease exceeding growth rates. With little active management occurring in the cold upland forest potential vegetation group under all of the alternatives which would alter structural stages, species composition, and stand densities, mortality from insects, disease, and wildfire would be expected to continue to result in stand-replacing events consistent with the historic disturbance regimes.

Dry Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman dry upland forest potential vegetation group, the alternatives would result in a substantial difference in the reduction of insect and disease risk hazard because more active management would occur in the dry upland forest potential vegetation group. Approximately 60 to 90 percent of the harvest activities would occur within the dry upland forest potential vegetation group. Additionally, the dry upland forest potential vegetation group in general tends to exhibit the greatest amount of departure from the HRV. The historical fire regime was characterized by frequent fire; therefore these forest types have experienced the greatest number of missed fires.

At year 50, alternatives D and E would result in the greatest reduction in insect and disease risk hazard and greatest improvement in overall forest health because these alternatives would result in the closest achievement of the desired conditions for forested structural stages (table 262), species composition (table 271), and stand densities (table 280) within the Wallowa-Whitman dry upland forest potential vegetation group. Alternatives D and E would result in increased ecological resiliency within the Wallowa-Whitman dry upland forest potential vegetation group by decreasing stand densities and creating a more open forest structure that more closely resembles the historical forest structure and species composition that existed prior to interruption of the historical frequent fire regime. This is because of the increased levels of timber harvest activities associated with these alternatives. At year 50, under alternatives D and E, the projected percent of the landscape in each of the forested structural stages would vary from the desired condition ranges by a summed total of approximately 66 percent; the projected percent of species composition tolerance classes would vary from the desired condition ranges by a summed total of

approximately 21 percent and 35 percent, respectively; and, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 6 percent and 22 percent, respectively.

Within the Wallowa-Whitman dry upland forest potential vegetation group, alternative C would be the least effective alternative in reducing the insect and disease risk hazard because this alternative would result in the greatest amount of variation from the desired conditions for structural stages (table 262), species composition (table 271), and stand densities (table 280) at year 50. Under alternative C, the percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 77 percent at year 50. Under alternative C, the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 59 percent at year 50. Under alternative C, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 56 percent at year 50. Alternative C would result in the least amount of improvement in overall forest health and ecological resiliency within the Wallowa-Whitman dry upland forest potential vegetation group by maintaining higher stand densities and a more departed forest structure that less resembles the historical forest structure and species composition that existed prior to interruption of the historical frequent fire regime.

Moist Upland Forest Potential Vegetation Group – Within the Wallowa-Whitman moist upland forest potential vegetation group, the alternatives would result in a difference in the reduction of insect and disease risk hazard. However, the difference between the alternatives would not be as substantial as in the dry upland forest potential vegetation group. The moist upland forest potential vegetation group would be less actively managed than the dry upland forest potential vegetation group. Only approximately 10 to 30 percent of the harvest activities would occur within the moist upland forest potential vegetation group. Additionally, in comparison to the dry upland forest potential vegetation group, the moist upland forest potential vegetation group in general exhibits a lesser amount of departure from the HRV because the historical fire regime was characterized by fires that burned with mixed frequency and severity. Therefore, these forest types have experienced a fewer number of missed fires.

All of the alternatives would result in a general reduction in insect and disease risk hazard due to decreased stand densities (table 281). Alternative C would result in achievement of the desired conditions for stand densities. Under alternative C, the projected percent of the landscape in open and closed forest would be within the desired condition ranges at year 50. Under alternatives A, B, and F, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 2-6 percent at year 50. Under alternatives D and E, the projected percent of the landscape in open and closed forest would vary from the desired condition ranges by a summed total of approximately 26 percent and 18 percent, respectively, at year 50. Alternatives D and E would result in slightly more open stand conditions at year 50 than the HRV/desired condition range. When taken in the context of climate change, slightly more open stand conditions would be desirable to reduce insect and disease risk hazards that are anticipated to increase with increasing temperatures.

Within the Wallowa-Whitman moist upland forest potential vegetation group, alternatives D and E, would result in a further reduction in insect and disease risk hazard by year 50 because these alternatives result in the closest achievement of the desired conditions for forested structural stages (table 263) and species composition (table 272). This is because of the increased levels of timber harvest activities associated with these alternatives. At year 50 under alternatives D and E,

the projected percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 12 percent and 14 percent, and the projected percent of the landscape in each of the species composition tolerance classes would vary from the desired condition ranges by a summed total of approximately 12 percent and 13 percent, respectively.

Within the Wallowa-Whitman moist upland forest potential vegetation group, alternatives A and C would be less effective at reducing the insect and disease risk hazard because these alternatives would result in a greater amount of variation from the desired conditions for structural stages (table 263) and species composition (table 272) at year 50. Under alternatives A and C at year 50, the percent of the landscape in each of the structural stages would vary from the desired condition ranges by a summed total of approximately 32 percent and the projected percent of the landscape in each of the species composition tolerance classes would vary from desired condition ranges by a summed total of approximately 21 percent.

Lands Suitable for Timber Production for Each Alternative

The NFMA requires that National Forest System lands be classified as to their suitability and availability for timber harvest and production. National Forest System lands were originally reserved with the intent of providing goods and services that would contribute to public interest and needs for the long term, including a sustainable supply of timber and related forest products.

Three important considerations exist for classifying National Forest System lands as suitable for timber production or unsuitable for timber production, but available for timber harvest:

1. Achieving and maintaining forest desired conditions using planned and regulated timber harvest
2. Restoring fire-adapted ecosystems and associated species habitats
3. Providing wood products that contribute to sustaining a wood products processing industry that is essential to continued forestland restoration.

To address these considerations, some level of regulated forest production is necessary and appropriate on forested lands within the administrative boundary of the national forest. Where biophysical, socio-economic, or legal constraints preclude scheduling planned and/or periodic harvests, some forested lands may not be deemed suitable for timber production even though they meet the definition of forested lands. In other areas, lands that are classified as unsuitable for timber production could be made available for timber harvest where such harvests are implemented on an unregulated basis with the intent to achieve multiple-use resource management objectives associated with a specific management area or prescription. Lands suitable for timber production form the basis for the calculation of the allowable sale quantity (ASQ) and the long term sustained yield capacity (LTSYC).

A timber suitability analysis following the NFMA and 36CFR 219.14 was completed as a part of the planning process (see Countryman 2010 process paper). The following paragraphs summarize the process. This process is basically a series of subtractions of land from the total forest land base utilizing the following 3 broad categories to identify lands not available for timber production:

1. National Forest System lands that have been withdrawn from wood product production. These are lands designated by Congress, the Secretary of Agriculture, or the Chief of the

Forest Service for other multiple-use objectives that preclude timber production (e.g., units of the National Wilderness Preservation System and Research Natural Areas).

2. National Forest System lands (exclusive of withdrawn areas) that are not forested, including lands that are incapable of supporting 10 percent tree cover; administrative sites; and lands maintained in a nonforest condition, such as power line rights-of-way.
3. Available forestland physically unsuited for timber production due to the inability to ensure adequate restocking or the potential for irreversible damage to soils or watersheds. However, acres within these forest types are considered available for timber harvest where irreversible damage to soils or watersheds would not result and where such activities contributed to underlying management emphases and objectives.

Forestlands remaining after identifying the subset of unsuitable forestlands described above are those that are tentatively available for and capable of timber production, and are also referred to as tentatively suitable forestland. Tentatively suitable forestlands represent the maximum number of acres that could be managed for regular and predictable wood product outputs (i.e., timber production). These acres remained constant as a starting point for the development of alternatives. Tentatively suitable lands were then separated into two categories based on the design parameters and objectives for each alternative. The lands were identified as:

1. Suitable for timber production
2. Unsuitable for timber production, but available for timber harvest if needed to meet desired conditions and objectives (NFMA sec (6)(k))

Areas that may have been identified as tentatively suitable, but later identified as unsuited for production during the development of alternatives, include riparian management areas, old forest, and undeveloped backcountry areas. Table 291 displays lands tentatively suitable for timber production by forest. See the comparison of alternatives for a display of suitable acres by alternative.

Table 291. Lands tentatively suitable for timber production (step A of 36CFR 219.14)

Category	MAL	UMA	WAW
1. NFS lands total (acres)	**1,700,000**	**1,400,000**	**1,800,000**
a. Non-forest land	215,000	199,000	250,000
b. Potential for irreversible damage	0	0	0
c. No assurance of adequate restocking	139,000	37,000	150,000
d. Forest land withdrawn from production	101,000	347,000	390,000
2. Total unsuitable land (acres)	455,000	583,000	790,000
3. Tentatively suitable forest land (acres)	1,245,000	817,000	1,010,000

Inventoried roadless areas (IRAs) were also subtracted from lands tentatively suitable for timber production, thus reducing the number of acres available. While IRAs are not suitable for timber production, silvicultural treatments which focus on the removal of generally small diameter timber could occur on an infrequent basis to improve TES species habitat or to reduce the risk of uncharacteristic wildfire.

The design of the alternatives further influenced the acres suitable for timber production. Table 292 displays the acres suitable for timber production under each of the alternatives by national forest. Each alternative started with the areas identified as tentatively suitable (see 36CFR 219.14

timber resource land suitability) for timber production displayed in table 291. Design parameters for each alternative resulted in a subtraction in acres suitable for timber production from the tentatively suitable acres. The main factors/criteria resulting in a change from suitable to unsuitable included changing classification of the following types of areas to unsuitable: old forest, riparian management areas, MA 3A and 3B (backcountry),MA 1B (preliminary administratively recommended wilderness areas), and specially designated areas (RNAs, municipal watersheds, and so on; see Countryman 2011 timber suitability process paper). Under most of the alternatives, these management areas were not compatible with the definition of timber production (regularly scheduled entries) or objectives of the alternatives.

Table 292. Acres suitable for timber production

National Forest	Tentatively Suitable	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	1,245,000	780,000	770,000	530,000	1,080,000	770,000	770,000
UMA	817,000	380,000	420,000	260,000	610,000	420,000	420,000
WAW	1,010,000	590,000	530,000	310,000	770,000	530,000	530,000

Table 293. Lands suitable for timber production as a percentage of National Forest System lands (forested)

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	52	52	35	72	52	52
UMA	35	38	24	55	38	38
WAW	37	33	19	48	33	33

Alternatives B, E, and F would result in the same number of acres suitable for timber production because these alternatives contain the same standards, guidelines, and similar management allocations that influence suitability. Even though the acres of MA 1B (preliminary administratively recommended wilderness areas) and MA 3 A and 3B would differ between alternatives B, E, and F, the difference would not result in a substantial change in suitability because the acres that would be shifted into or out of recommended wilderness areas would be classified as unsuitable for timber production. Suitable acres would be approximately 30 to 50 percent of the entire forested landbase, as displayed in table 298.

Alternative C would result in the fewest acres suitable for timber production because this alternative would result in a greater number of acres of recommended wilderness and wider riparian management areas, both of which are unsuitable for timber production. Alternative C would also retain all of the old forest management areas from alternative A. Old forest management areas and old forest stands would be unsuitable for timber production. Additional areas in wildlife corridor management areas identified would be unsuitable for timber production. Lands suitable for timber production would be approximately 19 percent of the total forested landbase within the Wallowa-Whitman National Forest, approximately 24 percent within the Umatilla National Forest, and approximately 35 percent within the Malheur National Forest.

Alternative D would result in the highest number of acres suitable for timber production within all three national forests. Under alternative D, riparian management areas would be narrower. Additionally, old forest would be reclassified as suitable for timber production. Alternative D would result in the highest percent of lands suitable for timber production within all three national

forests, when compared to the total forested landbase; approximately 48 percent within the Wallowa-Whitman National Forest; approximately 55 percent within the Umatilla National Forest; and approximately 72 percent within the Malheur National Forest.

Allowable Sale Quantity Effects

The allowable sale quantity is the upper limit of the amount of timber volume potentially available for harvest on forestlands suitable for timber production during a specified time period, usually a decade, while moving the landscape towards the desired conditions and while meeting other planning rule requirements. This volume is not a guaranteed harvest volume. Allowable sale quantity is the maximum amount of volume potentially available on timber suitable lands unconstrained by budget. The actual volume offered would be the aggregate of individual project proposals and would be dependent upon a number of factors, including annual budget and organizational capabilities. Actual volumes offered may also include volumes harvested from lands unsuitable for timber production but available for timber harvest, such as riparian management areas and old forest. Allowable sale quantity volume is also described as chargeable volume because it would be applied toward the decadal allowable sale quantity.

Allowable sale quantity includes only those volumes that meet utilization standards and that would be removed from lands suitable for timber production. The calculation of allowable sale quantity assumed any restrictions associated with the current landscape condition. Volume not in the allowable sale quantity includes unsound material, salvageable dead logs (unless included in yield tables), fuelwood, or any volume generated from harvest activities within unsuitable forestland. Yield tables were developed using the forest vegetation simulator (FVS), (Wykoff 1986) and VDDT. Yields were assigned based on a combination of vegetation state class (tree size class and canopy cover) and type of treatment (e.g., commercial thin, selection, and regeneration harvest). Total volume estimates were generated for each alternative by multiplying the total acres treated with a particular prescription, times the yield for a particular vegetation state class.

The base schedule of treatment activities in the model reflects the intensities of management and the amount of timber utilization consistent with the goals, assumptions, and standards contained or used in development of a proposed alternative. The base schedule is a timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and that this planned sale and harvest for any decade is not greater than the long-term sustained yield capacity (see following section). This definition expresses the principle of nondeclining flow. In addition to the long-term sustained yield capacity requirements, the first decade allowable sale quantity must meet the nondeclining flow requirements unless departure from the base schedule is determined to be warranted. The need for considering departures has not been identified at this time, so all of the alternatives would be consistent with the nondeclining flow requirements.

Wood product yields from suitable forestlands likely to result from an alternative management strategy depend on several factors, including the mix of allocations, the respective management emphasis, and associated forested vegetation desired conditions. As discussed under the methodology section, the VDDT model was used to estimate allowable sale quantity for each of the alternatives based on the assumptions discussed.

Table 294, table 295, and table 296, display the allowable sale quantity by alternative for each national forest. Under all of the alternatives, allowable sale quantity would be lower than those analyzed for the 1990 forest plans. This is the result of suitable acres being decreased under all of

the action alternatives compared to the 1990 forest plans. This would also be partially due to differences in the models that were used to predict harvest (FORPLAN versus VDDT).

While suitable lands are a primary component of allowable sale quantity, it is also based on the existing vegetation conditions (mix of structural stages and productivity classes), management emphasis, and the requirement to schedule a nondeclining flow of timber. In some instances, these factors can combine to create a nonlinear relationship between suitable acres and allowable sale quantity.

Table 294. Malheur National Forest timber sale program quantity (TSPQ), allowable sale quantity (ASQ), and long term sustained yield capacity (LTSYC) (million board feet per year)

Activity	1990 Forest Plan*	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
TSPQ	234-plus	30	31	16	87	56	37
ASQ	234	55	55	34	88	55	55
LTSYC	234-plus	86	86	59	125	86	86

Table 295. Umatilla National Forest timber sale program quantity (TSPQ), allowable sale quantity (ASQ), and long term sustained yield capacity (LTSYC) (million board feet per year)

Activity	1990 Forest Plan*	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
TSPQ	159	27	29	16	76	56	36
ASQ	124	51	51	31	73	51	51
LTSYC	184	53	53	32	79	53	53

Table 296. Wallowa-Whitman National Forest timber sale program quantity (TSPQ), allowable sale quantity (ASQ), and long term sustained yield capacity (LTSYC) (million board feet per year)

Activity	1990 Forest Plan*	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
TSPQ	206	24	27	15	80	50	34
ASQ	141	46	46	22	75	46	46
LTSYC	215	66	66	38	100	66	66

Alternative D would result in the highest allowable sale quantity within all three national forests. Under alternative D, allowable sale quantity would range from 73 million board feet within the Umatilla National Forest to 88 million board feet within the Malheur National Forest. Due to fewer acres allocated to wilderness, riparian areas, wildlife corridors, and old forest, alternative D would result in the greatest number of acres suitable for timber production. Alternative D would also be the least restrictive alternative in terms of timber harvest. The level of harvest would attempt to utilize a substantial portion of the net growth per year.

Alternative C would have the lowest allowable sale quantity within all three national forests. Under alternative C, allowable sale quantity would range from 22 million board feet within the Wallowa-Whitman National Forest to 31 million board feet within the Umatilla National Forest. Due to a greater number of acres allocated to wilderness, riparian areas, wildlife corridors, and old forest, alternative C would result in the fewest number of acres suitable for timber production. Alternative C would also be the most restrictive alternative in terms of timber harvest.

Alternatives B, E, and F would result in the same allowable sale quantity because these alternatives would have the same number of acres suitable for timber production, which is the

primary component of allowable sale quantity. Old forest and riparian management areas would be classified as unsuitable for timber production.

Long-term Sustained Yield Capacity Effects

Long-term sustained yield capacity (LTSYC) is the maximum amount of timber volume that can be sustainably harvested on lands suitable for timber production once the desired future conditions have been achieved. Long-term sustained yield capacity was summarized for the future time period of year 200 to 300. Generally, long-term sustained yield capacity is equivalent to annual increment. In order for yield or timber harvest to be sustainable in the long-term, annual yield or harvest would be equivalent to annual growth. In plain language, once desired conditions are achieved, harvest would not exceed growth so that desired conditions would be maintained over time. Long-term sustained yield capacity is calculated based on the determination of yield by prescription from regenerated stands, including, where appropriate, intermediate yields selected in the solution for a specific alternative. Calculations of long-term sustained yield capacity were not constrained by budget. The decadal allowable sale quantity cannot exceed long-term sustained yield capacity.

Table 294, table 295, and table 296 display the long-term sustained yield capacity by alternative for each national forest. Alternative D would result in the highest long-term sustained yield capacity within all three national forests. Alternative D would be the least restrictive alternative, in terms of timber harvest activities and would not allocate additional acres to wilderness, old forest, or wildlife corridors. Alternative D would also contain the most narrow riparian management areas. This would result in the greatest number of acres suitable for timber production under alternative D when compared to the other alternatives. In the long-term, alternative D would be able to sustain the largest timber harvest volumes due to fewer restrictions and an increased number of suitable acres. Long-term sustained yield capacity would range from 79 million board feet within the Umatilla National Forest to 125 million board feet within the Malheur National Forest.

Alternative C would have the lowest long-term sustained yield capacity within all three national forests. This is because alternative C would be relatively restrictive in terms of timber harvest activities. Additionally, alternative C would allocate a substantial amount of acres to wilderness, riparian areas, wildlife corridors, and old forest, which would result in a substantial decrease in the number of acres suitable for timber production. Under alternative C, long-term sustained yield capacity would range from 32 million board feet within the Umatilla National Forest to 59 million board feet within the Malheur National Forest.

As shown in table 296, alternatives B, E, and F would result in the same level of long-term sustained yield capacity within each national forest. This is because these alternatives have the same number of acres suitable for timber production.

Total Sale Program Quantity Effects

Total sale program quantity is the actual level of harvest volume predicted for each alternative. Total sale program quantity can come from lands suitable for timber production and lands unsuitable for timber production, as well as volume removed outside of the utilization standards. These estimates of volume were constrained by the budget assumptions assigned to each alternative. Lands unsuitable for timber production are available for timber harvest activities where harvest would contribute to meeting restoration objectives and desired conditions. Fuelwood was generally assumed to be included in timber sale program quantity and not allowable sale quantity, regardless of whether it is removed from suitable or unsuitable forestland.

Table 294, table 295, and table 296 display the timber sale program quantity by alternative within each national forest. Alternative D would result in the highest timber sale program quantity within all three national forests. This is because alternative D would result in the highest number of acres suitable for timber production. It would also be the least restrictive alternative in terms of timber harvest. Due to the increase in timber production under alternative D, the budgets required for vegetation management would need to be increased by approximately 170 to 195 percent from current levels. The budgets required for fuels reduction would also need to be increased by approximately 5 to 20 percent from current levels. Under alternative D, harvesting on lands suitable for timber production would occur at the allowable sale quantity. Total sale program quantity would exceed allowable sale quantity because the higher budget levels would also enable the harvesting of additional acres unsuitable for timber production, but available for harvest. Under alternative D, timber sale program quantity would range from 76 million board feet within the Umatilla National Forest to 87 million board feet within the Malheur National Forest.

Alternative E would result in the second highest timber sale program quantity within all three national forests because it would result in the second highest number of acres suitable for timber production. Due to the increase in timber production under alternative E, the required budget level for vegetation management would be approximately 65 to 80 percent higher than current levels. Higher budget levels for fuels reduction would also be required. An increase in the budget for fuels reduction of approximately 20 to 35 percent would be required to implement alternative E. Under alternative E, harvesting on lands suitable for timber production would occur at the allowable sale quantity. Total sale program quantity would exceed allowable sale quantity because the higher budget levels would also enable the harvesting of additional acres unsuitable for timber production, but available for harvest. Under alternative E, timber sale program quantity would range from 50 million board feet within the Wallowa-Whitman National Forest to 56 million board feet within the Umatilla and Malheur National Forests.

Alternative C would result in the lowest timber sale program quantity within all three national forests because alternative C would result in the fewest number of acres suitable for timber production. Alternative C would also be the most restrictive alternative in terms of timber harvest. Due to the decrease in timber production under alternative C, budget levels required for vegetation management would be approximately 45 to 50 percent less than current budget levels. Budget levels required for fuels reduction would be approximately 25 to 55 percent less than current levels. Under alternative C, funding for vegetation management and other ground disturbing activities would be de-emphasized in favor of watershed restoration (road closure and decommissioning, and stream channel and fish passage improvements), invasive species control, and habitat improvements in the dry forest. As a result, timber sale program quantity would be lower than the allowable sale quantity. Greater restrictions on harvesting would also prevent full utilization of the volume available. Under alternative C, timber sale program quantity would range from 15 million board feet within the Wallowa-Whitman National Forest to 16 million board feet within the Malheur and Umatilla National Forests.

Table 297 displays the timber sale program quantity level of harvest as a percent of the estimated annual growth on lands suitable for timber production. Annual growth was estimated using data from the CVS plots for net growth per acre per year and multiplying it by the suitable acres for each alternative. The percent figures in table 297 were then calculated using the CVS estimated growth and timber sale program quantity. These estimates may be slightly high because timber sale program quantity includes some volume from lands unsuitable for timber production. However, the estimated annual growth was determined for just suitable lands. If the ratio of timber sale program quantity to growth was calculated for all lands where harvest was possible

(i.e., lands available for harvest, but unsuitable for timber production), then the ratio of harvest to growth would be much smaller.

Alternatives D and E would result in the harvesting of the largest percent of the estimated annual growth, averaging approximately 40 to 70 percent within the three national forests. The Umatilla National Forest would have the highest ratio of harvest to growth under all of the alternatives, relative to the other two national forests. Alternative C would result in the lowest ratio of harvest to growth within all three national forests. All alternatives fulfill mandates of sustainability, which include the concept of harvesting not exceeding growth. However, one of the purposes of timber harvest is to restore the ecosystem by changing the existing conditions in such a way as to move them towards the desired conditions. The consequences of not harvesting or reducing biomass by fire would be an increased risk of mortality from uncharacteristic wildfire, insects, and disease. The increase would be primarily due to growth exceeding mortality (from insects and disease and fire), making it difficult to achieve desired stand densities.

Table 297. Annual harvest as a percentage of annual net growth

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	23%	24%	18%	48%	43%	29%
UMA	39%	38%	34%	69%	74%	47%
WAW	18%	22%	21%	45%	41%	28%

Cumulative Effects

Potential cumulative effects were analyzed by considering the effects of the alternatives in the context of past, present (ongoing), and reasonably foreseeable future activities that have occurred within the vegetation cumulative effects analysis area. This analysis area consists of the 25 sub basins (HUC 4) which contain the Malheur, Umatilla, and Wallowa-Whitman National Forests and other lands. The time period into the future considered was 50 years. The effects that past activities have had on forested vegetation are discussed in the Forested Vegetation, Timber Resources, and Wildland Fire Section under the History and Affected Environments sections and are reflected in the forested vegetation existing conditions. Present and foreseeable future activities that could affect forested vegetation are summarized below:

Human Population Increases and/or Shifts toward Wildland-Urban Interface

For the last several decades, there has been more human development within the wildland-urban interface (WUI). The trend indicates that people will continue to move to western states and build houses adjacent to National Forest System lands, resulting in additional areas designated as wildland-urban interfaces during the life of the forest plan. Adjacent ownerships and inholdings of private property can influence management options for fuels treatments and prescribed fire. Human development within the wildland-urban interface has had effects on forested vegetation by influencing the locations of hazardous fuels reduction treatments. Implementing fuels reduction treatments within a wildland-urban interface may postpone or override the opportunity for vegetation treatments intended to meet other resource needs in areas located away from communities. Public support and concerns will also affect fire and fuels projects and may affect the use of fire by limiting fire in some areas because of social and political issues and smoke concerns. These trends are likely to continue in the future. Additionally, with a greater number of people living and recreating in the wildland-urban interface areas, there is a greater probability of more human-caused wildfire ignitions that could affect forested vegetation.

Community assistance plans that identify wildland-urban interface areas and opportunities for fuels treatments in areas adjacent to national forests would enhance the Forest Service's ability to treat these areas and protect high risk, high value areas. Community Wildfire Protection Plans (CWPPs) emphasize a collaborative approach to fuel reduction projects on both public and private land and place priority on treatment areas identified by communities themselves. CWPPs involve identifying fuel hazards, the risk of wildfire occurrence, structures and other community values at risk, and local preparedness capabilities. CWPPs would help to establish community priorities, recommendations, and develop an action plan and assessment strategy for communities at risk. Currently, all of the counties located within the cumulative effects analysis area have prepared Community Wildfire Protection Plans, including Baker, Umatilla, Grant, Harney, Morrow, Union, Wallowa, Asotin, Columbia, Garfield, Idaho, Nez Perce, Walla Walla, Adams, Wheeler, Washington, Crook, Malheur, Gillian, and Deschutes Counties. The ability to reduce fire hazard across agency boundaries and on private ownership contributes to long-term forest health, mitigation of large fires, reduction of suppression costs, and greater firefighter and public safety. The amount treated annually is difficult to predict due to a number of factors, but is predicted to increase.

Increased Regulation and Concern over Smoke Emissions

The ability to implement the vegetation treatments under alternatives A, B, C, E, and F is dependent upon prescribed burning (both within and outside harvest units), as well as using wildland fire (unplanned ignitions) for resource benefits. Therefore, to the extent that air quality regulations may become more stringent concerning the quantity and timing of smoke emissions, there could be substantial effects in limiting vegetation treatments using prescribed burning.

Alternative C would be most negatively affected by increased regulation and concern over smoke emissions because alternative C would rely mainly on the use of fire (planned and unplanned ignitions) to reduce stand densities. Due to the high percent of the dry upland forest potential vegetation group in closed stand densities and the potential for very high levels of tree mortality, the window or timeframe under which fire could and would be managed to achieve the desired conditions would be limited. Since alternative C would utilize fire to achieve the desired conditions, and current conditions limit the ability to reintroduce low severity fire effects, the window or timeframe may prove unrealistic. The levels of smoke emissions generated under alternative C would be substantially increased, further limiting burn windows and the amount of acres that could be burned due to the increased levels of particulate matter generated. Impacts to public health from the likelihood of exceeding air quality standards would also substantially limit the amount of acres that could be burned under alternative C. Alternative C would likely result in increased fire severity, decreased ecological resiliency, and loss of key ecosystem components and functions due to scope and scale of fire severity outside that which historically occurred within the dry upland forest potential vegetation group.

Alternative D would be the least negatively affected by increased regulation and concern over smoke emissions because alternative D would not utilize prescribed fire (planned ignitions) outside of harvest units. Additionally, the majority of the fuels treatments within the harvest units would be accomplished by removal or crushing, instead of burning.

Timber Product Manufacturing Infrastructure and Economics

The ability of the national forests within the Blue Mountains to positively manage forested vegetation is partially dependent upon the ability to sell forest products to manufacturing companies and to use the harvesting processes, including residual slash disposal activities. If the forest products industry continues to decline in areas surrounding the Blue Mountains to the

extent that it is more difficult to sell forest products, or if stumpage prices decrease substantially, it would affect the number of acres that could be treated during the planning period. While some treatments could be accomplished by using only prescribed burning treatments, it is generally too risky within the wildland-urban interface or may result in unacceptable levels of mortality, thus making it difficult to achieve the desired conditions for forested vegetation. Other treatment options may be cost-prohibitive. Additionally, smoke emissions generated by “burn only” treatments would be high and would limit the number of acres that could be treated.

Alternatives D and E would provide the greatest support of the forest products industry within the cumulative effects analysis area because these alternatives would result in the greatest increase in timber volume harvested. Under alternative D, the amount of timber volume produced within the Blue Mountains forests would increase by 200 percent, when compared to alternative A. Under alternative E, the amount of timber volume produced within the cumulative effects analysis area would increase by 100 percent, when compared to alternative A. Under alternative A, the amount of timber volume produced would remain the same and would not result in a change in the total timber volume produced within the cumulative effects analysis area. Under alternative C, the amount of timber volume produced within the cumulative effects analysis area would decrease by 42 percent, when compared to alternative A.

Conservation Efforts for Whitebark Pine

The U.S. Fish and Wildlife Service (USFWS) recently determined that this tree species warranted listing as a threatened or endangered species, but that it was precluded due to higher priority species. The species is now designated as a Federal Candidate species and it is on the Region 6 Sensitive Species list. One of the major threats to this species is climate change. As the result of climate change, whitebark pine may be particularly vulnerable to loss of favorable habitat due to the restriction of its range to the upper subalpine zone (Aubry et al. 2008). The predicted impacts of increased temperatures include a severe decline in suitable habitat; increased mountain pine beetle activity; an increase in the number, intensity, and extent of wildfires; and perhaps an increase in white pine blister rust-related mortality.

The present lack of scientific tools to predict climate change on regional or local scales limits the ability to quantify potential future impacts that can be applied to management decisions at the forest or stand level. However, a number of new initiatives that focus on the impacts of climate change on western forests provide information and tools that could be used to create management strategies for whitebark pine in the Pacific Northwest that incorporate climate change. Part of the regional five- year action plan is the development of specific management recommendations for whitebark pine and associated species that incorporate the best available science on the predicted impacts of climate change on whitebark pine (Aubry et al. 2008).

The forests within the Blue Mountains have implemented some restoration efforts for this species and these activities would likely continue or intensify, contingent upon funding. If this tree species is eventually listed as a Federal threatened or endangered species, there could be effects to the vegetation and fire management programs within the Blue Mountains national forests due to additional emphasis placed on whitebark pine restoration actions.

All of the alternatives would contain desired conditions for special habitats such as whitebark pine. The desired condition would stress the desire that whitebark pine persists on the landscape. Furthermore, whitebark pine would provide high quality habitat for associated species and be resilient and sustainable considering the range of possible climate change scenarios.

Carbon Sequestration

Forests are an important part of the global carbon (C) cycle as they help slow the rising of atmospheric CO_2 concentrations by storing carbon in forest biomass and soils, as well as in some forest products. Carbon fluxes between the atmosphere and forests are complex, and vary spatially and temporally. The Malheur, Umatilla, and Wallowa-Whitman National Forests store and sequester approximately 13 percent of the total Pacific Northwest Region carbon and CO_2 (data obtained from Heath et al. 2011).

Factors that could potential influence whether carbon stocks shift from regional carbon sinks to carbon sources include increasing temperatures, changes in precipitation, changing disturbance regimes, such as more frequent fires, and land use that decreases forested area. Fire and bark beetle outbreaks play a large role in regional carbon balances. How the complex interactions between climate, fire, and insects outbreaks will affect the carbon cycle within the Blue Mountains is challenging to quantify with any certainty because the science is still developing in this area.

Under simulations, eastern Oregon gains ecosystem carbon as a result of the expansion of forest and woodland vegetation, while experiencing more and larger wildfires at the same time (Millar et al. 2006). This has implications for carbon sequestration as well as timber production. Timber productivity could increase through three mechanisms: through CO_2 fertilization, through warming in cold climates extends growing seasons where precipitation also increases, or through precipitation increases under currently water-limited conditions (Fischlin et al. 2007). However, the magnitude of these effects remains uncertain. Countering these potential increases in timber productivity are the effects of increased fire and insect disturbance.

Mitigation options that can help reduce climate change impacts on carbon include maximizing the forests' capacity to store carbon, decreasing carbon loss potential from disturbance, and utilizing biomass for energy. However, these options need to weigh tradeoffs and risks, and must ultimately be coupled with adaptation strategies. A forest's carbon capacity could be maximized by retaining large diameter trees or by extending rotation age. Carbon loss potential from disturbance could be decreased through fuels reduction treatments that decrease fire severity and increase ecological resiliency.

Timber management projects can influence carbon dioxide sequestration in three main ways: (1) by increasing new forests (afforestation), (2) by avoiding damage or destruction of forests (avoided deforestation), and (3) by manipulating existing forest cover (managed forests). Land-use changes, specifically deforestation and regrowth, are by far the biggest factors on a global scale in forests' role as sources or sinks of carbon dioxide, respectively (IPCC, Intergovernmental Panel on Climate Change, 2000). Projects that create forests or improve forest conditions and capacity to grow trees tend to increase carbon sequestration. Research by Hurteau and North (2009) found that, in wildfire-prone forests, tree-based carbon stocks were best protected by fuel treatments that produced a low-density stand structure dominated by large, fire-resistant pines. However, other findings suggest that reducing the fraction by which carbon is lost in a wildfire requires the removal of a much greater amount of carbon, since most of the carbon stored in forest biomass remains unconsumed even by high-severity wildfires (Mitchell et al. 2009). Most of the treatments simulated resulted in a reduced mean stand carbon storage.

Within the dry upland forest potential vegetation group, where approximately 60 to 90 percent of the harvesting treatments would occur, alternatives E and D would result in the greatest improvement in ecosystem resiliency. When compared to the other alternatives, alternatives E and

D would promote the greatest change in diversity in vegetation composition and structure that would lead to increased ecological resiliency in the face of climate change, and therefore result in the lowest risk of damage or destruction by fire or insects. However, alternatives E and D would also harvest the greatest amount of timber, removing a substantial amount of carbon.

Climate Change

Of all of the ongoing and foreseeable future actions that have the potential to affect forest vegetation within the Blue Mountains, climate change potentially may be the most important factor. The effects of climate change may combine with some of the effects that result from implementing the alternatives to produce cumulative effects. Although increases in temperature, changes in precipitation, higher atmospheric concentrations of carbon dioxide (CO_2), and higher nitrogen (N) deposition may change ecosystem structure and function by the end of the 21st century, the most rapidly visible and most significant short-term effects on forest ecosystems may be caused by altered disturbance regimes (Vose et al. 2012). In general, given the existing condition of the forested vegetation within the Blue Mountains, the potential effects (and uncertainties) that climate change may have on forested vegetation can be summarized as follows:

- Increased wildfires and more severe fire behavior within all forest types
- Increased insect-related mortality
- Reduction in or loss of whitebark pine populations
- Reduction in or loss of aspen
- Reduction in subalpine forest
- Shifts in species compositions and distributions within upland forest potential vegetation groups
- Shifts from forests, woodlands, and shrublands to grasslands and deserts
- Drought-induced tree mortality
- Declines in vegetation productivity

In the future, climate change is anticipated to contribute to the character of the Blue Mountains forests, disturbance regimes, and timber productivity (Schmoldt et al. 1999). At the most fundamental level, plant physiology may change in response to increased temperatures and CO_2 concentrations, in some cases reducing transpiration and water loss. The potential for CO_2-induced increases in plant water use efficiency are not well known. There is a potential for increased forest growth in areas that become warmer and wetter, and decreased growth in areas that become warmer and dryer (Fischlin et al. 2007). Where forest growth increases, there could be an accompanying increase in water demand because of higher evapotranspiration rates resulting from increased temperatures.

Climate change, primarily through increases in temperatures and CO_2 and changes in precipitation, could result in shifts in species composition and distributions of forest communities. Climate changes have, and could continue to, result in earlier initiation of the growing season, longer growing season length, earlier plant senescence, and mismatches between climate characteristics and plant phenology. Plant species respond individually to changes in temperature and precipitation regimes, atmospheric CO_2, and disturbance regimes. Hence, new plant associations may develop in the future as a result of climate change. More broadly, in future vegetation simulations produced by Bachelet et al. (2001a), areas of subalpine forest and alpine

tundra in the Pacific Northwest are projected to decrease as temperatures increase at higher elevations (Bachelet et al. 2001b, Shafer et al. 2010). They also project an expansion of forest and woodland into areas of eastern Oregon currently dominated by grassland and shrubland as a result of projected increases in precipitation, a longer growing season, and increased plant water-use efficiency produced by increased atmospheric CO_2 concentrations. General increases in precipitation could result in expansion of woody species and shifts from grasslands to shrublands, or from grasslands and shrublands to woodlands and forests. Conversely, decreases in effective precipitation could cause declines in vegetation productivity and shifts from forests, woodlands, and shrublands to grasslands and deserts. Some species have the potential to expand upslope with increases in temperature. Some native forest species may be displaced where climate change favors invasive species. Changes in forest composition, structure, seasonality and productivity could have consequences for wildlife species dependent on forested habitats.

Inadequate water availability coupled with drying conditions could contribute to an overall increase in the vulnerability of forests to insects, fire, and drought. Recent forest dieback in the western United States, and model simulations, indicate that the frequency and magnitude of some disturbance events (e.g., drought, wildfire, and insect outbreaks) may be changing (Allen et al. 2010). The relative influence of climate and fuels on fire behavior and effects varies regionally and subregionally across the western United States (McKenzie 2004). However, an increase in fire activity is expected for all major forest types in the Blue Mountains under projected climate changes (Bachelet et al. 2001, Whitlock et al. 2003, Keeton et al. 2007). A warmer climate has already led to more frequent fires, more severe fires, earlier initiation of the fire season, and a longer fire season in the western United States (Westerling et al. 2006). Littel et al. (2009) built statistical models of the associations between seasonal and annual precipitation, and temperature and fire extent for 1916-2002 for the 11 contiguous western states. They found that relatively modest changes in mean climate will lead to substantial increases in area burned, particularly in crown-fire ecosystems in which distinct thresholds of fuel moisture and fire weather exist (Littel 2009). For a mean temperature increase of 4 °F (expected by the mid-21st century), annual area burned by wildfire is expected to increase by a factor of 1.5 to 5. Summer temperature forces the change in area burned, likely as a result of overall drought patterns and fuel dryness. Large fires (greater than 1,000 acres) account for most of the area burned in the Blue Mountains in a given year. Regional-level relationships between climate and fire differ, depending on seasonal and annual variability in climatic drivers, fire frequency and severity, and the legacy of previous-year climate in live and dead fuels (Veblen et al. 2000, Hessl 2004). Current-year drought is typically associated with more area burned, but the effects of antecedent conditions differ owing to interactions among climatic effects (Littel 2009). In the Pacific Northwest, direct associations exist between fire extent and current-year drought (Hessl 2004, Wright and Agee 2004, Heyerdahl et al. 2001, Heyerdahl et al. 2008). In the cold upland forest potential vegetation group and some moist upland forest potential vegetation groups where fine fuel production is not limited by climatic variability, short-term synoptic fluctuations in atmospheric conditions play an important role in forcing extreme wildfire years (Johnson 1993, Gedalof et al. 2005).

In general, there is a greater range of area burned under hot, dry conditions than under cool, wet conditions. Whereas cool, wet conditions nearly always lead to reductions in area burned, favorable fire conditions do not necessarily lead to increases in area burned. This difference in response is linked to the sequence of events required to cause large fire increases. Although drought is important, fires will not occur unless drought is accompanied by an ignition source and strong winds. As long as weather conditions do not become unfavorable for wildfire, forests will remain flammable and ignition and rapid spread could occur at any point during the fire season. It

remains to be seen how increases in conditions favorable for wildfire could impact the ability to use prescribed burning as a management tool.

Insect lifecycles depend on a complex interaction of temperature, moisture, and suitable hosts. Although outbreak dynamics differ from species to species and from forest to forest, climate change appears to be one driving factor for some of the current forest insect outbreaks in western North America. Temperature influences everything in an insect's life, from the number of eggs laid by a single female, to the insects' ability to disperse to new hosts, to individuals' over-winter survival and developmental timing. Elevated temperatures associated with climate change, particularly when there are consecutive warm years, can speed up reproductive cycles and reduce cold-induced insect mortality. Additionally, shifts in precipitation patterns and associated drought can also influence insect outbreak dynamics by weakening trees and making them more susceptible to attacks. For many forest insect species (primarily beetles; notably Ips and Dendroctonus species), the influence of elevated temperatures on outbreak dynamics is most notable at higher elevations and latitudes where some beetles have shifted to completing their development in a single year, rather than two or even three years or, in some cases, have shifted to completing multiple generations per year. All else remaining constant, this decrease in generation time translates to an increasing rate of population growth.

Depending on the magnitude of the temperature increase, which may vary by elevation, high elevation forests could be at greater risk than lower elevation forests, where warmer temperatures may disrupt the insects' seasonality. Elevated winter temperatures are associated with increased winter survival; however, it should be noted that increased winter survival does not always coincide with increased population success based on developmental timing. Each process is affected by temperature patterns occurring at different times of the year.

The combined expectations regarding increases in water limitation, wildfire activity, high elevation adaptive mountain pine beetle seasonality, and forest vulnerability to drought, fire and insects, suggest that Blue Mountains forests are likely to be fundamentally affected by altered disturbance regimes as the region's climate changes.

Fire Regime Condition Class

The emphasis on treatments of fire regime condition class areas out of historical range (condition class 2 and 3) would continue. This is applicable to Bureau of Land Management, State lands, and National Forest System lands. In general, non-Forest Service lands are dominated by condition class 2 and 3.

Wildfire and Other Disturbance Mechanisms

Most of the vegetation types in the analysis area have evolved with fire. Fire frequency and intensity varied historically by vegetation type, and vast acres of shrub and timber burned each year (Agee 1993). There is evidence that Native Americans used fire to herd game and provide feed for stock. According to fire records, in the first half of the 20th century an average of 30 million acres burned each decade in the west.[4] Before that, settlers report seeing vast acreages of blackened land (Gruell 1985). With the settlement of the west came the notion that fires were bad. Following the fires of 1910, the Forest Service began its campaign to suppress wildfires. Instead of fire, settlers employed plows, railroads, saw blades, sluice boxes, cattle, sheep, and other accoutrements as disturbance agents. Settlers converted many acres of rangelands to farm ground, primarily in the lower elevations, while ranchers grazed horses, cattle and sheep on less

[4] http://www.nifc.gov/fire_info.html

productive and higher elevation sites. At the turn of the last century, livestock grazing occurred throughout the forest, introducing a new disturbance on what would later become National Forest System lands. High levels of livestock grazing reduced the fine fuels (grasses and shrubs) that carried low severity surface fires, resulting in a substantial reduction in fire disturbances on National Forest System lands.

Timber harvest replaced fire as the major disturbance on the national forest, but it did not affect an equivalent number of acres. This has led to a decrease in forests of older age classes and an increase in some areas of dense forests of smaller diameter classes. This change in age and size classes has resulted in conditions that are less resilient than desired.

Uncharacteristically severe wildfires are on the rise, especially in the dry upland forest potential vegetation group. Over the past 10 years, lightning-caused fires ranged from approximately 808 to 2,170 per year in the northwest. Human-caused fires ranged from approximately 1,078 to 2,666 fires per year in the northwest.[5] More fires are occurring adjacent to residential areas as people build more subdivisions and structures along public land boundaries. These changes are occurring across the west.

Most of the higher elevation cold upland forest potential vegetation group in the cumulative effects area is located in National Forest System lands. Therefore, management activities affecting these vegetation types would be initiated by the Forest Service. Much of the cold upland forest potential vegetation group is located within existing or proposed wilderness, roadless, or backcountry areas. Under all of the alternatives, only approximately 5 to 10 percent of the harvest activities in Forest Service System lands would occur within the cold upland forest potential vegetation groups. The majority of vegetation effects resulting from management actions within the cold forest potential vegetation group would occur as the result of wildfire managed for resource benefits. The cold upland forest potential vegetation group was historically characterized by infrequent, high severity fire. Managing wildfires for resource benefits could result in stand-replacing events with high levels of mortality. If climate change causes fires to increase in size and severity, managing wildfires for resource benefits to achieve desired conditions may become more difficult. Not every natural ignition would be managed for resource benefits. For each unplanned ignition, a decision would be made whether to suppress or manage the fire to benefit the resources in accordance with the Fire Management Plan. Under all of the alternatives, all ignitions would be managed based on safety, values at risk, and the consistency of predicted fire effects with the desired conditions. Responses can range from monitoring to full suppression.

Within the dry upland forest potential vegetation group, existing vegetation conditions tend to be more highly departed from the HRV due to the historic, frequent fire regime and a greater number of missed fires. All of the alternatives would attempt to address, to varying amounts, some of the negative effects of the past events that have occurred within the dry upland forest potential vegetation group within the cumulative effects analysis area. Under alternatives D and E, the dry upland forest potential vegetation group would be expected to exhibit decreased fire-related mortality due to more open stand densities resulting from increased levels of timber harvest activities. Approximately 60 to 90 percent of the mechanical treatments would occur within the dry upland forest potential vegetation group. Under alternative D, approximately 72 to 77 percent of Forest Service lands within the cumulative effects analysis area would contain open stand densities at year 50. Under alternative E, approximately 69 to 70 percent of Forest Service lands within the cumulative effects analysis area would contain open stand densities at year 50. Under these alternatives, the majority of the landscape would be fairly open. Conditions would be

[5] http://www.nifc.gov/fireInfo/fireInfo_stats_lightng.html

conducive to the reintroduction of low severity fire. There would be more opportunities to use prescribed fire and to manage unplanned ignitions for resource benefits to achieve desired conditions.

Decreased stand densities would also result in regeneration of more shade intolerant/fire tolerant tree species. Within the dry forest potential vegetation group, it would be beneficial to increase the percent of the landscape in shade intolerant/fire tolerant species because this would result in decreased fire behavior and decreased risk of uncharacteristically severe wildfire across the cumulative effects area. This would also result in decreased fire risk to adjacent land ownerships. If climate warms over time and fires increase in size and severity, a landscape dominated by more open stand conditions with shade intolerant/fire tolerant tree species would be at decreased risk for catastrophic, uncharacteristically severe wildfire and more sustainable and ecologically resilient.

Difficulties may arise due to the mixture of land ownerships that occurs within the lower elevation, dry upland forest potential vegetation group within the cumulative effects analysis area. Other ownerships adjacent to or surrounded by lands administered by the Forest Service affect opportunities to use fire and, therefore, to emulate historical fire effects on large landscapes. In general, private landowners use timber harvest rather than fire to manage their vegetation. Fire may be used to treat activity fuels, but treatments are often limited in extent and effect. The proximity or inclusion of private lands affects, in particular, the use of fire because these fires can burn large areas for long time periods depending on the vegetation, fuels, weather, and other factors. However, fire management activities can be coordinated with managers of adjacent public lands, such as the BLM and adjacent national forests, or other agencies. In this case, effects of managing wildfire could extend beyond lands administered by the Forest Service. Prior to managing wildfire, a site-specific, prescriptive plan must be in place. This is included in the Fire Management Plan. Not every unplanned ignition would be managed for resource benefits. For each unplanned ignition, a decision would be made whether to suppress or manage the fire to benefit the resources in accordance with the Fire Management Plan. Under all of the alternatives, all ignitions would be managed based on safety, values at risk, and the consistency of predicted fire effects with the desired conditions. Responses can range from monitoring to full suppression. Agreements are currently in place with the BLM and the State of Oregon and State of Washington on protection responsibilities.

Restoration activities occurring within the dry upland forest potential vegetation group would most likely occur in National Forest System lands. Restoration activities, such as prescribed burning or managing for old forest, would be beneficial to the overall functioning of these ecosystems and would improve wildlife habitat within these vegetation types. Some vegetation components may take many years before noticeable changes occur on the landscape. Other more localized changes would be dramatic and immediate. For example, removing large trees affects not only size class distributions of forest stands, but also the recruitment of snags over time and would reduce the density of large snags on a landscape basis. Given the existing conditions, large tree removal on or off National Forest System lands would affect distribution of the large tree component and future snags and coarse woody debris at a landscape scale. Therefore, the retention and future development of these critical components on National Forest System lands would be essential to providing habitat elements needed by many species. Improvements to these components would cumulatively affect and improve the conditions within the lower-elevation ponderosa pine, dry upland forest potential vegetation groups. Disturbances such as fire, insects, disease, and windthrow would migrate across a landscape, depending upon conditions, and may

move from National Forest System lands to other ownerships or vice versa. Vegetative conditions would have a substantial influence on the spread, extent, and direction of disturbances.

All of the proposed forested vegetation treatments would reduce stand density and thereby reduce risks from bark beetles for a 15- to 25-year period. These vegetation treatments and prescribed fire would enhance ponderosa pine and western larch; however, prescribed fire would increase the risk of bark beetle attack in the short-term (1 to 3 years) because bark beetles are attracted to fire-killed and fire-damaged trees which would occur as a result of prescribed fire. In the long term, tree mortality from prescribed fire and associated insect infestations would work together to reduce stand density and reduce the risk of bark beetle infestation for 15 to 25 years. The reduced density of conifers would extend the opportunity for seedling ingrowths and herb/shrub-component enhancement, which would increase structural complexity and species diversity. Complexity and diversity are important in maintaining long-term site productivity (Franklin et al. 1989).

The forested vegetation treatments would reduce density to a prescribed level on a somewhat consistent basis across the treatment areas. Forested vegetation treatments would offer more control in achieving desired structural relationships than prescribed fire, whose affects are more random and less controlled. In the long term, where species that are more fire-resistant occur, lower stand densities would foster the use of prescribed fire to manage fuel loadings. Prescribed fire reduces tree density on a more random and mosaic basis depending on fuel distribution, resulting in variations in fire intensity and tree mortality. All of the proposed forested vegetation treatments and prescribed fire would reduce overall fuel loadings, increase average stand diameter, favor thicker-barked, self-pruning, early-seral species, and make the areas slightly less prone to uncharacteristic effects from wildfire. Such treatments are needed for restoration of landscape structure and fuel conditions. Hahn and others, in An Assessment of Ecosystem Components in the Interior Columbia Basin (Quigley and Arbelbide 1997), report that “without restoration of landscape structure and fuel conditions, the probability of returning to the succession/disturbance regimes that existed historically (that is, the native system) was determined to be low.”

Terrestrial Wildlife Species

This section describes the affected environment, existing conditions, and environmental consequences of the alternatives on a variety of terrestrial wildlife species. The majority of changes to wildlife results from the proposed management of other resources, such as vegetation, access, wildland fire, and livestock grazing. The projected impacts to wildlife from these activities are described in this section, but the actual activities are discussed in more detail in their respective sections. Although the life of a forest plan is 10 to 20 years, impacts to wildlife are displayed on a decadal basis out to 50 years to clearly depict the trajectory for the element being discussed. Different levels of management are proposed for each of the alternatives, and each is described in detail in chapter 2 and appendix A. Unless otherwise noted, the description of effects is only for National Forest System lands in the Blue Mountains (excluding Hells Canyon Natural Recreation Area), and therefore references to the planning area, analysis area, or national forest are to public lands administered by the Forest Service, unless specifically noted otherwise.

Because of the high number of species, wildlife species are placed into different categories and the affected environment and environmental consequences are discussed by groups, representing varying management focus. This section is organized by the following groups of species:

- Viability analysis
  - focal species – a set of species selected to represent the full array of wildlife responses to conditions projected under management alternatives
  - threatened and endangered species – those species listed or proposed for listing under the Endangered Species Act
  - Forest Service sensitive species – species of conservation concern in the Blue Mountains from the 2010 Regional Forester's Sensitive Species List
- Management indicator species – species required by the 1982 NFMA regulations for monitoring purposes
- Resident and migratory birds
- Hunted species
- Wildlife habitat connectivity.

Introduction

The conservation of wildlife species is integral to the maintenance of viable plant and animal populations and biological diversity. National Forest System lands administered by the Forest Service in the Blue Mountains have long served an important role in supporting a variety of wildlife species that are critical to the needs and values of the human population. The diversity of Blue Mountains wildlife habitat is outstanding as a result of the abrupt changes in vegetation that result from changes in aspect, elevation, temperature, moisture, geology, soil depth, the effects of fire, and the management activities and influence of humans. More than 300 wildlife species occur in the Blue Mountains (Baydeck 1999, Thomas 1979), although many of the bird species occur only as migrants.

Federal land management agencies and the state wildlife agencies share legal co-trustee responsibility for the protection and management of wildlife. The Forest Service continues to work closely and cooperatively with both the Oregon Department of Fish and Wildlife (ODFW) and Washington Department of Fish and Wildlife (WDFW) for the conservation and management of wildlife resources, including habitat, within the Malheur, Umatilla, and Wallowa-Whitman National Forests. Such cooperation is important to meet the needs of a growing human population that places increasing demands and competing values on resources, which ultimately impact the wildlife resource.

Managing ecosystems to sustain terrestrial wildlife species depends on maintaining the appropriate mix of habitat quantity, quality, and distribution across the landscape. Most habitats for terrestrial wildlife species are shaped by vegetation characteristics, although in some cases it is an individual component, such as snags or talus slopes. Landscapes are diverse, highly complex systems influenced by many factors, including the interaction of soils, aspect, elevation, climate, disturbance events, and humans. Together these influences have shaped vegetative composition and patterns that have influenced the distribution and quality of wildlife habitats across the landscape (Hessburg et al. 1999).

Fire has historically been a dominant influence in the Blue Mountains (Agee 1993). Fire, insects, storms, disease, animals, and plant succession have been the agents most responsible for modification of habitat and altering species' habitat use (Hessburg et al. 1994, Heyerdahl et al. 2001). Over time, ecosystem conditions fluctuate within some range of variability related to the type and intensity of disturbances that occur. The term historical range of variability (HRV) has been used to describe these fluctuations in ecosystems, using conditions prior to Euro-American settlement as a reference point (Morgan 2004). Historically, low-elevation forests in the Blue Mountains burned frequently (every few years) with low-intensity ground fires, leaving most of the large trees alive. In contrast, high-elevation forests usually burned with stand-replacing fires that killed most trees but at infrequent intervals (hundreds of years).

The categories and types of wildlife species within the planning area reflect the diversity of available habitat. Some species, such as mule deer and Rocky Mountain elk, are steeped in local culture and tradition and have long been important to the local people and communities. However, many nongame species have recently gained more recognition for the economic, aesthetic, and ecological values they provide. For example, as a resource, resident and migratory bird species in the United States generate more than 85 billion dollars in overall economic output and are enjoyed by more than 46 million people (USFWS 2003); however, they are more recognized for the ecological values they offer in terms of insect control, pollination, and seed dispersal. Some of the wildlife species that occur within the planning area are migratory and/or wide ranging and can utilize several habitat types, while others are more sedentary and utilize only a single habitat or individual component within a habitat type. Because of the high number of species, wildlife species are placed into different categories and discussed as groups.

Affected Environment – Terrestrial Species Viability

The implementing regulations (36 CFR 219.19) for the National Forest Management Act of 1976 (NFMA) call for providing viable populations of native and desired nonnative wildlife. Andelman et al. (2001) conducted a review of viability assessments conducted under NFMA and concluded that there was no single accepted or standardized approach for viability analysis, and the debate continues at the national level. Comprehensive viability analysis requires significant data inputs on species demography and life history that are, to this day, unavailable for most species (Ruggiero et al. 1994). The fact that a species occurs in an area is indicative of its persistence, but species generally are tolerant of a range of environmental conditions, resulting in increasingly complicated predictions when using models (Haufler et al. 1996).

Special management emphasis is given to species for which there is a documented viability concern. Species listed in compliance with the Endangered Species Act are placed in one of four categories based on viability concerns: threatened (T), endangered (E), proposed (P), and candidate (C). The Forest Service has a legal requirement to maintain or improve habitat conditions for TEP species to comply with the Endangered Species Act. Administrative direction also exists to maintain or improve conditions for species included on the Regional Forester's Sensitive Species List as addressed in FSM 2670. Currently, there are two threatened and endangered (TE) terrestrial wildlife species (Canada lynx and gray wolf) that either occur or have habitat present within the planning area. TE species are of particular concern because of their status and their need for special management attention. Additionally, 33 species identified by the regional forester as sensitive either occur or have habitat within the planning area.

Species listed in compliance with Endangered Species Act are given special consideration at the project level through biological assessments that are completed to identify possible effects to these species. These evaluations determine at a much finer scale whether or not a project may

affect a TEP species or its habitat and are used for consultation with the U.S. Fish and Wildlife Service in compliance with Section 7 of the Endangered Species Act.

Managing habitat to sustain terrestrial wildlife species depends on maintaining the appropriate mix of habitat quantity, quality, and distribution across the landscape. Landscapes are diverse, highly complex systems influenced by many factors, including the interaction of soils, aspect, elevation, climate, disturbance events, and humans. Together these influences have shaped vegetative composition and patterns that, in turn, have influenced the distribution of biodiversity across the landscape. A detailed discussion regarding departure of vegetation from historical conditions is in the Forested Vegetation, Timber Resources, and Wildland Fire affected environment for forested vegetation section.

Changes in vegetation due to natural or human-caused disturbances and human influence on the landscape have affected terrestrial wildlife species and their habitat within the Blue Mountains national forests. For example, early timber and fire management strategies within the dry forest have resulted in an ecosystem that is highly departed from what occurred historically. This leads to concern for the viability of some species, such as the white-headed woodpecker, that rely heavily on this ecosystem. Spatial characteristics of landscapes, such as patch size and distribution, connectivity, and fragmentation, are largely determined by management actions and interactions with fire, insects, disease, and other natural disturbances. The extent of human influence within habitats can affect patch quality and connectivity and thereby affect wildlife presence and/or movement across the landscape. An example would be the I-84 corridor which may impede the movement of large carnivores between preferred habitats.

Within the planning area, major vegetation types that provide habitat for wildlife species have been described by various authors (Hall 1973, Hann et al. 1997, Johnson and Clausnitzer 1992, Johnson and O'Neil 2001, Thomas et al. 1979). Following procedures found in Powell et al. (2007), Countryman (2009) classified 60 plant association groups (PAG) into 22 potential vegetation groups (see "Forested Vegetation, Timber Resources, and Wildland Fire" section). Assessments of the planning area have been conducted to establish existing conditions (Countryman 2008, Countryman 2008a, Countryman and Justice 2010) and to compare to what is considered HRV (Countryman and Swanson 2008 (revised 2010), Countryman and Justice 2010, Mason and Countryman 2010). In general, alterations to vegetation types have been most significant in the lower elevations and least significant in the higher elevations, and past timber harvest has influenced many vegetation types and associated wildlife habitats. Some loss of ecological function has occurred as a result of these changes. Change in ecological function helps identify where the potential for active restoration is often higher, such as in ponderosa pine, and where the potential is lower, such as in higher elevation spruce-fir and alpine tundra types where deviation from historical conditions is less. Approximately 31 percent of the planning area is in inventoried roadless areas, designated wilderness areas, or other specially designated areas that contain representative vegetation types (Countryman 2009a). IRAs and/or wilderness area qualities offer large areas of wildlife habitat that are relatively undisturbed by humans and are especially important for some wildlife species.

Recent habitat assessments of landscape conditions and trends on lands administered by the Forest Service within the Blue Mountains have identified several major factors influencing change in forested and nonforested habitat conditions that have occurred since early Euro-American settlement (Countryman and Justice 2008, Countryman and Swanson 2008 (revised 2010), Mason and Countryman 2010, Quigley and Arbelbide 1997, Wisdom et al. 2000, Wissmar et al. 1994). Depending upon the vegetation type examined, these factors include fire exclusion,

timber harvest, road and urban development, livestock grazing, and recreational uses associated with a rapidly growing human population, resulting in changed conditions and trends with implications for wildlife species that include:

- Changes in forest structure and composition that may contribute to uncharacteristic wildfire behavior in lower elevation forest types
- Roads that fragment habitat, with densities varying from about 14 miles per square mile to about 0.3 mile per square mile
- Competition from invasive plant species that compromises plant diversity and habitat quality and connectivity
- A reduction or degradation of habitats for some wildlife and plant species where human impacts have occurred, and/or where natural disturbance regimes have been altered
- Urban development and infringement into some traditionally important wildlife habitats (including big game winter range), typically at lower to moderate elevations
- A rapidly increasing human population that places uses and demands upon the landscape that alter habitat security and cause disturbance to wildlife species

Wisdom et al. (2000) used the concept of focal species in an attempt to streamline the assessment of ecological systems by monitoring a subset of species and use of a focal species can be a pragmatic response to dealing with ecosystem complexity (Noon 2003, Roberge and Angelstam 2004). The key characteristic of a focal species is that its status and trend provide insights to the integrity of the larger ecological system to which it belongs (Andelman et al. 2001, Lambeck 1997, Noss et al. 1997, Noon 2003). Focal species serve an umbrella function in terms of encompassing habitats needed for other species, are sensitive to the changes likely to occur in the area, or otherwise serve as an indicator of ecological sustainability (Andelman et al. 2001, Lambeck 1997, Noss et al. 1997).

Species assessments have been prepared for 197 of the 300 terrestrial wildlife species present in the Blue Mountains (Lehmkuhl et al. 1997). These species assessments brought together available information at differing scales in order to help assess the habitat wildlife species utilize, along with management information and research needs. Wisdom et al. (2000) reviewed these initial assessments and, utilizing seven criteria to determine if a species should be further assessed, compiled a list of 91 broad scale species. Another 82 fine scale species were added, resulting in a final list of terrestrial vertebrate species for the Columbia Basin analysis. Not all of these species occur in the Blue Mountains. The 91 species that were assessed by Wisdom et al. (2000) were further refined by Rafael et al. (2001) and reduced to 28 species in 12 different families thought to represent the full array of species' responses to projected conditions. These works were used as a starting point for developing an initial list of terrestrial vertebrate species for assessment in the Blue Mountains planning area.

Within the planning area, 175 species were identified as having some level of local and/or regional conservation concern. These 175 species were evaluated and 38 species representing 26 families or groups based on similarity of habitat use were selected for assessment. In selecting 38 species for more detailed analysis, the concept of focal species (Lambeck 1997) was applied and the findings of Wisdom et al. (2000) were consulted. Terrestrial species were grouped by habitat associations; risks and threats were identified for the group, and a representative species (focal species) was selected for the group. The groupings displayed in table 298 are based on the terrestrial families in the Forest Service Region 6 terrestrial assessment (USDA Forest Service

2010). The use of terrestrial families may have tenuous value when applied to a small area like a subbasin, but when applied to large landscapes it can be an effective analysis tool (Raphael et al. 2001, USDA and USDI 2000). All species, however, contribute to, or influence, the ecological processes that maintain biodiversity within the planning area.

Table 298 is an updated list of species for the Blue Mountain planning area and shows whether they were used as a focal species for the group or not. Additionally, the table associates all of the sensitive species for the Blue Mountains to groups and families. Based upon knowledge of ecological relationships of the species evaluated, the smallest number of groups possible was chosen that still allow a meaningful aggregation of species and habitats reflecting important patterns in source habitats. Groups were then aggregated into families to help describe how similar groups of species are related to each other. Families include one or more groups that are associated with similar broad scale vegetative conditions. These generalized vegetative conditions are often used by managers to interpret broad scale patterns and trends. By using a hierarchical evaluation of species, groups, and families, the analysis process addresses single- and multi-species needs as well as identifying broad-scale patterns of habitat change, as did Wisdom et al. (2000).

Analysis Assumptions

Several general overriding assumptions are used throughout this assessment. **A key assumption is that managing for the historical range of variability across ecosystems will result in maintaining viability for most species.** [6] Therefore, if management activities can produce conditions close to or within HRV, species that are adapted to these conditions will have a stronger likelihood of persistence (Aplet and Keeton 1999, Landres et al. 1999, Swanson et al. 1994). Use of HRV relies on two concepts: that past conditions and processes provide context and guidance for managing ecological systems today and that disturbance-driven spatial and temporal variability is a vital attribute of nearly all ecological systems. Approximating historical conditions for source habitats provide a management strategy likely to sustain diverse focal species, even for those species where little information is available (Hunter et al. 1988; Landres et al. 1999; Swanson et al. 1994). Similarly, because of limited understanding about ecosystems, approximating past conditions offers one of the best means for predicting and reducing impacts to current ecosystems (Kaufmann et al. 1994). Therefore, if the amount and structure of source habitats are within HRV, associated wildlife species will have a greater likelihood of sustainability than if the amount and structure of source habitats are outside HRV (Raphael et al. 2001; Spies et al. 2006).

Throughout this analysis, acres of potential vegetation groups, road miles, acres of treatments, etc., are all best estimates based on the information available at the time. Change in forested vegetation was simulated using the vegetation dynamics development tool (VDDT) model (see the Forested Vegetation, Timber Resources, and Wildland Fire section for detailed discussion of VDDT). The analysis using these estimates is intended to indicate the relative differences between alternatives and is not intended to predict absolute amounts of activities, outputs, or effects.

[6] Hunter et al. 1988, Baydeck 1999, Landres et al. 1999, and Samson et al. 2003.

Table 298. Species of conservation concern identified in the Region 6 terrestrial species assessment (USDA Forest Service 2010), their family, group, and representative focal species (F) analyzed (indicated by X) for the Blue Mountains national forests as well as other status categories by species

Family	Group	Common Name	Focal Species	Federally Listed[1]	Sensitive[2]	Management Indicator[3]
Alpine/boreal	Alpine	Gray-crowned rosy-finch	X		O	
		Black Rosy Finch			O	
Alpine/boreal	Boreal forest	Spruce grouse				
		Boreal owl	X			
		Pine grosbeak				
		Water vole	X			
		Canada lynx		FT		
		Moose				
Forest mosaic	All forested communities	Northern goshawk	X			A
		Blue grouse				
		Great gray owl			W	
		Long-eared owl				
Medium/large trees	All forested communities	Sharp-shinned hawk				
		Rufous hummingbird				
		Williamson's sapsucker				
		Hammond's flycatcher				
		Cordilleran flycatcher				
		Mountain chickadee				
		Yellow-rumped warbler				
		Cassin's finch	X			
		Long-legged myotis				
		Silver-haired bat				
		Hoary bat				
		Northern flying squirrel				
Medium/large trees	Cool/moist forest	Vaux's swift				
		Pileated woodpecker	X			X

Family	Group	Common Name	Focal Species	Federally Listed[1]	Sensitive[2]	Management Indicator[3]
		Chestnut-backed chickadee				
		Brown creeper				
		Winter wren				
		Golden-crowned kinglet				
		Ruby-crowned kinglet				
		Townsend's warbler				
		Varied thrush				
		American marten	X			A
		Fisher				
Medium/large trees	Dry forest	Flammulated owl				
		White-headed woodpecker	X		X	X
		White-breasted nuthatch				
		Pygmy nuthatch				
Open forest	All forested communities	Rubber boa				
		Calliope hummingbird				
		Dusky flycatcher				
		Western bluebird	X			
		Chipping sparrow				
		Dark-eyed junco				
		Purple finch				
		Pine siskin				
		California myotis				
		Fringed myotis	F		O	
		Long-eared myotis				
		Fox sparrow	X			
		Lazuli bunting				
Upland grassland	Upland grassland	Upland sandpiper	X		O	
Open forest	Post-fire habitat	American kestrel				

Family	Group	Common Name	Focal Species	Federally Listed[1]	Sensitive[2]	Management Indicator[3]
		Lewis's woodpecker	X		X	A
		Three-toed woodpecker				A
		Black-backed woodpecker	X			A
		Olive-sided flycatcher				
		Western wood-pewee				
Human disturbance	Habitat generalist	Peregrine falcon	X		X	
		Gray wolf		FE	X	
		Wolverine	X	FC	X	
Woodland/grass/shrub	Woodland/grass/shrub	Pygmy horned lizard				
		Side-blotched lizard				
		Striped whipsnake			W	
		Ferruginous hawk				
		Golden eagle	F			
		Prairie falcon				
		Mourning dove				
		Common nighthawk				
		Common poorwill				
		White-throated swift				
		Black-billed magpie				
		Rock wren				
		Lark sparrow	X			
		Brewer's blackbird				
		Western small-footed myotis				
		Yuma myotis				
		Spotted bat			O	
		Pallid bat	F		X	
Woodland/grass/shrub	Juniper woodland	Ash-throated flycatcher	X		W	
		Pinyon jay				

Family	Group	Common Name	Focal Species	Federally Listed[1]	Sensitive[2]	Management Indicator[3]
Woodland/grass/shrub	Woodland/shrub	Sagebrush lizard				
		Night snake				
		Gray flycatcher			W	
		Loggerhead shrike	F			
		Green-tailed towhee			W	
		Merriam's shrew				
Woodland/grass/shrub	Shrub	Desert horned lizard				
		Greater sage-grouse		FC	O	
		Sage thrasher	X			
		Brewer's sparrow				
		Black-throated sparrow				
		Sage sparrow				
		Pygmy rabbit			O	
		Black-tailed jackrabbit				
Woodland/grass/shrub	Grass/shrub	Sharp-tailed grouse			O	
		Long-billed curlew				
		Burrowing owl				
		Horned lark				
		Oregon vesper sparrow				
		Western meadowlark				
		Preble's shrew			W	
		White-tailed jackrabbit				
		Sagebrush vole				
		American badger				
		Pronghorn				
		Mountain goat			W	
		Rocky Mountain bighorn sheep	X			
		California bighorn	X			

Family	Group	Common Name	Focal Species	Federally Listed[1]	Sensitive[2]	Management Indicator[3]
Woodland/grass/shrub	Grassland	Northern harrier	X			
		Swainson's hawk				
		Short-eared owl				
		Grasshopper sparrow			O	
Chambers/caves	Chambers/caves	Townsend's big-eared bat	F		X	
Riparian	Shrubby/deciduous riparian	Mountain quail			W	
		Yellow-billed cuckoo				
		Western screech-owl				
		Black-chinned hummingbird				
		Broad-tailed hummingbird				
		Red-naped sapsucker	F			
		Willow flycatcher				
		Red-eyed vireo				
		Barn swallow				
		Black-capped chickadee				
		Veery				
		Orange-crowned warbler				
		Yellow warbler				
		American redstart				
		MacGillivray's warbler	X			
		Wilson's warbler				
		Yellow-breasted chat				
		White-crowned sparrow				
		American goldfinch				
		Water shrew				
Riparian	Conifer riparian	Inland tailed frog	X		X	
		Black swift	F		O	
Riparian	Marsh with adjacent large trees	Great blue heron				

Family	Group	Common Name	Focal Species	Federally Listed[1]	Sensitive[2]	Management Indicator[3]
		Black-crowned night-heron	F			
Riparian	Riparian/large tree or snag/open water	Wood duck	F			
		Harlequin Duck	F		X	
		Bufflehead			O	
		Common goldeneye				
		Barrow's goldeneye				
		Hooded merganser				
		Common merganser				
		Bald eagle	X		X	
Wetland	Pond/small lake/backwater	Western toad				
		Columbia spotted frog	X		O	
		Northern leopard frog				
		Painted turtle	F		O	
		Spotted sandpiper				
Wetland	Marsh	American bittern				
		Virginia rail				
		Marsh wren	X			
		Tricolored blackbird			O	
		Yellow-headed blackbird				
Wetland	Marsh/wet meadow	Sandhill crane				
		Black-necked stilt				
		American avocet				
		Greater yellowlegs				
		Willet				
		Wilson's snipe	X			
		Wilson's phalarope				
		Bobolink			X	

Family	Group	Common Name	Focal Species	Federally Listed[1]	Sensitive[2]	Management Indicator[3]
Wetland	Marsh/open water	Eared grebe	F			
		Blue-winged teal				
		Northern shoveler				
		Northern pintail				
		Green-winged teal				
		Canvasback				
		Redhead				
		Ring-necked duck				
		Lesser scaup				
		Ruddy duck				

1 Federally listed as threatened (FT), endangered (FE), proposed (FP), or as a candidate (FC)
2 Regional Forester's Sensitive Species List for Oregon (O) or Washington (W) or both states (X)
3 Management indicator species for action alternatives (X) or only for alternative A (A)

The long-term sustainability of a focal species is assumed to be representative of a group of species with similar ecological requirements, and this group is assumed to respond in a similar manner to environmental change (Suring et al. 2011). By providing for adequate amounts and distribution of habitat and managing risks for focal species, it is assumed that the ecological conditions needed to maintain viability of other associated species will also be provided (USDA Forest Service 2010).

It is also assumed that implementing projects following the guidance of the forest plan would impact at least one individual of each species of conservation concern during the plan period. Disruptions to an individual's normal behavior patterns, such as breeding, foraging, and sheltering, are considered impacts to that individual. For example, it is assumed that wildland fire would be used as a management tool to help achieve desired conditions outlined in the forest plan. Inherently the use of fire will disrupt the normal behavior of species due to smoke and could actually cause mortality in less mobile species, such as land snails. Snags and down logs are also vulnerable to loss from fire (Bagne et al. 2008, Randall-Parker and Miller 2002). It is reasonable to assume that during the plan period at least some snags/down logs that provide shelter, nest sites, plucking posts, or foraging structure for various species would be lost, therefore disrupting an individual's behavior.

Another example would be ground nests. Although considered a random event (Jensen et al. 1990) with a low probability of occurrence (Beck and Mitchell 2000), Fondell and Ball (2004) documented that the nests of grassland species in Montana were destroyed by livestock trampling. Since domestic livestock would graze within the national forests, it is likely that at least some individuals would be disturbed.

Although Hamann et al. (1999) focused on birds other authors (Boyle and Samson 1985, Gaines et al. 2003, Taylor and Knight 2003) have documented the impacts of recreation on wildlife, which include the continuum of responses from habituation at one extreme to habitat abandonment at the other. Whether it is a snowmobile that disturbs a wolverine's foraging behavior or a hiker scrambling up a talus slope crushing a snail, individuals of species of conservation concern will most likely be impacted by recreational activity during the life of the plan.

Forest plans do not actually authorize site-specific activity but provide the umbrella under which projects would be designed and implemented. Project level analysis would be based on current and more site-specific information about existing conditions where the actions would be proposed. Historical conditions, current conditions, and desired conditions would be analyzed at a finer scale of resolution to better predict project outcomes. As such, it is assumed that the conditions presented in this analysis are representative of conditions as a whole across the national forest; however, there are sites within the national forest that, when analyzed at the project scale, would not be representative of the bigger picture (e.g., grazing intensity on an individual allotment that may exceed what would be presented for the national forest as a whole).

The Forest Service developed alternatives that have desired conditions for vegetation that strive to be within the bounds of HRV. The potential to diminish biological diversity is greater if current and anticipated conditions are outside and remain outside HRV. As stated previously, the effects described in this DEIS are designed to show the relative differences between alternatives but not precisely predict the amount or location of management activities that would occur during the plan period should an alternative be selected for implementation.

Environmental Consequences – Terrestrial Species Viability

This analysis describes how alternatives contribute to, address, or mitigate patterns of habitat alteration and fragmentation and wildlife disturbance, and identifies terrestrial source habitat that occur at levels less than estimates for the historical, forestwide scale. The discussion includes how alternatives address:

- progress towards achieving habitat desired conditions
- species that have a viability concern
- species affected by human influences

In particular, the analysis focuses on species and their habitats where sustainability may be affected and/or where the species has status as a Federal threatened, endangered, proposed, or candidate species or as a Regional Forester's Sensitive Species.

Changes in wildlife habitat occur at several scales and at differing intensities depending on the home range size and habitat requirements of individual species. The desired conditions are the same for the action alternatives, while management area designations, standard and guidelines, and the anticipated amount and rate of progress towards achieving desired conditions vary. Therefore, effects analyses for wildlife are broad, forestwide, and programmatic by design. The effects from probable management activities that could potentially affect wildlife communities can be grouped into three broad categories:

1. Changes in the type, quantity, and quality of source habitat:

Habitat changes from management activities would affect wildlife. Restoration, regeneration, and forest health goals exist for each alternative. The management activities needed to achieve those goals could include timber harvest; fuel treatments; livestock grazing; road reconstruction, maintenance, and decommissioning; prescribed fire; managed wildland fire; planting; and other similar activities. The Vegetation Dynamics Development Tool (VDDT), a modeling program, was used to project changes in vegetation from management actions as well as natural disturbances (i.e., wildfire and insects and disease).

2. Direct mortality, reduced survival, or increased susceptibility to mortality:

Management activities, such as prescribed burning, road construction, timber harvesting, trail construction, and construction of recreational facilities, could result in direct mortality to individual species. Motorized equipment, logging, road construction and maintenance, fire line construction, and off-road vehicles can kill individual animals. Individuals, as well as groups of species, can be killed by both natural and management ignited fires. Some activities could increase both the likelihood of disease transfer to wildlife populations and competition with nonnative species.

3. Increased disturbance:

Several variables influence disturbance and therefore the response of an animal to disturbance. These variables include type, predictability, frequency, magnitude, timing, and nearness of disturbance. Often due to group size, age, or sex, individuals respond differently to the same disturbance (Bejder et al. 2009). These responses may vary during different life stages of a given species (Wisdom et al. 2000). Disturbance could cause wildlife to change home range use patterns to avoid major disturbances, which in turn may force animals to use inferior quality habitat. Depending on the longevity, intensity, and type of disturbance, shifts in home range utilization may be temporal, seasonal, or permanent.

Roads and OHV access can create barriers to wildlife movement and dispersal. For very immobile species, such as terrestrial snails, reptiles, or amphibians, the impacts could result in isolation of local populations. Improved motor vehicle access can also result in increasing the vulnerability of popular game species, such as elk, deer, and black bears, to mortality from hunting.

Wildlife generally responds to human activities in the forms of avoidance, attraction, habituation, or indifference (as in no response) (Bjeder et al. 2009). Construction of recreation facilities, such as parking lots, campgrounds, trails, and snow play areas, could reduce the habitat suitable for wildlife through direct conversion and by increasing the distribution and level of human disturbance. Disturbance to wildlife would be expected from moderate- to high-use recreation facilities (e.g., campgrounds, picnic sites, boat launches, interpretive centers, and parking lots); special uses; motor vehicle routes and areas open to the public (including snowmobile use); and recreation trails (e.g., mountain bike, horseback, and hiking).

General Effects of National Forest Management

What follows is a description of general effects to wildlife habitat from other resource management activities. Although the amount or distribution of these activities differs by alternative, the general types of effects from the activities would be the same for all alternatives.

Timber Harvest

Timber harvest activities would alter vegetation components that comprise habitat for almost all terrestrial species. Harvesting can change vegetation composition, density, size, amounts, and distribution, and move successional trend toward or away from HRV. These changes in vegetation can have positive or negative effects on different species (Bunnell et al. 1997, Zwolak 2009). For example, past harvest of late old structure pine was detrimental to the white-headed woodpecker, a species that depends on large trees and snags, but may have been beneficial for other species, such as the fox sparrow, that prefer open, brushy habitats (Finch et al. 1997). Post-fire salvage logging can reduce the use of an area by cavity-nesting species, such as the black backed woodpecker, that evolved with fires where trees were not removed (Cahall and Hayes 2009) but may result in more favorable conditions for Lewis's woodpecker (Saab et al. 2007).

The mechanical processes involved in timber harvest often cause disturbance to wildlife because of equipment use or human presence. In areas where roads are built and maintained for long-term use, vehicle access can increase threats to some wildlife species (Forman 2000, Frair et al. 2008, Trombulak and Frissell 2000). Snags are usually removed adjacent to roads for safety reasons, and roads provide ready access to people wanting firewood (Bate et al. 2007). This reduces the habitat for species that require snags/logs. The timing of activities can also have different effects. For instance, localized harvest activities may disturb elk calving during a relatively short period in the spring, but not at other times of the year.

The amount of active management being proposed varies. Alternative D anticipates the most mechanical treatment during the life of the plan. It also would have the most movement towards HRV potential vegetation groups and would result in the greatest improvement for source habitats for many of the forested wildlife species. At the same, it would result in the greatest amount of potential disturbance to a variety of wildlife species. Although no new road construction is proposed, special habitat features, such as snags, that are important to certain species would be at greater risk.

The least amount of mechanical treatments is proposed for alternative C, which also would have the fewest acres of National Forest System lands suitable for active management. For most wildlife species, source habitat would improve the least, while the risk of disturbance to wildlife and special habitats would be smallest. Salvage harvest would be prohibited for alternative C, whereas it would not be expressly prohibited for alternative D. All alternatives include standards and guidelines that would provide some protection to post fire habitats as well as snag habitat.

Fire Management

Fire management activities change vegetation. Fire use or its exclusion can change vegetation composition, density, size, and amount and distribution of both live and dead material, as well as successional trends (Kennedy and Fontaine 2009).

Long-term fire exclusion causes an increase in vegetation quantity above levels that were historically present. In white-head woodpecker habitat, this has caused a reduction in habitat quality because of increasing tree density and higher composition of shade-tolerant tree species (Altman 2000). Long-term fire exclusion in the same type of habitat has benefitted other species, such as the pileated woodpecker, that prefer multi-storied tree stands and abundant snags and logs for feeding sites (*ibid*). The timing of fire can have different effects. Historically, fire created disturbance that altered vegetation at fairly regular intervals and at intensities that varied by potential vegetation group (Saab et al. 2007). Vegetation and animals evolved with fire, which is a common disturbance in many environments. As discussed, the change in vegetation resulting from fire can have positive or negative effects on different species depending on fire intensity, frequency, and timing.

Alternatives vary in the tradeoffs of fire risk to vegetation change. Potential effects to wildlife habitat and species from fire management will vary by alternative theme and management area assignments. Alternative C would rely greatly on both natural and management ignited fires as the agent of change for achieving desired conditions. The likelihood of natural fires would be greatest for alternative C, whereas implementing alternative D would make little use of management ignited fires and, due to the amount of anticipated vegetation treatment, would have the lowest probability of natural fire occurring.

Livestock Grazing

Domestic livestock grazing directly competes with wildlife for the use of available forage. Grazing results in plant defoliation, mechanical changes to soil and plant material, and nutrient redistribution (Belsky and Blumenthal 1997). These and other factors also influence successional trends. Succession is affected by the grazing frequency (times grazed), intensity (amount of plant removal), and opportunity (time the plant needs to meet its physiological growth needs). Timing (spring, summer, and/or fall) of grazing can also have different effects on vegetation, such as reduction of flowering parts or physical damage to plants if conditions are too wet in the spring. Grazing can alter the density and composition of herbaceous and shrub vegetation, which can have either a positive or negative effect on wildlife (Bock et al. 1993, Finch et al. 1997, Short and Knight 2003). Vegetation is sometimes altered to increase forage for livestock, which also increases forage for some wildlife species.

The presence of livestock can affect some wildlife species by attracting cowbirds in open forest settings, which lay eggs in (parasitize) other bird nests (Friedmann 1963). The presence of livestock may be giving cowbirds an ecological advantage over other bird species in the area (Goguen and Mathews 1998). In all cases, it is important to distinguish between historical and current livestock impacts. For example, some species, such as mule deer (Clements and Young

1997, Mule Deer Working Group 2003), and some bird species that rely on shrubs for nesting may have actually benefitted from the early heavy grazing in the West (Saab et al. 1995).

Grazing by domestic sheep can increase the risk of disease transmission to bighorn sheep (George et al. 2008). Bighorn sheep are highly susceptible to some strains of Pasteurella that are carried by domestic sheep (Foreyt et al. 1994). The disease, which does not affect domestic sheep, is usually fatal to bighorn sheep. Transmission of the disease can occur when bighorn sheep and domestic sheep occupy the same area and come in physical contact with each other (Coggins 2002, Clifford et al. 2009).

As with the forested landscapes, all alternatives have the desired condition of achieving historical vegetative conditions in those areas that are subjected to grazing. However, alternative C would be likely to achieve historical conditions the fastest and would reduce the potential threat of negative effects to wildlife from domestic livestock grazing the most. It proposes the least amount of area considered suitable for domestic livestock grazing and proposes the most stringent utilization standards. It also would have the widest riparian management areas (MA 4B). Alternatives A, B, and D likely would be the slowest to achieve rangeland HRV and also would pose the highest potential threat of negative effects to wildlife. In addition, alternative D would have the narrowest width for riparian management areas and would have the most area suitable for livestock grazing. While alternatives E and F are very similar to alternative B, they would have lower utilization levels and therefore should achieve desired conditions faster than alternatives A, B, and D.

Road and Trail Construction and Use

The majority of roads constructed on National Forest System lands during the last 50 years have been developed primarily for timber management activities. Historically, trails were developed for livestock management activities, mining, and fire lookout access. More recently, however, trails have been constructed for recreational activities.

Construction and use of roads and trails removes vegetation from the travel surface. This removal directly reduces the amount of vegetation that can be used as habitat and indirectly affects adjacent habitat (Frair et al. 2008). The relative effects of roads on wildlife depend on the interaction of topography, vegetation type and condition, and frequency of human use (Edge and Marcum 1991). One of the primary direct effects is increased human access to areas. Improved access increases mortality risk, fragmentation of habitat, and displacement/avoidance responses (Trombulak and Frissell 2000). Access can increase the risk of nonnative plants becoming established, and many of these plants are not used as habitat or forage by native wildlife. Access on roads and trails can be restricted during certain times of the year to reduce or eliminate these effects; however, the increasing human population trend for Oregon is likely to continue, and growth will likely increase human use of public lands during all seasons of the year.

No new road construction is anticipated for any of the alternatives. The alternatives provide a range of desired open motor vehicle route densities within the management areas. With the exception of alternative D, the alternatives include a desired condition of 2.4 miles of open motor vehicle routes per square mile for the general forest area (MA 4A) where most of the roads and active management occur. Alternative D includes a desired condition of 3 miles per square mile for MA 4A. Because the areal extent of MA 4A varies between the alternatives, alternative C would have the lowest overall open motor vehicle route density, followed closely by alternatives E and F. Because alternative D has the highest desired open motor vehicle route density and the greatest amount of MA 4A, it would pose the greatest risk of human disturbance to wildlife.

Minerals Management

Mining exploration and development can influence wildlife in a number of ways, including road construction to mineralized areas, increased human interaction, and loss of vegetation that was used as habitat (Wilcove et al. 1998). Mining at the turn of the twentieth century influenced extensive areas and resulted in considerable changes to the landscapes where it occurred. Dredging of areas like Sumpter Valley left a highly scarred landscape that is just recently beginning to recover. Some of the first roads constructed were to gain access to mineral deposits. Mining operations have different requirements for support facilities and access. In areas where mineral reserves justify the construction of a mill, impacts may include buildings, equipment, utilities, tailings, and human presence. Today most mining is in the form of placer mining. Although mining operations on public lands are required to file operating plans, it is still a ground-disturbing activity with a higher level of human activity that is not always compatible with wildlife.

The scale of mineral development has differing effects on habitat and displacement/avoidance associated with the extent, timing, and duration of activities. Exploration activities are usually brief compared to mineral production, which can displace wildlife for many years in some cases. Some mining activities use or produce toxic material. If improperly handled, this material can cause mortality to wildlife.

The ability to access minerals would be the same for each alternative, therefore effects to habitat and wildlife species would not vary. Mineral development is a function of worldwide market values. Areas may be withdrawn from mineral exploration or development by Congress or administratively. There are no proposals to directly withdraw any areas through plan revision, although land allocation decisions could indirectly influence mineral withdrawals in the future, depending on Congressional action.

Recreation

Recreation is a function of social demands related to desired, available, and provided experiences on National Forest System lands. Developed and dispersed camping can decrease the habitat capability for some species (Cole and Landres 1995). Wildlife species that require snags are usually negatively affected by hazard tree removal (for safety reasons) and firewood collection. Long-term use of dispersed sites can modify the vegetation that wildlife species depend on. Wildlife disturbance or disruption from recreation during breeding/nesting periods can also occur (Boyle and Samson 1985, Saab 1998).

Winter recreation, such as cross-country skiing and snowmobiling, can stress wintering animals during deep snow periods (Eckstein et al. 1979, Goldberg 2010, Goodrich and Berger 1994). Over-the-snow trails provide some animals with access to areas they usually cannot use during the winter because of deep snow conditions.

The increasing human population trend for Oregon is likely to continue. Likewise, the public desire for differing recreational activities will continue to increase. This increase in recreation use has resulted in increased conflicts with wintering wildlife, particularly big game. Most big game winter ranges have motorized access restrictions to reduce stress to wildlife during periods of deep snow; additional restrictions for big game winter ranges are not anticipated.

Though none of the alternatives would actively promote an increase in recreational use of National Forest System lands, in all likelihood, recreation demand within the national forests will increase during the plan period as the human population increases. With motor vehicle recreation

being the most disruptive to wildlife, the roads and trails discussion would best describe the degree of recreation impacts to impact wildlife. Alternative D would have the greatest potential for impacts, while alternative C would have the least.

General Effects of Non-native Plants

Over time, many nonnative plants have been introduced into the planning area. Some plants were intentionally introduced while others were not. Non-native plants change the value of wildlife habitat by displacing native plant species. Some nonnative species are not usable by native wildlife species as habitat or forage, and their presence decreases the habitat carrying capacity. Some nonnative plants influence fire regime and create conditions that may cause areas to burn more frequently. An increasing fire frequency can cause a reduction in woody species that are valuable as habitat. Additionally, nonnative plants compete with native vegetation for moisture, nutrients, and space, all of which can reduce habitat quality and quantity. All alternatives would provide parameters for noxious weeds treatments, but some may be more successful than others due to variable factors, such as access, detection, and vectors of establishment and spread.

Focal Species

The focal species assessment is intended to assist in the development of forest plans by helping frame the goals and desired conditions for ecosystems within the landscape, the management focus for implementing the plan, the anticipated accomplishments during the life of the plan, and the development of standards and guidelines where the risks and/or threats were not sufficiently ameliorated through other plan components. This section examines how the management alternatives for forest plan revision either contribute to or mitigate the changing patterns of habitat alteration and fragmentation and disturbance to wildlife. Raphael et al. (2001) suggested that the total amount of source habitat for any given species is best interpreted as the upper limit to the potential of an area to support that species, but should be tempered with factors that determine habitat quality to refine the potential carrying capacity of an area.

Table 299, table 300, and table 301 display the level of concern regarding the probability that species viability is maintained or improved; however, it should be noted that forest plans cannot remove all uncertainty and risk regarding species viability. Only those species that have model outcomes of high (H) or medium/high (M/H) displayed in the tables and have no improvement in the level of concern for all alternatives (e.g., ash-throated flycatcher) are discussed in detail here. The assumption is that those species with a moderate (M) or low (L) level of concern have minimal risk of becoming nonviable during the life of the plan. Alternatives with model outcomes demonstrating positive changes in source habitat compared to the existing condition are assumed to improve viability of the species, unless the outcome for risk factors or quality of habitat did not show a corresponding change. A detailed analysis for these species (Wales et al. 2011) is in the project record but, in general, habitats were more than 40 percent of the historical level (Denoël and Ficetola 2007, Olson et al. 2004, Radford et al. 2005, Svancara et al. 2005, Tear et al. 2005, With and Crist 1995), were adequately distributed across the landscape, and threats/risks had been reduced to an acceptable level.

Table 299, table 300, and table 301 highlight those focal species where modeling demonstrates no improvement from the current concern level and the focal species continue to have a high level of concern (H or M/H). The analysis is organized by first discussing source habitat trends for each focal species, and, because the threats and risks are similar for several focal species, they are discussed following the source habitat analysis. As a Federal candidate species, the wolverine is

discussed in detail in the "Threatened, Endangered, Proposed, Candidate, and Sensitive (TEPCS) Wildlife Species" section.

Table 299. Change in the level of concern (from existing condition) at year 20 for each focal species for each alternative for the Malheur National Forest; gray shaded cells indicate species analyzed in detail

Species	Existing Condition	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Boreal owl	H	M	M/H	M	M/H	M/H	M/H
Water vole	L	L	L	L	L	L	L
Northern goshawk	L	L	L	L	L	L	L
Cassin's finch	H	M	M	M	M/L	M	M
Pileated woodpecker	L	L	L	L	L	L	L
American marten	M/H	M	M	M	M	M	M
White-headed woodpecker	H	H	H	H	H	H	H
Western bluebird	H	H	H	H	M/H	M/H	H
Fox sparrow	H	H	H	H	M/H	M/H	H
Lewis' woodpecker	M/H	M/H	M/H	M/H	M/H	M/H	M/H
Black-backed woodpecker	M	M	M	M	M	M	M
Wolverine	H	H	H	M/H	H	H	H
Lark sparrow	L	L	L	L	L	L	L
Ash-throated flycatcher	H	M/H	M/H	M/H	M/H	M/H	M/H
Sage thrasher	M	M	M	M	M	M	M
Northern harrier	L	L	L	L	L	L	L
Bald eagle	L	L	L	L	L	L	L
MacGillivray's warbler	M	M	M	M/L	M	M	M
Columbia spotted frog	M	M	M	M/L	M	M	M
Marsh wren	L	L	L	L	L	L	L
Wilson's snipe	L	L	L	L	L	L	L
Inland tailed frog	MAL is outside of species' range						
Peregrine falcon	Extremely limited habitat; not analyzed						

Level of Concern Classification: L - low; L/M – low to moderate; M - moderate; M/H - moderate-to-high; H - high

Table 300. Change in the level of concern (from existing condition) at year 20 for each focal species for each alternative for the Umatilla National Forest; gray shaded cells indicate species analyzed in detail

Species	Existing Condition	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Boreal owl	M	M	M	M	M/H	M	M
Water vole	L	L	L	L	L	L	L
Northern goshawk	L	L	L	L	L	L	L
Cassin's finch	M/H	M/H	M/H	M/H	M	M	M/H
Pileated woodpecker	L	L	L	L	L	L	L
American marten	L	L	L	L	L	L	L
White-headed woodpecker	H	H	H	H	H	H	H
Western bluebird	H	H	H	H	M/H	H	H
Fox sparrow	M	M	M	M	M/L	M/L	M
Lewis' woodpecker	M	M/H	M/H	M/H	M/H	M/H	M/H
Black-backed woodpecker	M	M	M	M	M	M	M
Peregrine falcon	L/M	L/M	L/M	L/M	L/M	L/M	L/M
Wolverine	M/H	M/H	M/H	M	M/H	M/H	M/H
Lark sparrow	L	L	L	L	L	L	L
Ash-throated flycatcher	H	M/H	M/H	M/H	M/H	M/H	M/H
Sage thrasher	M	M	M	M	M	M	M
Northern harrier	L	L	L	L	L	L	L
Inland tailed frog	L	L	L	L	L	L	L
Bald eagle	L/M	L/M	L/M	L/M	L/M	L/M	L/M
MacGillivray's warbler	M	M	M	M/L	M	M	M
Columbia spotted frog	M	M	M	M/L	M	M	M
Marsh wren	L	L	L	L	L	L	L
Wilson's snipe	L	L	L	L	L	L	L

Level of Concern Classification: L - low; L/M – low to moderate; M - moderate; M/H - moderate-to-high; H - high

Table 301. Change in the level of concern (from existing condition) at year 20 for each focal species for each alternative for the Wallowa-Whitman National Forest; gray shaded cells indicate species analyzed in detail

Species	Existing Condition	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Boreal owl	M	M	M	M	M	M	M
Water vole	L	L	L	L	L	L	L
Northern goshawk	L	L	L	L	L	L	L
Cassin's finch	H	H	H	H	M	M/H	H
Pileated woodpecker	M	M	M	M	M	M	M
American marten	L/M	L/M	L/M	L/M	L/M	L/M	L/M
White-headed woodpecker	H	H	H	H	H	H	H
Western bluebird	H	H	H	H	M/H	M/H	H
Fox sparrow	M	M	M	M	M/L	M	M
Lewis' woodpecker	M	M/H	M/H	M/H	M/H	M/H	M/H
Black-backed woodpecker	L	L	L	L	L	L	L
Peregrine falcon	L/M	L/M	L/M	L/M	L/M	L/M	L/M
Wolverine	M/H	M/H	M/H	M	M/H	M/H	M/H
Lark sparrow	L	L	L	L	L	L	L
Ash-throated flycatcher	H	M/H	M/H	M/H	M/H	M/H	M/H
Sage thrasher	M	M	M	M	M	M	M
Northern harrier	L	L	L	L	L	L	L
Inland tailed frog	M	M	M	M	M	M	M
Bald eagle	M	M	M	M	M	M	M
MacGillivray's warbler	M	M	M	M/L	M	M	M
Columbia spotted frog	L	L	L	L	L	L	L
Marsh wren	L	L	L	L	L	L	L
Wilson's snipe	L	L	L	L	L	L	L

Level of Concern Classification: L - low; L/M – low to moderate; M - moderate; M/H - moderate-to-high; H - high

Cold Forest

The boreal owl was identified as the focal species for the alpine/boreal group that represents high elevation forests and is dependent on the availability of snags for nesting. Eight other species are found within this source habitat group (see table 298). Boreal owls inhabit mid- to high-elevation forests with large diameter trees and abundant snags and down logs. The boreal owl is primarily associated with closed-canopied cold, dry forests. Source habitats are defined as closed canopy (60 percent or greater) forests with trees 15 inches d.b.h. or greater. Home ranges for the boreal owl vary between seasons (Hayward et al. 1993) and average more than 2,000 acres with some home ranges being estimated in excess of 8,000 acres (Hayward 1994a). Home ranges of several males can overlap but breeding territories of approximately 95 acres are defended (Hayward and Hayward 1993 and Hayward et al. 1993).

Malheur and Wallowa-Whitman National Forests – Wales et al. (2011) indicated that habitat loss was the primary viability concern for the boreal owl and other species associated with high elevation, older forests with closed canopies. Habitat loss has occurred due to wildfires and past timber harvest. For both the Malheur and Wallowa-Whitman National Forests, an improvement in source habitat would occur for all alternatives during the first five decades after forest plan implementation. Within the Wallowa-Whitman National Forest, more than half of the source habitat occurs in protected areas. Although never abundant, the Malheur National Forest would have the greatest increase in source habitat during the first five decades.

Umatilla National Forest – The overall trend for source habitat within the Umatilla National Forest would decline in all alternatives for the first three decades before beginning to improve (see figure 20). Less than half of boreal owl habitat occurs within the area actively managed for timber harvest (MA 4A) within the Umatilla National Forest. During the first decade, commercial harvest would occur from a low of 0.2 percent of the cold forest potential vegetation group for alternative A to a high of 4.1 percent for alternative D (see table 300). These projected harvest levels cannot account for the five and 10 percent decline in habitat for alternatives A and D respectfully, indicating that natural processes (i.e., wildfire and insects and disease) as simulated in the VDDT model are probably influencing a greater portion of the cold forest within the Umatilla National Forest.

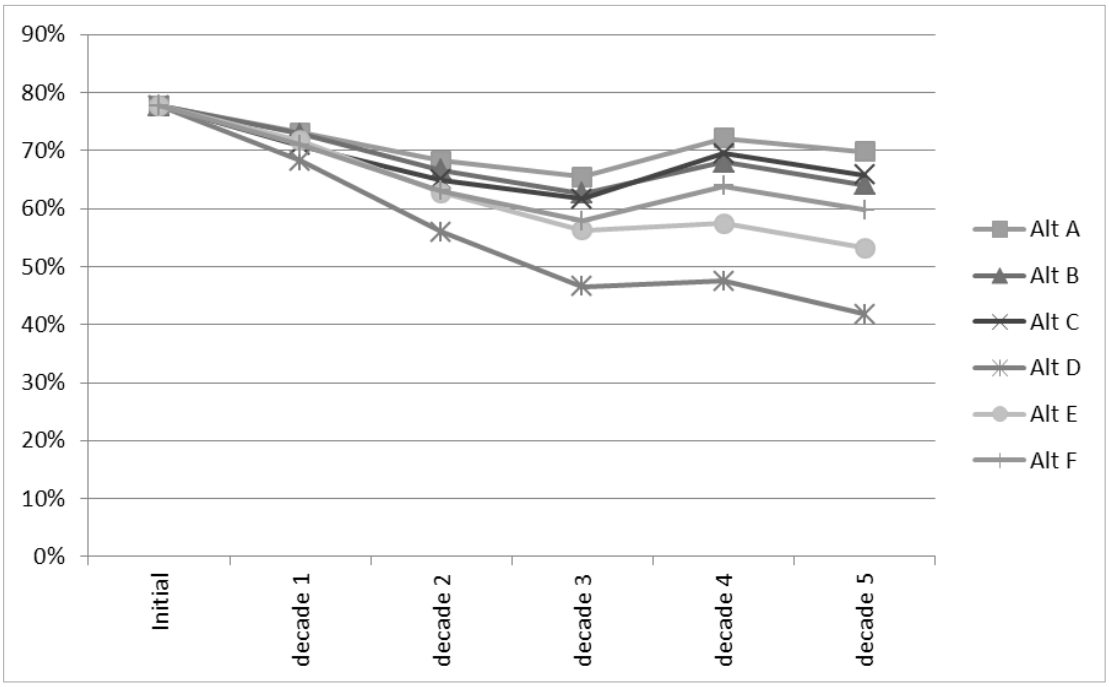

Figure 20. Decadal changes of Umatilla National Forest boreal owl source habitat expressed as a percentage of the mid-point of what would have been expected historically

According to Hayward et al. (1993) boreal owls occupy a narrow life zone at low population densities in isolated patches that represent a relatively small percentage of the landscape. They have large home ranges and, although not well studied in North America, the European subspecies has been well studied. Distances between breeding areas of the same individual have been reported to be hundreds of kilometers, and median dispersal distances for juveniles has been reported to be between 21 and 88 kilometers (Hayward and Verner 1994). In essence, the boreal

owl occurs in habitat that is naturally fragmented and not well distributed and has the ability to disperse over great distances through nonbreeding habitat to colonize available suitable habitat (Hayward and Verner 1994). As such, the distribution of habitat is less of a concern than the overall loss of habitat. Other species in the group represented by boreal owl also have relatively good dispersal capability (see table 298).

Raphael et al. (Raphael et al. 2001) suggested that the total amount of source habitat for any given species is best interpreted as the upper limit to the potential of an area to support that species, but should be tempered with factors that determine habitat quality to refine the potential carrying capacity of an area. Availability of snags greater than 20 inches in diameter influences the quality of habitat for the boreal owl as their distribution and abundance is largely tied to nest cavity availability and prey populations (Hayward et al. 1993). The boreal owl model utilized DecAID data (Mellen-McLean et al. 2009) for montane mixed conifer, small/medium trees vegetation condition of snags 50 centimeters d.b.h. or greater (DecAID figure MMC_S.inv-3) to establish snag categories for assessing habitat quality. The categories for snags 20 inches d.b.h. or greater are: low is 2.6/ha or less (less than 30 percent tolerance); moderate is 2.6 to 6.6/ha (30 to 50 percent); high is 6.6 to 18.3/ha (50 to 80 percent); very high is 18.3/ha or more (greater than 80 percent). According to DecAID figure MMC_S.inv-15, the high and very high snag densities historically would have been expected on more than 50 percent of the landscape. Within most watersheds (71 percent), more than half of the source habitat has moderate to low snag densities, indicating snag distribution is probably less than what would have occurred historically.

Table 302. Percent of the cold forest potential vegetation group proposed for treatment by type of treatment for each alternative for the Umatilla National Forest

Type of Treatment	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Salvage	0.0%	0.0%	0.0%	0.8%	0.4%	0.2%
Prescribed fire	0.3%	0.8%	1.1%	0.0%	1.4%	0.9%
Precommercial thin	0.7%	0.9%	0.8%	1.2%	0.9%	0.9%
Commercial	0.2%	0.7%	0.4%	4.1%	1.3%	0.9%
Totals	1.3%	2.4%	2.3%	6.0%	4.0%	3.0%

VDDT modeling indicates a downward trend in source habitat for all alternatives, but the level of concern is highest for alternative D, although the amount of projected active management alone cannot account for the downward trend. Alternative D is of concern since its downward trajectory is steeper and would approach 40 percent in the fifth decade. Several authors (Rompré et al. 2010, Svancara et al. 2005, With and Crist 1995) have indicated that landscapes containing at least 40 percent of source habitat for a species should sustain that species over time. The other alternatives would maintain more than 50 percent of the habitat that occurred historically, which would reduce the immediate concern for persistence of the boreal owl and species associated with this habitat. There are plan components in place that should lead to improved habitat for all of these alternatives. For example, although it will take time to replace large snags, there are desired conditions (see appendix A, 1.14 Snags and Down Wood) that mimic what is thought to have occurred across the landscape historically (see the threats/risks section for more discussion). There also are desired conditions for forest composition, density, and structure that are designed to mimic historical conditions.

Dispersal ability is an important component of population viability (Lamberson et al. 1994, King and With 2002), and most species of the group have good dispersal capability (see table 298).

King and Worth (2002) point out that dispersal success is usually not a concern when habitat exceeds 40 percent of the landscape. Although there is a degree of uncertainty, since all alternatives would maintain more than 50 percent of the landscape in source habitat during the first two decades, populations would likely be viable for all alternatives during the life of the plan. Because source habitat would be reduced for all alternatives and uncertainty exists, changes in source habitat for the boreal owl due to management or disturbances that can be mapped, such as wildfires, as well as risk factors, should be reevaluated once every two years.

Dry Forest: Medium/Large Trees

The white-headed woodpecker was chosen as the focal species to represent the medium-large trees/dry forest group. The white-headed woodpecker is associated with open-canopied ponderosa pine forests (Bull et al. 1986, Frederick and Moore 1991, Garrett et al. 1996, and Kozma 2009) and specifically with large trees and snags, which are important habitat components for five other species in the group and family (USDA Forest Service 2010). White-headed woodpeckers rely on mature, cone-producing trees during winter (Garrett et al. 1996, Milne and Hejl 1989). For the purpose of this analysis, source habitat for both current and historical conditions is considered to be the dry forest potential vegetation group with single- and multi-stories, large-tree structure (greater than 20 inches d.b.h.), and open canopies (i.e., less than 40 percent).Other factors that were considered in the evaluation of habitat for this species included snag availability, open motor vehicle route density, and shrub cover (Wales et al. 2011). The ability of white-headed woodpecker to disperse across the planning area is not considered an issue.

Several studies have documented the importance of large diameter ponderosa pine snags for white-headed woodpeckers (Dixon 1995, Dixon 1995a, Milne and Hejl 1989, Raphael and White 1984). Frenzel (2002) found that of 405 nests of white-headed woodpeckers, all but 12 were in completely dead trees. The focal species assessment model utilized DecAID data (Mellen-McLean et al. 2009) for ponderosa pine/Douglas-fir, large tree vegetation condition for snags 50 centimeters d.b.h. or greater (DecAID figure PPDF_L.inv-3) and dry grand fir, large tree vegetation condition for snags 50 cm or greater (DecAID figure EMC_ECB_L.inv-3) to establish snag categories to be used in assessing habitat.

The white-headed woodpecker is a focal species, sensitive species, and a management indicator species (see table 298). The concept of focal species differs from the concept of management indicator species as described in the regulations written to implement NFMA (36 CFR 219.19). The use of management indicator species was considered a means of evaluating the effects of implementing the forest plan and assumes that the predicted changes in population trends would be reflective of the predicted changes in amount and quality of habitat from management practices resulting from implementing a forest plan. Because the planning regulations (39 CFR 219) require that alternatives are evaluated for habitat of management indicator species, the white-headed woodpecker is also addressed in the management indicator species analysis. As Owen (2010) and Hayward et al. (2004) point out, management indicator species may or may not be used in the NFMA viability assessment; so to maintain clarity and to meet the intent of the focal species analysis, the viability assessment for the white-headed woodpecker and its associated species will be discussed.

Model outcomes for all three national forests displayed in table 299 through table 301 indicate a high concern for viability of this species for all alternatives. Within all three national forests, improvement in source habitat is predicted for all alternatives. The projected viability outcome is low primarily due to the low amount of open-canopied large tree forests as compared to HRV (Wales et al. 2011). Loss of habitat has occurred for a variety of reasons, including wildfire and

past timber harvest. Habitat has also been lost due to fire suppression, which resulted in stands becoming denser.

Malheur National Forest – White-headed woodpecker habitat within the Malheur National Forest is well below historical levels, which causes a high level of concern for the viability of the species. As displayed in figure 21, the alternatives would have increases in source habitat between 165 and 260 percent by year 20, but none would come close to the 40 percent level that has been identified as the threshold for viability (Tear et al. 2005, Rompré et al. 2010, With and Crist 1995). Although the fastest trajectory of habitat improvement is projected for alternative D, it would come with the cost of increased short-term disturbance levels. Even so, such a trajectory would indicate that populations should be stable throughout the plan period, assuming no other complicating factors occur. This assumption is based on the management emphasis in the proposed forest plan to restore dry forest habitat occupied by this species, including reductions in fuels and thus reduced risk of fire and insects outbreaks.

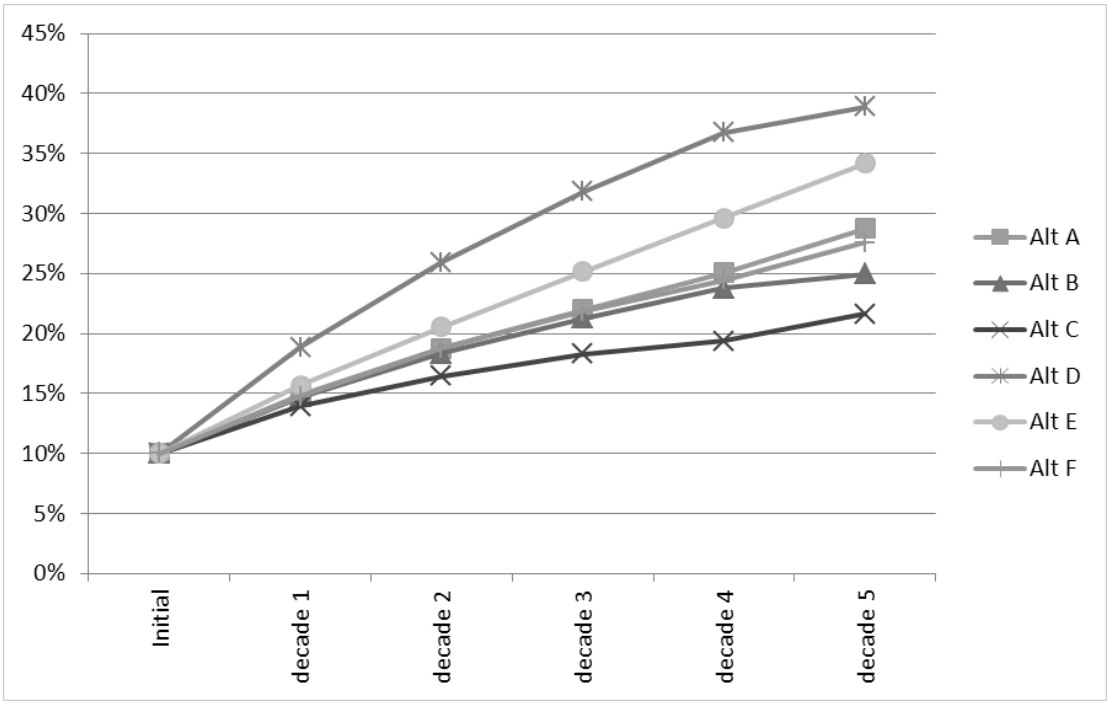

Figure 21. Decadal changes of Malheur National Forest white-headed woodpecker source habitat expressed as a percentage of the mid-point of what would have been expected historically

Mason and Countryman (2010) utilized CVS plot data to summarize snag conditions within the Blue Mountains. Bate et al. (2007) identified some of the shortcomings of using CVS data for snag analysis but concluded that, with the exception of human access variables such as distance to nearest town, the patterns of distribution were similar between CVS data and the more stratified data that they collected. They also identified a variety of risks that affected snag density, which are discussed in more detail later. Table 303 displays that snag densities across the landscape are similar to what would be expected historically. High densities of large diameter snags (80 percent tolerance level) in both the dry and moist potential vegetation groups are lower than what would be expected, which may be a relic of past harvest practices as management during the past decade has emphasized the retention of large diameter snags. Although snag densities may be similar to

historical levels, it is recognized that distribution across the landscape may different than what was found historically (Nutt et al. 2010).

Table 303. Snag density per acre for 30, 50, and 80 percent tolerance levels found at white-headed woodpecker nest and roost sites, and percent of historic and current landscape at these levels for the Malheur National Forest

d.b.h. (inches)	Potential Vegetation Group Associations	Tolerance levels[1]			Percent of landscape that historically met species tolerance levels[2]			Percent of landscape that currently meets species tolerance levels[3]		
		30%	50%	80%	30%	50%	80%	30%	50%	80%
≥ 10	Ponderosa pine /Douglas-fir	0.5	1.9	4.0	67%	67%	19%	71%	71%	18%
≥ 20		0.5	1.8	3.8	79%	79%	15%	82%	82%	13%
≥ 10	Eastside mixed conifer	0.3	1.9	4.0	34%	34%	26%	36%	36%	24%
≥ 20		0.0	1.5	3.8	62%	62%	24%	64%	64%	18%

1 From Mellen-McLean (2011) management indicator species information sheet
2 From tables 8 and 9 in Mason and Countryman (2010)
3 From tables 14 and 15 in Mason and Countryman (2010)

All alternatives would have the same desired condition for snags (see appendix A 1.14 Snags and Down Wood). In the case of the dry potential vegetation group, all alternatives except alternative D would have a standard to retain snags greater than 21 inches d.b.h. and 50 percent of snags between 12 and 21 inches (WHAB-12 S7). Although this would help maintain current snag levels (see table 303), it is possible that future snag recruitment could be different between alternatives because of differing harvest levels. Friesen (2009) reviewed modeling efforts and literature to assess the impact on snag dynamics from thinning of forested stands. She found that thinning in young stands promotes the development of larger diameter green trees faster than in un-thinned stands. However, the reduced competition from the thinning reduces density-dependent mortality in the residual trees, allowing them to be healthier and live longer before succumbing to competition, insects, or disease to become a snag (Davis et al. 2007, Garman et al. 2003, Harrington et al. 2005). Friesen (2009) noted that modeling this question results in different answers from different models. Because traditional implementation of silvicultural systems will probably capture mortality and improve the health of the stand in general, it is assumed that snag recruitment would take longer for those alternatives with more commercial treatment. Although source habitat would increase the most for alternative D, it also would have the greatest impact on snag dynamics as more acres would be treated commercially (see table 249 in the Forested Vegetation, Timber Resources, and Wildland Fire section). However, at the landscape level areas of undisturbed forest are often skipped leaving habitat islands with diverse structural legacies and unique environmental conditions (Foster et al. 1998, Franklin et al. 2002, Friesen 2009). Less than 10 percent of the dry forest potential vegetation group would actually be treated commercially for alternative D (see table 310) within the Malheur National Forest in the first decade. Based on harvest alone, the potential for snag recruitment at the landscape level would not be significantly reduced during the life of the plan.

Umatilla National Forest – White-headed woodpecker habitat within the Umatilla National Forest is at far less than historical levels, which causes a high level of concern for the viability of the species. As displayed in figure 22, the alternatives would have increases in source habitat between 248 and 419 percent by year 20, but none would come close to the 40 percent level that has been identified as the threshold for viability (Rompré et al. 2010, Tear et al. 2005, With and Crist 1995). Although the fastest trajectory of habitat improvement is projected for alternative D, it would come with the cost of increased short term disturbance levels. Even so, such a trajectory

would indicate that populations should be stable throughout the plan period, assuming no other complicating factors occur. This assumption is based on the management emphasis in the proposed forest plan to restore dry forest habitat occupied by this species, including reductions in fuels and thus reduced risk of fire and insects outbreaks.

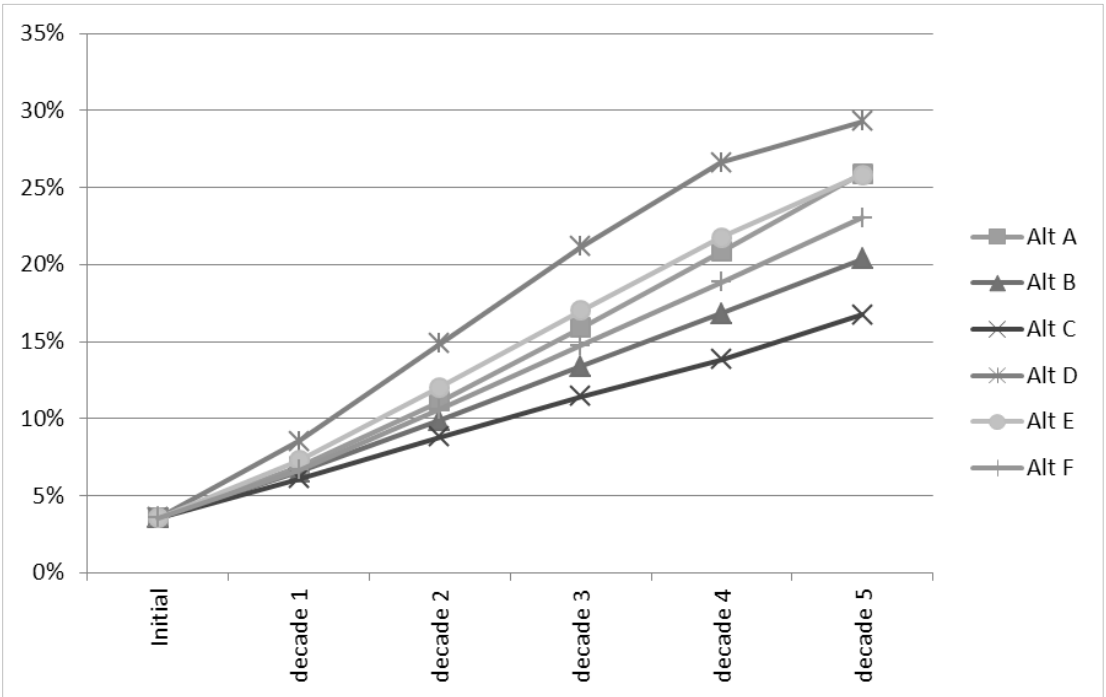

Figure 22. Decadal changes of Umatilla National Forest white-headed woodpecker source habitat expressed as a percentage of the mid-point of what would have been expected historically

Table 304 displays that snag densities are close to HRV with the possible exception of large snags at high densities in the dry potential vegetation group. As discussed for the Malheur National Forest, snag recruitment can be impacted by thinning. Only a small portion of the dry potential vegetation group within the Umatilla National Forest (see table 341) would be harvested during the life of the plan. Based on harvest alone, the potential for snag recruitment at the landscape level would not be significantly reduced.

Table 304. Snag density per acre for 30, 50, and 80 percent tolerance levels found at white-headed woodpecker nest and roost sites, and percent of historic and current landscape at these levels for the Umatilla National Forest

d.b.h. (inches)	Potential Vegetation Group Associations	Tolerance levels[1]			Percent of landscape that historically met species tolerance levels[2]			Percent of landscape that currently meets species tolerance levels[3]		
		30%	50%	80%	30%	50%	80%	30%	50%	80%
≥ 10	Ponderosa pine /Douglas-fir	0.5	1.9	4.0	53%	53%	23%	54%	54%	24%
≥ 20		0.5	1.8	3.8	70%	70%	19%	73%	73%	16%
≥ 10	Eastside mixed conifer	0.3	1.9	4.0	29%	29%	26%	29%	29%	25%
≥ 20		0.0	1.5	3.8	55%	55%	22%	54%	54%	23%

1 From Mellen-McLean (2011) management indicator species information sheet

2 From tables 8 and 9 in Mason and Countryman (2010)

3 From tables 14 and 15 in Mason and Countryman (2010)

Wallowa-Whitman National Forest – White-headed woodpecker habitat within the Wallowa-Whitman National Forest is at far less than historical levels, which causes a high level of concern for the viability of the species. As displayed in figure 23, the alternatives would have increases in source habitat between 194 to 359 percent by year 20, but none would come close to the 40 percent level that has been identified as the threshold for viability (Rompré et al. 2010, Tear et al. 2005, With and Crist 1995). Although the fastest trajectory of habitat improvement is projected for alternative D, it would come with the cost of increased short term disturbance levels. Even so, such a trajectory would indicate that populations should be stable throughout the plan period, assuming no other complicating factors occur. This assumption is based on the management emphasis in the proposed forest plan to restore dry forest habitat occupied by this species, including reductions in fuels and thus reduced risk of fire and insects outbreaks.

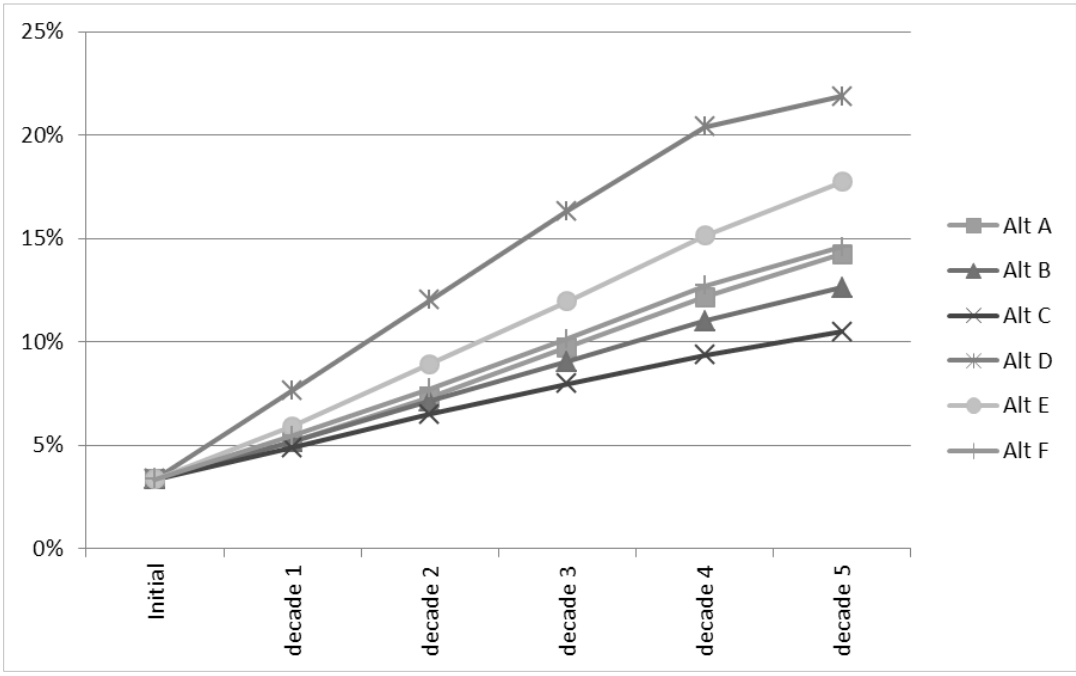

Figure 23. Decadal changes of Wallowa-Whitman National Forest white-headed woodpecker source habitat expressed as a percentage of the mid-point of what would have been expected historically

Table 305 indicates that snag densities are mostly close to HRV within the Wallowa-Whitman National Forest in the dry potential vegetation group. As discussed for the Malheur National Forest, snag recruitment can be impacted by thinning. Only a small portion of the dry potential vegetation group within the Wallowa-Whitman National Forest (see table 341) would be harvested during the life of the plan. Based on harvest alone, the potential for snag recruitment at the landscape level would not be significantly reduced.

Table 305. Snag density per acre for 30, 50, and 80 percent tolerance levels found at white-headed woodpecker nest and roost sites, and percent of historic and current landscape at these levels for the Wallowa-Whitman National Forest

d.b.h. (inches)	Potential Vegetation Group Associations	Tolerance levels[1]			Percent of landscape that historically met species tolerance levels[2]			Percent of landscape that currently meets species tolerance levels[3]		
		30%	50%	80%	30%	50%	80%	30%	50%	80%
≥ 10	Ponderosa pine /Douglas-fir	0.5	1.9	4.0	68%	68%	18%	68%	68%	19%
≥ 20		0.5	1.8	3.8	83%	83%	12%	84%	84%	11%
≥ 10	Eastside mixed conifer	0.3	1.9	4.0	40%	40%	23%	41%	41%	25%
≥ 20		0.0	1.5	3.8	69%	69%	18%	68%	68%	18%

1 From DecAID Figure PPDF_O.inv-3 and EMC_ECB_O.inv-3

2 From tables 8 and 9 in Mason and Countryman (2010)

3 From tables 14 and 15 in Mason and Countryman (2010)

All Forest Types: Medium/Large Trees

The Cassin's finch was chosen as a focal species for medium and large tree forests in the all forest communities group, which includes 11 additional species (see table 298). One species in the group, northern flying squirrel, is probably better represented by another focal species in the family, the pileated woodpecker representing the cool/moist forest group. This finch occupies forests with large diameter trees and abundant snags and down logs at all elevation levels. It is found in all potential vegetation groups and was chosen as a focal species to represent medium and large trees, but more specifically to represent the open-canopied forests with which other species in this group and family are also associated. The Cassin's finch has a negative association with grazing, as do other species it represents. Source habitats were defined as open canopy forests (less than or equal to 40 percent for dry forest and less than or equal 60 percent for other forested potential vegetation groups) with trees 15 inches d.b.h. and greater.

Loss of habitat is the primary viability concern for the Cassin's finch and species associated with open forested habitats.

Malheur National Forest – Model outcomes for the three national forests displayed in table 299 indicate a strong improvement in the viability concern for this species within the Malheur National Forest, and therefore it is not discussed in detail for this national forest.

Umatilla National Forest – All alternatives would have reductions in source habitat for the Cassin's finch during the first decade (see figure 24). Source habitat would increase for alternative D sufficiently during the second decade to reduce the level of concern for viability (see table 300). Although all alternatives would eventually exhibit an upward trend for source habitat, only alternatives D, E, F, and A would actually have more source habitat in year 50 than at the start of the plan period. Alternative C would have the greatest level of concern for the viability of this species. Although grazing is a risk factor (discussed in detail later in this section) in the assessment model, it was not weighted heavily (Wales et al. 2011). Due to increases in source habitat, alternatives D and E would have the greatest reductions in risk to species viability for the Cassin's finch. Although the other alternatives would reduce source habitat availability, it would be fairly well distributed within the Umatilla National Forest. Due to the high dispersal capability of the Cassin's finch and the other species it represents, individuals would be likely be able to interact and populations would likely be viable for all alternatives during the life of the plan.

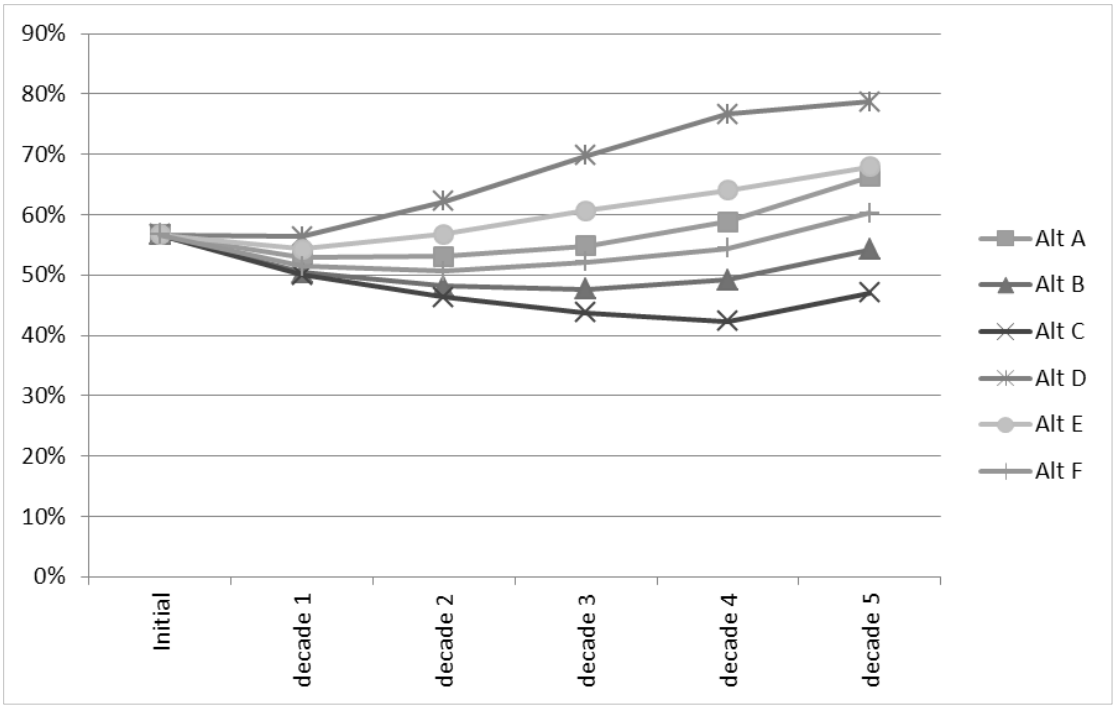

Figure 24. Decadal changes of Malheur National Forest Cassin's finch source habitat expressed as a percentage of the mid-point of what would have been expected historically

Wallowa-Whitman National Forest – There would be a high level of concern for the viability of the Cassin's finch within the Wallowa-Whitman National Forest. This is primarily due to the extensive departure in the amount of source habitat (see figure 25). Unlike the Umatilla National Forest, only alternative C would lead to a slight reduction in source habitat during the first decade. By the end of the second decade, all alternatives would have more source habitat than at the start of the plan period. The increases in source habitat for alternatives D and E would be sufficient enough to result in reduced concern for species viability. Because all alternatives show an improving source habitat trend, none would lead to an increased concern based on habitat alone. As discussed previously, risks associated with this species (discussed in detail later in this section) would not outweigh the improvement in habitat. As such, populations would likely be viable for all alternatives during the life of the plan.

Open Forest: All Forest Structure (Tree Sizes)

The western bluebird was identified as the focal species for the open forest/all forest group because it is widely distributed in open, low-elevation forests, and is limited by the availability of snags with existing cavities (Guinan et al. 2008). Western bluebirds are summer residents in Oregon, and this assessment is for breeding and rearing habitat. Source habitat was defined as the all forest structure (tree sizes) in the dry forest potential vegetation group with less than 40 percent canopy cover (Wales et al. 2011). Snag availability, open motor vehicle route density, and grazing were other factors used in the focal species assessment model to assess habitat quality. Some species in the group use down wood and it is assumed that if snags are present for the bluebird, down wood will be available as snags fall.

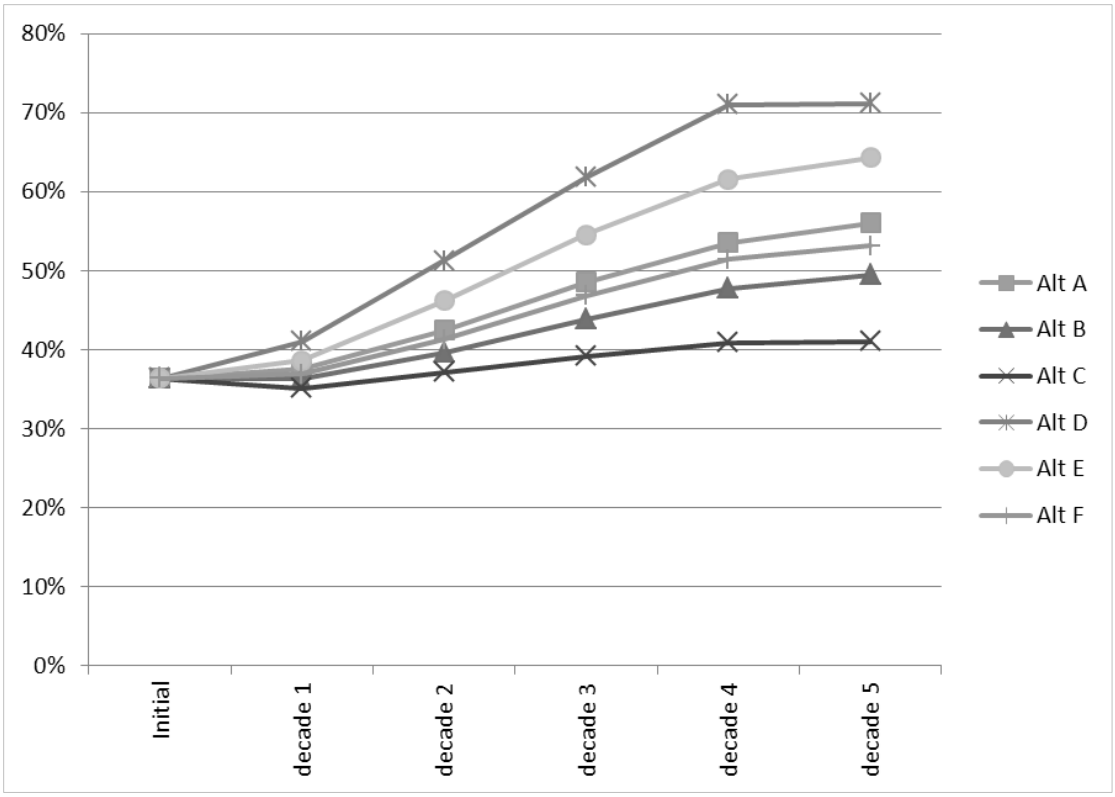

Figure 25. Decadal changes of Wallowa-Whitman National Forest Cassin's finch source habitat expressed as a percentage of the mid-point of what would have been expected historically

Outcomes for all three national forests displayed in table 299 through table 301 indicate a high concern for species viability both currently and for the alternatives. Although an improvement in source habitat would occur at the scale of the Blue Mountains, the projected viability outcome would remain low primarily because the amount of open habitats within forested communities would remain low compared to historical conditions (Wales et al. 2011). Loss of habitat has occurred for a variety of reasons, including wildfire suppression and possibly past livestock grazing practices, which resulted in stands becoming more dense.

Malheur National Forest – With the exception of alternative D, source habitat would be reduced to less than the existing condition during the first decade (see figure 26). By year 20, source habitat would exceed the existing condition only for alternatives D and E, resulting in reducing the level of viability concern from high to moderate-to-high for those alternatives (see table 299). The level of concern would continue to be high for the other alternatives. Although the concern would remain high, the habitat trend would be relatively stable. For all alternatives, it would be above the 40 percent level that has been identified as a threshold for viability (Rompré et al. 2010, Tear et al. 2005, With and Crist 1995). Source habitat was highly abundant (more than one million acres) within the Malheur National Forest. Although below what occurred historically, it is still relatively common. This reduces the immediate concern for the persistence of the western bluebird and other species associated with this habitat for all alternatives. With the exception of the rubber boa, most species within the group have high dispersal capabilities (see table 298), so individuals would likely be able to interact, thus maintaining viable populations for all alternatives during the life of the plan.

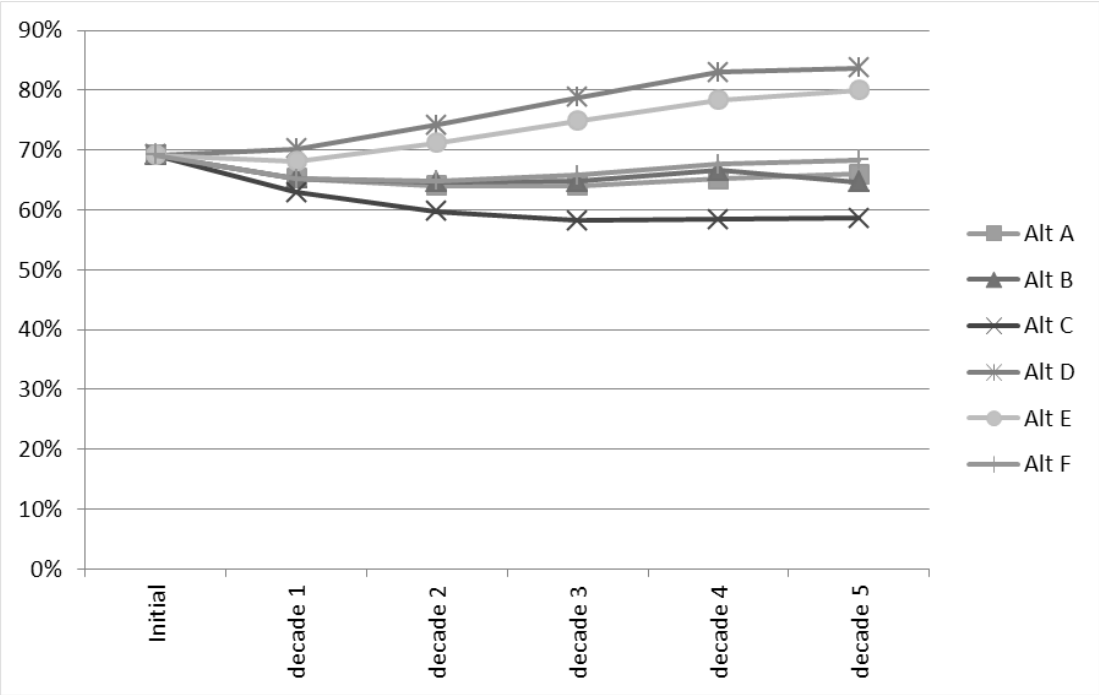

Figure 26. Decadal changes of Malheur National Forest western bluebird source habitat expressed as a percentage of the mid-point of what would have been expected historically

As indicated previously, habitat quality is affected by snag density and grazing. Risks to snag density from roads and management activities are discussed later in this section as well as the risks associated with grazing. Table 306 displays the snag levels analyzed and how they compare to what would be expected across the landscape based on Mason and Countryman (2010). It is important to note that because of the categories used in Mason and Countryman (2010), all three levels for ponderosa pine fall in the same category (zero to two snags per acre) and therefore the landscape percentages are the same. What it does point out is that high snag levels in the dry potential vegetation group approximate what would be expected across the landscape historically. However, when compared with the analysis at the watershed level (Wales et al. 2011) only three percent of the watersheds within the Malheur National Forest have 50 percent or more of source habitat with high or very high snag densities, indicating a distribution problem. Wales et al. (2011) estimated that historically half of source habitat would have had snag densities of one snag per acre or less and half would have snag densities greater than one snag per acre. As previously noted (see discussion of the white-headed woodpecker for the Malheur National Forest), it seems unlikely, given the plan components, that the potential for snag recruitment for any alternative would be reduced to a level that would offset increases in source habitat. At the same time, in all likelihood alternative C would not reduce threats to habitat quality sufficiently to compensate for the decrease in open habitats (see the risks discussion that follows).

Table 306. Snag density per acre for 30, 50, and 80 percent tolerance levels described in DecAID, and percent of the historic and current landscape at these levels for the Malheur National Forest

d.b.h. (inches)	Potential Vegetation Group Associations	Tolerance levels from unharvested inventory plots[1]			Percent of landscape that historically met species tolerance levels[2]			Percent of landscape that currently meets species tolerance levels[3]		
		30%	50%	80%	30%	50%	80%	30%	50%	80%
≥ 20	Ponderosa pine/Douglas-fir	0.0	0.0	1.1	79%	79%	79%	82%	82%	82%
≥ 20	Eastside mixed conifer	0.0	0.8	5.5	62%	62%	24%	61%	61%	20%

1 From DecAID Figure PPDF_O.inv-3 and EMC_ECB_O.inv-3
2 From tables 8 and 9 in Mason and Countryman (2010)
3 From tables 14 and 15 in Mason and Countryman (2010)

Umatilla National Forest – With the exception of alternative D, there would be a high level of viability concern for the western bluebird (see table 300). Source habitat would increase for all alternatives compared to the existing condition during the first decade (see figure 27) but would increase sufficiently by the second decade to reduce the level of concern from high to moderate-to-high only for alternative D. Although the concern would remain high for all of the other alternatives, the trajectory for habitat is strongly upward. Coupled with the fact that habitat is currently common (historically more than 500,000 acres) and that most species of the group have high dispersal ability, populations would likely be viable for all alternatives during the life of the plan (see discussion for the Malheur National Forest).

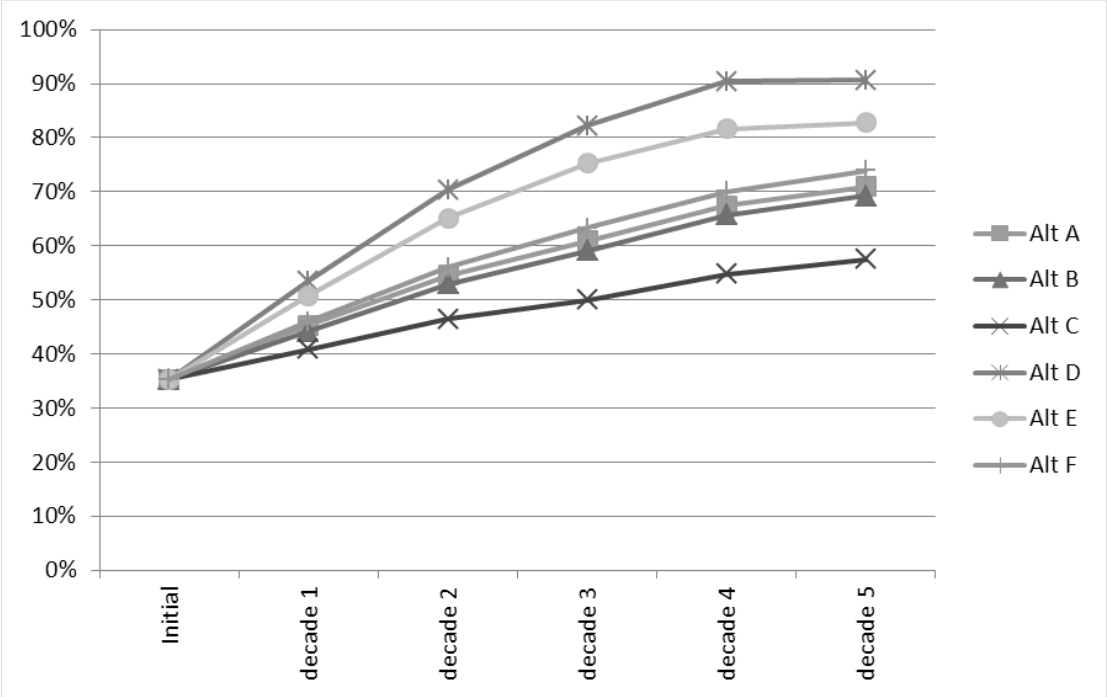

Figure 27. Decadal changes of Umatilla National Forest western bluebird source habitat expressed as a percentage of the mid-point of what would have been expected historically

Table 307 displays large snag availability across the landscape, which contributes to the quality of habitat for the western bluebird. The shortcomings of the snag data were discussed previously for the Malheur National Forest (see white-headed woodpecker under Dry Forest: Medium/Large Trees). Similar to the Malheur National Forest, it would appear that distribution across the landscape is of concern as only 34 percent of the watersheds within the Umatilla National Forest have 50 percent or more of source habitat with high or very high densities of large snags (Wales et al. 2011). As previously noted (see discussion of the white-headed woodpecker for the Malheur National Forest), it seems unlikely, given the plan components, that the potential for snag recruitment for any alternative would be reduced to a level that would offset increases in source habitat. At the same time, in all likelihood alternative C would not reduce threats to habitat quality sufficiently to compensate for the decrease in open habitats (see the risks discussion that follows).

Table 307. Snag density per acre for 30, 50, and 80 percent tolerance levels described in DecAID, and percent of the historic and current landscape at these levels for the Umatilla National Forest

d.b.h. (inches)	Potential Vegetation Group Associations	Tolerance levels from unharvested inventory plots[1]			Percent of landscape that historically met species tolerance levels[2]			Percent of landscape that currently meets species tolerance levels[3]		
		30%	50%	80%	30%	50%	80%	30%	50%	80%
≥ 20	Ponderosa pine/Douglas-fir	0.0	0.0	1.1	70%	70%	70%	73%	73%	73%
≥ 20	Eastside mixed conifer	0.0	0.8	5.5	55%	55%	22%	54%	54%	23%

1 From DecAID Figure PPDF_O.inv-3 and EMC_ECB_O.inv-3

2 From tables 8 and 9 in Mason and Countryman (2010)

3 From tables 14 and 15 in Mason and Countryman (2010)

Wallowa-Whitman National Forest – With the exception of alternatives D and E, there is a high level of concern for western bluebird viability (see table 301). The amount of source habitat would increase during the first decade for all alternatives (see figure 28), but would increase sufficiently by the second decade to reduce the level of concern from high to moderate-to-high only for alternative D. Although the concern for viability would remain high for all of the other alternatives, the trajectory for habitat is strongly upward. Coupled with the fact that habitat is still common (historically more than 600,000 acres) and that most species of the group have high dispersal ability; populations would likely be viable for all alternatives during the life of the plan (see discussion for the Malheur National Forest).

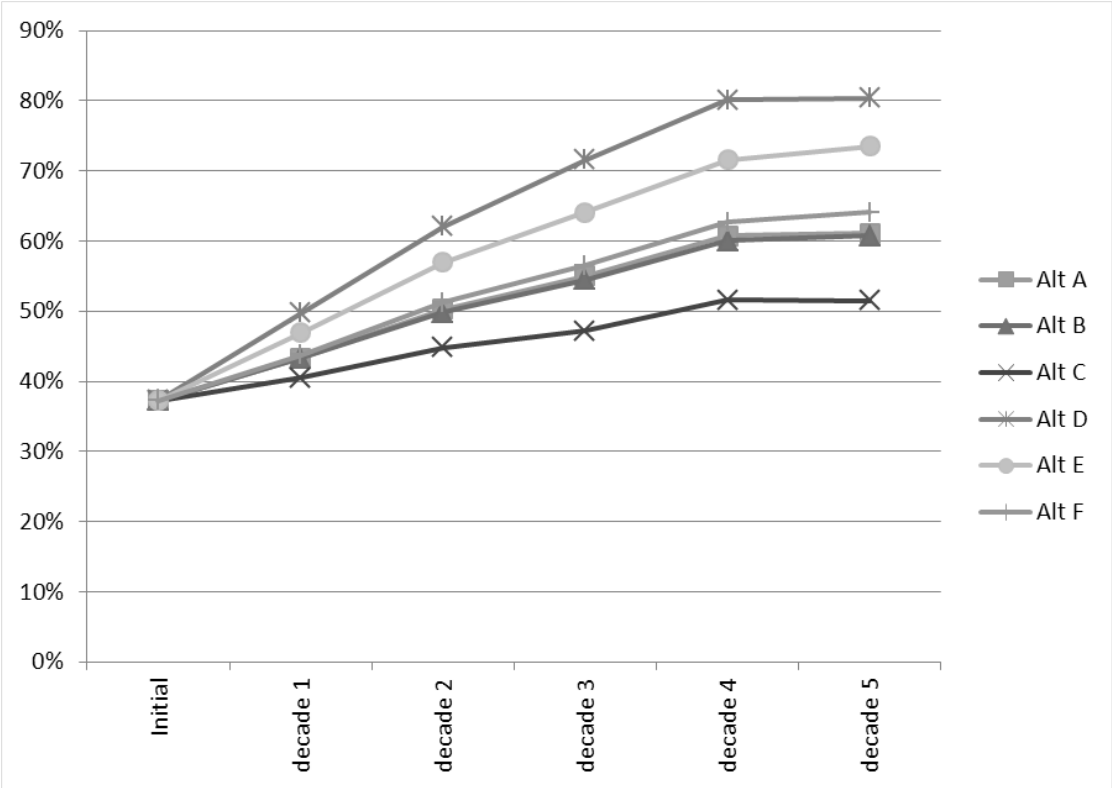

Figure 28. Decadal changes of Wallowa-Whitman National Forest western bluebird source habitat expressed as a percentage of the mid-point of what would have been expected historically

Table 308 displays large snag availability across the landscape, which is one of the attributes determining habitat quality for the western bluebird. The shortcomings of the snag data were discussed previously for the Malheur National Forest (see white-headed woodpecker under Dry Forest: Medium/Large Trees). Similar to the Malheur National Forest, it would appear that distribution across the landscape is of concern as only 10 percent of the watersheds within the Wallowa-Whitman National Forest have 50 percent or more of source habitat with high or very high densities of large snags (Wales et al. 2011).

Table 308. Snag density per acre for 30, 50, and 80 percent tolerance levels described in DecAID, and percent of the historic and current landscape at these levels for the Wallowa-Whitman National Forest

d.b.h. (inches)	Potential Vegetation Group Associations	Tolerance levels from unharvested inventory plots[1]			Percent of landscape that historically met species tolerance levels[2]			Percent of landscape that currently meets species tolerance levels[3]		
		30%	50%	80%	30%	50%	80%	30%	50%	80%
≥ 20	Ponderosa pine/Douglas-fir	0.0	0.0	1.1	70%	70%	70%	73%	73%	73%
≥ 20	Eastside mixed conifer	0.0	0.8	5.5	55%	55%	22%	54%	54%	23%

1 From DecAID Figure PPDF_O.inv-3 and EMC_ECB_O.inv-3

2 From tables 8 and 9 in Mason and Countryman (2010)

3 From tables 14 and 15 in Mason and Countryman (2010)

As previously noted (see discussion of the white-headed woodpecker for the Malheur National Forest), it seems unlikely that the potential for snag recruitment for any alternative would be reduced to a level that would offset increases in source habitat. At the same time, in all likelihood alternative C would not reduce threats to habitat quality sufficiently to compensate for the decrease in open habitats (see the risks discussion that follows).

Open Forest: Early Successional

The fox sparrow was chosen as the focal species to represent the early successional group of the open forest family. Banks (1970) as well as Weckstien et al. (2002) indicate that three subspecies occur in Oregon. They prefer dense, low shrub growth typical of such habitats and were susceptible to the effects of grazing by domestic livestock similar to other species in this group. Fox sparrows are breeding season residents of the planning area; therefore, this assessment is for breeding and rearing habitat. Source habitat was defined as all potential vegetation groups in the stand initiation, grass, or shrub (less than 5 inches) structural stages with open canopy (less than 10 percent cover).

Fox sparrows were strongly associated with riparian shrubs (e.g., willow [*Salix* spp.] and alder [*Alnus* spp.]) and the early shrub stage following disturbances such as fire and clearcut logging (Banks 1970, Fontaine et al. 2009, Hagar 1960, Kirk and Hobson 2001, Machtans and Latour 2003, Simon et al. 2002, Webster 1975, Weckstein et al. 2002). Although the amount of shrub cover is directly related to habitat quality for fox sparrow, it was not used in the model because of the high variability within the data set available for analysis (Wales et al. 2011).

Loss of habitat is the primary concern for the fox sparrow and species associated with open forest early successional habitats. Outcomes for the three national forests in table 299 through table 301 indicate a high level of concern exists only for the Malheur National Forest and therefore it is the only forest discussed.

Malheur National Forest – For all alternatives, the amount of source habitat for the fox sparrow would be increased during the first decade (see figure 29), but only alternatives D and E would increase habitat sufficiently by the end of the second decade to reduce the level of concern from high to moderate-to-high. Although concern would remain high for all of the other alternatives, the trajectory for habitat is strongly upward. Coupled with the high dispersal ability of the species of the group, the improvement in source habitat would improve viability for all alternatives during the life of the plan

Habitat quality for this species is affected by ungulate grazing which can reduce the amount of understory vegetation, indirectly affecting availability of nesting habitat and prey (insect) availability. Several authors reported a negative response of fox sparrows to grazing of riparian areas by domestic livestock (Page 1978, Knopf et al. 1988, Schulz and Leininger 1991) as well as native ungulates (Berger et al. 2001, Olechnowski and Debinski 2008). The risk of grazing to focal species habitat is discussed in detail in the risks discussion that follows.

Considering forest plan components for all alternatives, it seems unlikely that improvements in viability based on an increase in open habitats would be offset by threats to habitat quality (see risks discussion) for any of the alternatives.

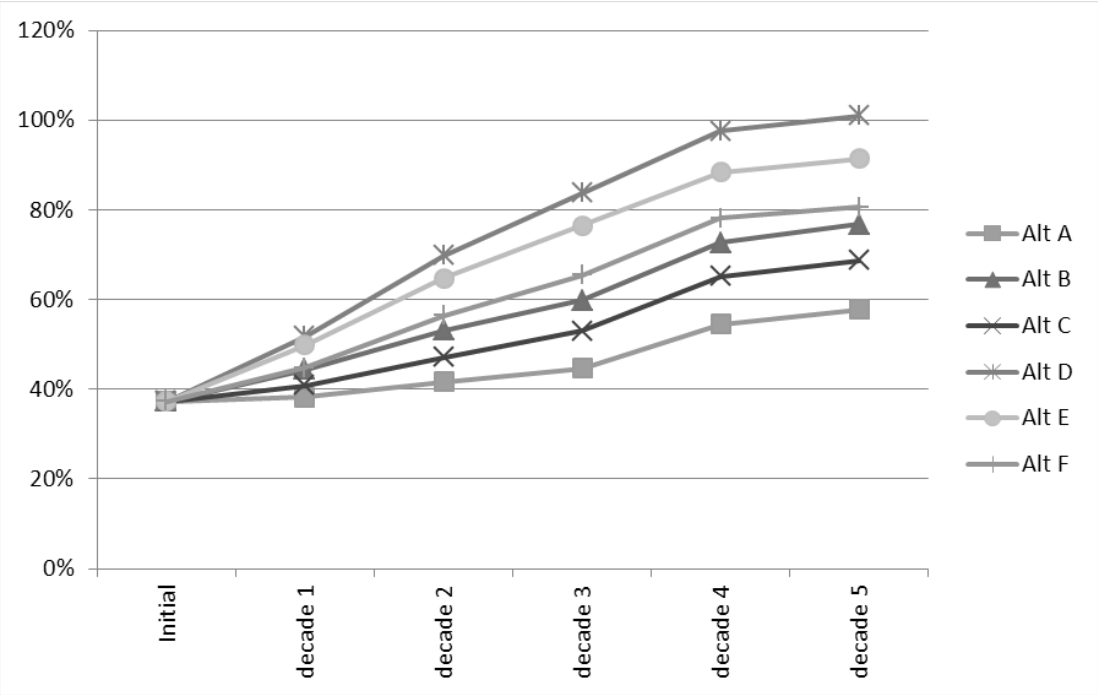

Figure 29. Decadal changes of Malheur National Forest fox sparrow source habitat expressed as a percentage of the mid-point of what would have been expected historically

Post Fire Habitats

Lewis's woodpecker was chosen as a focal species for the post fire habitat group. It represents post fire habitat with lower densities of large snags and trees unlike other species in the group that prefer post fire habitat with a high density of fire-killed trees. It was selected because it is closely tied to post fire habitats, is widespread across the western United States, and occurs in suitable habitat across the planning area. Lewis's woodpecker is also associated with unburned ponderosa pine forests with open canopies and large trees as well as cottonwood/willow habitat. It generally occurs at lower abundance in these habitats than in post fire habitat.

Lewis's woodpecker is a locally common but patchily distributed woodpecker usually seen in open forests of western North America. The combination of its sporadic distribution, its diet of adult-stage free-living insects (primarily aerial), its preference to nest in burned landscapes, and its variable migratory behavior makes it a unique member of New World woodpeckers (Abele et al. 2004). In Oregon, the Lewis' woodpecker breeds on the three national forests in Union, Baker, and Grant counties and elsewhere locally (Gilligan et al. 1994). It is opportunistic in its feeding habits, eating mostly insects in summer and switching in winter to acorns and other nuts, which are cached during the nonwinter months (Abele et al. 2004, Tobalske 1997). It is adept at capturing insects aerially through a variety of complex maneuvers and, although it may glean from the surfaces and crevices of tree bark, it seldom excavates for wood-boring insects (*ibid*). Lewis's woodpeckers are strongly associated with ponderosa pine throughout its range (Diem and Zeveloff 1980) but have also been found nesting in riparian habitats (Block and Brennan 1987, Saab and Vierling 2001). Some researchers have suggested an elevational relationship in which ponderosa pine forests are preferred at higher elevations and open riparian forests are preferred at low elevations (Tobalske 1997).

Wales et al. (2011) defined both primary and secondary source habitat for the Lewis's woodpecker. Primary source habitat was characterized as the dry forest potential vegetation group that was burned during the past five years (1999 through 2003) and was salvage harvested. Also included were areas that had burned between 1985 and 1999 without any regeneration harvest regardless of salvage history. Secondary habitat was characterized as the dry forest potential vegetation group with a canopy cover less than 50 percent and trees 40 cm d.b.h. or greater (15 inches). Cottonwood/willow habitat located primarily in riparian areas was also included as secondary source habitat (mapped using data from the National Wetlands Inventory).

Unlike other woodpeckers, Lewis's woodpecker is not morphologically well-adapted to excavate cavities in hard wood (Spring 1965). Lewis's woodpeckers tend to nest in a natural cavity, reuse preexisting cavities, or may excavate a new cavity in a soft snag (Raphael and White 1984, Saab and Dudley 1998, Tobalske 1997). Snag densities were assumed to be adequate in primary habitat (post fire). In secondary habitat, Wales et al. (2011) evaluated densities of snags 20 inches d.b.h. or larger using DecAID data (DecAID figure PPDF_L.inv-3) for ponderosa pine/Douglas-fir, large tree vegetation condition for snags 50 centimeters d.b.h. and greater.

Outcomes for all three national forests displayed in table 299 through table 301 indicate a moderate-to-high concern for viability of this species for all alternatives. This would be an increase in the level of concern for both the Umatilla and the Wallowa-Whitman National Forests and no change for the Malheur National Forest. The main factor leading to the high level of concern is the amount of source habitat (Wales et al. 2011). Both primary (post fire) and secondary source habitats occur at levels well below what was thought to have occurred historically. Wales et al. (2011) modeled the current situation for the Lewis's woodpecker but because of the uncertainty surrounding future fire occurrence, a focal species assessment model was not utilized to assess any of the alternatives.

Malheur National Forest – According to Wales et al. (2011), primary habitat for the Lewis's woodpecker would decrease from the current amount to less than the HRV median at year 20. Secondary source habitat (excluding cottonwood riparian habitat) would increase for all alternatives (see figure 30). Although secondary source habitat would increase nearly six fold for alternative D by year 20, the amount would not be sufficient to reduce the level of concern. Even though the trajectory for secondary habitat would be strongly upward, the viability concern would remain high for all alternatives due to the lack of primary source habitat

The forest plan includes a desired condition for fire to play a greater role in creating natural disturbances (see appendix A, 1.4.1 Wildland Fire). For example, table 238 in the Forested Vegetation, Timber Resources, and Wildland Fire section displays that 5 to 15 percent of the dry upland forest would have severe fire over time, the same as historical conditions. Currently, 50 percent of the dry upland forest within the Malheur National Forest has the potential for high severity fire (see table 242), which indicates that it would be possible to achieve the desired disturbance during the life of the plan. The use of fire is dependent upon the risk to life and or social/economic values. Higher risks would lead to more aggressive suppression, which makes it exceedingly difficult to actually predict how much and where post fire habitat might occur. Although predicting the amount of post fire habitat is highly uncertain, all alternatives have a desired condition to see fire play its ecological role. This, along with the projected increasing trend in secondary source habitat and the high dispersal capability of the Lewis's woodpecker, would result in a high likelihood of improving species viability.

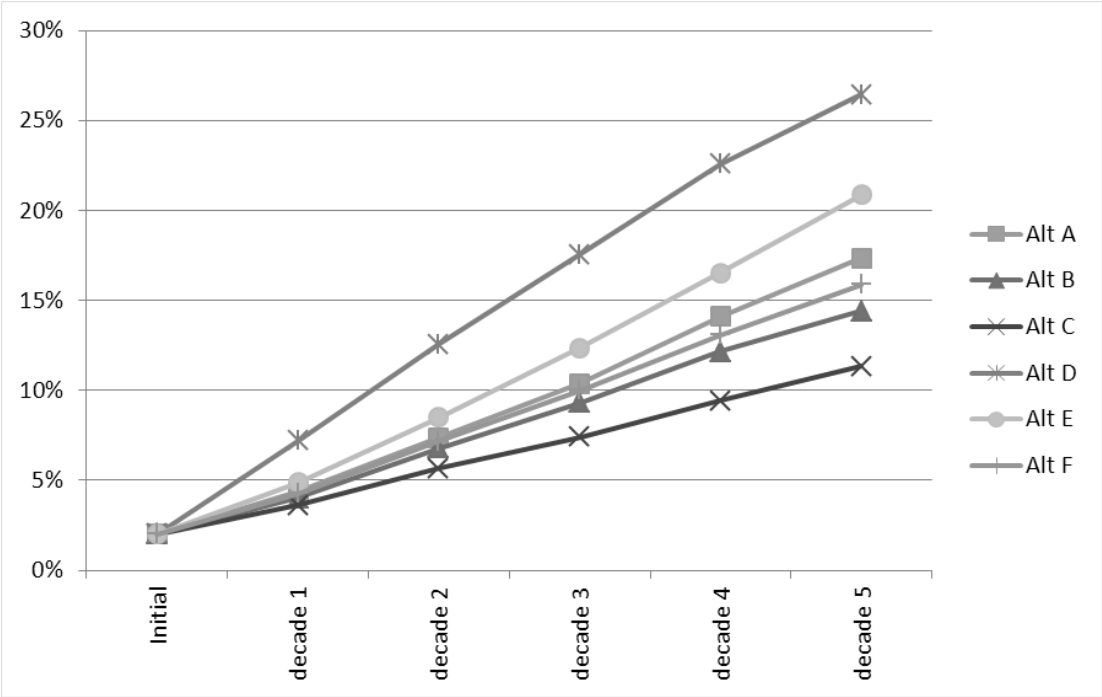

Figure 30. Decadal changes of Malheur National Forest Lewis's woodpecker source habitat expressed as a percentage of the mid-point of what would have been expected historically

Snag densities are assumed to be adequate in primary habitat (post fire). This is due in part to the species' tolerance of salvage harvest. Saab and Dudley (1998) and Saab et al. (2007) found nest success for this species to be greater in salvage harvested units than in unharvested units in Idaho. In Washington, Haggard and Gaines (2001) found this species primarily in stands with low snag density. Standards and guidelines for post fire habitat (WLD-HAB-19 G-4, WLD-HAB-20 G-5, and WLD-HAB-21 G-6) included in alternatives B, E, and F would provide more than adequate protection of source habitat for this species. Salvage harvest would be prohibited for alternative C, and alternative D would not have plan components specifically designed to guide management of post fire habitats within MA 4A.

Secondary source habitat quality is affected by large diameter snag density. Risks to snag retention have been discussed for the white-headed woodpecker and in the "Risks and Threats" section. Wales et al. (2011) categorized snag density in manner similar to that used for the western bluebird (see table 306). Although Mason and Countryman (2010) found large snag density distribution across the landscape to be comparable to historical levels (see western bluebird discussion), Wales et al. (2011) determined that there were no watersheds with high or very high levels of snags within the Malheur National Forest.

Umatilla National Forest – Similar to the Malheur National Forest, primary habitat for the Lewis's woodpecker would decrease to less than the HRV median at year 20 (Wales et al. 2011). Secondary source habitat (excluding cottonwood riparian habitat) would increase for all alternatives (see figure 31). Although secondary source habitat would increase nearly 10 fold for alternative D by year 20, the amount would not be sufficient to prevent an increase in the level of concern from moderate to moderate-to-high. Even though the trajectory for secondary habitat would be strongly upward, the level of concern would remain moderate to high for all of the other alternatives. This is due to the projected reduction in post fire habitat over time, which may or

may not be an artifact of VDDT modeling. According to the wildfire severity effects analysis (see the Forested Vegetation, Timber Resources, and Wildland Fire section), the acres predicted to burn on National Forest System lands in the Blue Mountains would actually increase at year 20 compared to what has burned in the past 25 years.

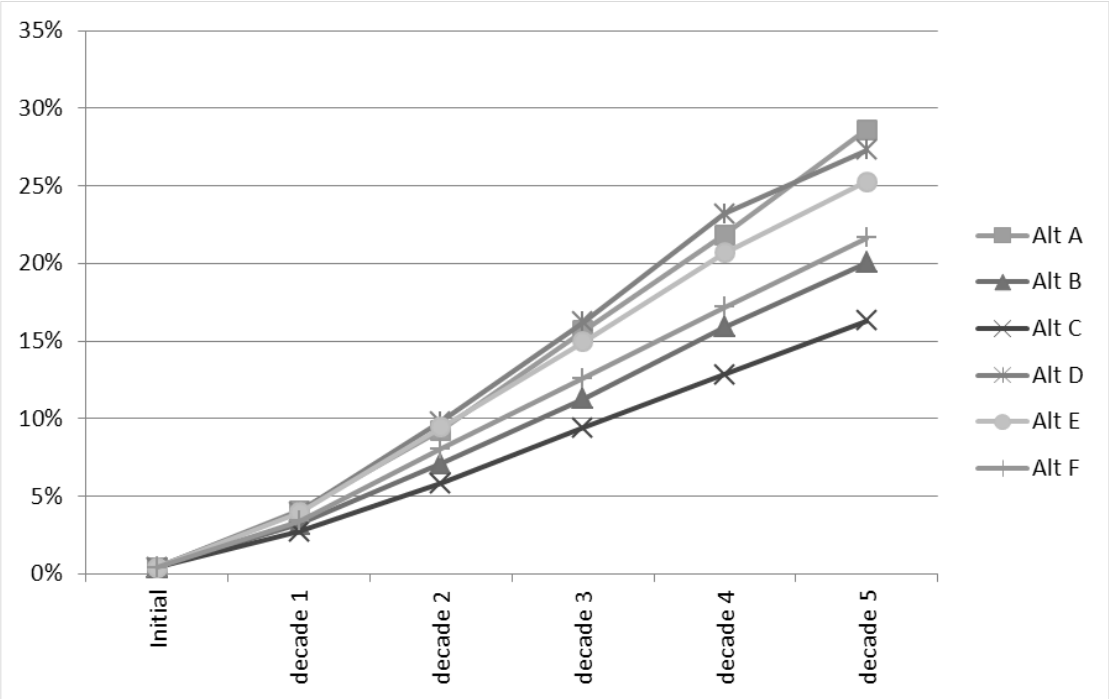

Figure 31. Decadal changes of Umatilla National Forest Lewis's woodpecker source habitat expressed as a percentage of the mid-point of what would have been expected historically

It is important to note that the alternatives with the greatest projected increases in secondary habitat would also have the greatest reductions to the risk of high severity fire (see table 264). Consequently, the probability of creating primary habitat would be reduced for those alternatives.

The forest plan includes a desired condition for fire to play a greater role in creating natural disturbances (see appendix A, 1.4.1 Wildland Fire). For example, table 238 displays that 5 to 15 percent of the dry upland forest would have severe fire over time, the same as historical conditions. Currently, more than 45 to 71 percent of the dry upland forest within the Umatilla National Forest has the potential for high severity fire (see table 242), which indicates that it would be possible to achieve the desired disturbance during the life of the plan. The use of fire is dependent upon the risk to life and or social/economic values. Higher risks would lead to more aggressive suppression, which makes it exceedingly difficult to predict how much and where post fire habitat might occur. Although predicting the amount of post fire habitat is highly uncertain, all alternatives have a desired condition to see fire play its ecological role. This, along with the projected increasing trend in secondary source habitat and the high dispersal capability of the Lewis's woodpecker, would result in a high likelihood of improving species viability.

Snag densities are assumed to be adequate in primary habitat (see the discussion for the Malheur National Forest). Standards and guidelines for post fire habitat (WLD-HAB-19 G-4, WLD-HAB-20 G-5, and WLD-HAB-21 G-6) included in alternatives B, E, and F would provide more than

adequate protection of source habitat for this species. Salvage harvest would be prohibited for alternative C, and alternative D would not have plan components specifically designed to guide management of post fire habitats within MA 4A.

Secondary source habitat quality is affected by large diameter snag density. Risks to snag retention on the landscape have been discussed for the white-headed woodpecker and in the Risks and Threats section. Wales et al. (2011) categorized snag density in a manner similar to that used for the western bluebird (see table 307). Although Mason and Countryman (2010) found large snag density distribution across the landscape to be comparable to historical levels (see western bluebird discussion), Wales et al. (2011) determined that 53 percent of the watersheds had 50 percent or more of the source habitat with high or very high levels of snags within the Umatilla National Forest.

Wallowa-Whitman National Forest – Similar to the Malheur National Forest, primary habitat for the Lewis's woodpecker would decrease to less than the HRV median at year 20 (Wales et al. 2011). Secondary source habitat (excluding cottonwood riparian habitat) would increase for all alternatives (see figure 32). Although secondary source habitat would increase nearly 14 fold for alternative D by year 20, the amount would not be sufficient to prevent an increase in the level of concern from moderate to moderate-to-high. Even though the trajectory for secondary habitat would be strongly upward, the level of concern would remain moderate--to high for all of the other alternatives. This is due to the projected reduction in post fire habitat over time, which may or may not be an artifact of VDDT modeling. According to the wildfire severity effects analysis (see the Forested Vegetation, Timber Resources, and Wildland Fire section), the acres predicted to burn on National Forest System lands in the Blue Mountains would actually increase at year 20 compared to what has burned in the past 25 years.

It is important to note that the alternatives with the greatest projected increases in secondary habitat would also have the greatest reductions to the risk of high severity fire (see table 264). Consequently, the probability of creating primary habitat would be reduced for those alternatives.

The forest plan includes a desired condition for fire to play a greater role in creating natural disturbances (see appendix A, 1.4.1 Wildland Fire). For example, table 238 displays that 5 to 15 percent of the dry upland forest would have severe fire over time, the same as historical conditions. Currently, more than 35 to 64 percent (see table 242) of the dry upland forest within the Wallowa-Whitman National Forest has the potential for high severity fire, which indicates that it would be possible to achieve the desired disturbance during the life of the plan. The use of fire is dependent upon the risk to life and/or social/economic values. Higher risks would lead to more aggressive suppression, which makes it exceedingly difficult to predict how much and where post fire habitat might occur. Although predicting the amount of post fire habitat is highly uncertain, all alternatives have a desired condition to see fire play its ecological role. This, along with the projected increasing trend in secondary source habitat and the high dispersal capability of the Lewis's woodpecker, would result in the likelihood that species viability would be maintained.

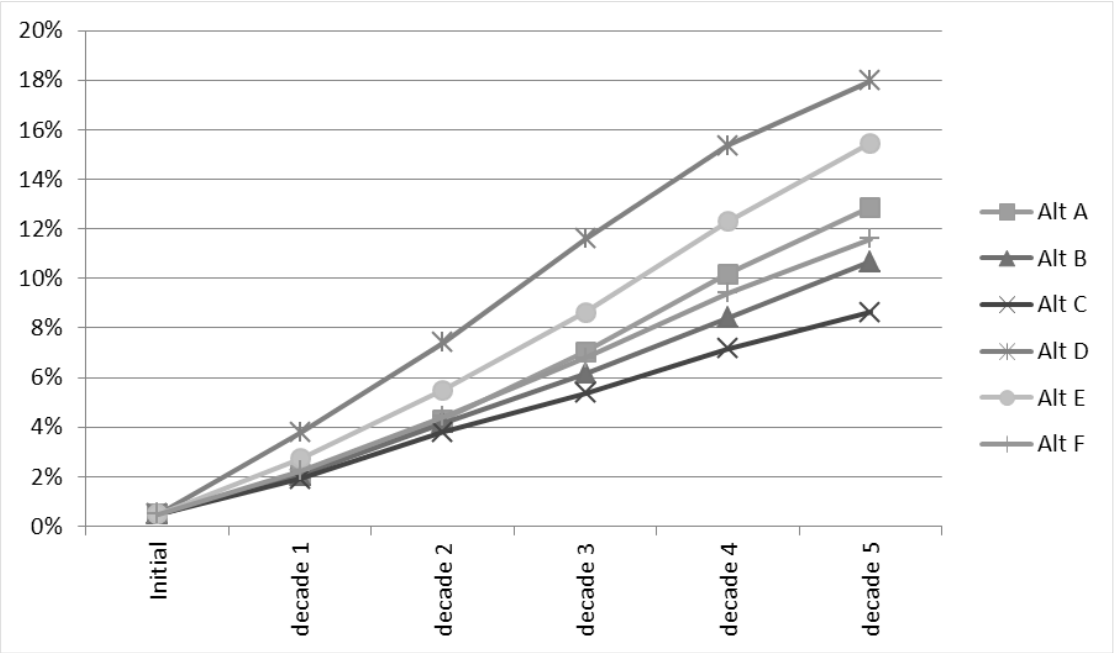

Figure 32. Decadal changes of Wallowa-Whitman National Forest Lewis's woodpecker source habitat expressed as a percentage of the mid-point of what would have been expected historically

Snag densities are assumed to be adequate (see discussion for the Malheur National Forest). Standards and guidelines for post fire habitat (WLD-HAB-19 G-4, WLD-HAB-20 G-5 (standard), and WLD-HAB-21 G-6) included in alternatives B, E, and F would provide more than adequate protection of source habitat for this species. Salvage harvest would be prohibited for alternative C, and alternative D would not have plan components specifically designed to guide management of post fire habitats within MA 4A.

Secondary source habitat quality is affected by large diameter snag density. Risks to snag retention on the landscape have been discussed for the white-headed woodpecker and in the "Risks and Threats" section. Wales et al. (2011) categorized snag density in a manner similar to that used for the western bluebird (table 308). Although Mason and Countryman (2010) found large snag density distribution across the landscape to be comparable to historical levels (see western bluebird discussion), Wales et al. (2011) determined that 45 percent of the watersheds had 50 percent of the source habitat with high or very high levels of snags within the Wallowa-Whitman National Forest.

Risks and Threats to Focal Species

Various risk and threat factors were incorporated into the analysis of focal species viability (see table 309) and are discussed in this section and where appropriate, identified by species or potential vegetation group.

Table 309. Threats and/or risks by focal species identified by Wales et al. (2011) that could impact source habitat quality and/or species viability

Species	Family	Group	Grazing	Risk to Snags	Roads
Boreal owl	Alpine/boreal	Boreal forest		X	X
Western bluebird	Open forest	All forest communities	X	X	X
Cassin's finch	Medium/large trees	All forest communities	X		
Fox sparrow	Open forest	Early successional	X		
White-headed woodpecker	Medium/large trees	Dry forest		X	X
Lewis' woodpecker	Open forest	Post-fire		X	X

Snag Density (all Potential Vegetation Groups)

Snag density is a habitat attribute that is important to at least one focal species with a high or moderate- to-high level of concern within all potential vegetation groups. All of the alternatives have the same desired condition for retention of snags as well as for downed logs on the landscape (see appendix A 1.14 Snags and Down Wood). Using CVS data, Mason and Countryman (2010) indicated that at the broad scale, the percent of the landscape with large snags is similar to historical levels. While snag numbers may appear similar to HRV for the landscape, distribution may be different than historical distribution (Nutt et al. 2010). Wales et al. (2011) demonstrated that in most cases, distribution within source habitat across watersheds within each of the national forests is not what would be expected.

It is assumed that the level of active management (i.e., timber harvest, fuel treatments, and prescribed fire) increases the risk of a reduction in snags due to safety reasons. Those alternatives proposing the most prescribed fire probably present the greatest risk to snag availability. Although it is commonly thought that prescribed fire will create snags, studies have indicated loss of snags is greater than recruitment (Randall-Parker and Miller 2002, Stephens and Moghaddas 2005, Tiedemann et al. 2000).

For all of the alternatives and each national forest, there would be such little use of prescribed fire (table 310) in the cold forest potential vegetation group (boreal owl) that the risk of snag loss would be negligible. Harvest of trees larger than 21 inches d.b.h. and salvage harvest would both be prohibited for alternative C, which therefore would pose the least risk to large snag recruitment. For alternative B, harvest of green trees larger than 21 inches d.b.h. would be allowed only for very specific conditions, which also would provide well for recruitment of large snags. Standards for alternative A prohibit harvest of live trees 21 inches d.b.h. and greater and provide for retention of snags 21 inches d.b.h. and greater post timber sales at 2.25 snags per acre. Alternative A provides for snag retention and recruitment at a rate second only to alternative C. Alternatives E and F would use an age limit to protect older trees, which could lead to slightly fewer trees 21 inches d.b.h. and greater being retained on the landscape as individual trees could reach this diameter at an earlier age and be available for harvest.

Table 310. Percent of potential vegetation group treated in the first decade by alternative, treatment type, and national forest

Vegetation Type	Type of Treatment	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Malheur National Forest							
Cold forest	Salvage	0.0	0.0	0.0	0.1	0.1	0.1
	Prescribed fire	0.3	0.4	0.9	0.0	0.9	0.9
	Precommercial thinning	0.3	0.5	0.6	1.0	0.6	0.6
	Commercial	0.5	1.2	0.9	6.1	3.4	2.4
	Totals	1.1	2.1	2.4	7.2	5.0	4.0
Cool/moist forest	Salvage	0.0	0.0	0.0	0.3	0.1	0.0
	Prescribed fire	0.2	0.1	0.6	0.0	0.6	0.6
	Precommercial thinning	0.0	0.1	0.1	0.1	0.1	0.0
	Commercial	0.4	1.3	0.8	5.9	2.5	1.5
	Totals	0.7	1.6	1.4	6.3	3.2	2.1
Dry forest	Salvage	0.1	0.1	0.0	0.4	0.1	0.1
	Prescribed fire	5.2	5.2	7.1	0.0	9.6	7.0
	Precommercial thinning	0.9	1.0	0.9	1.0	0.7	0.7
	Commercial	1.6	2.9	1.4	8.2	5.1	3.4
	Totals	7.7	9.1	9.3	9.6	15.5	11.2
Umatilla National Forest							
Cold forest	Salvage	0.0	0.0	0.0	0.8	0.4	0.2
	Prescribed fire	0.3	0.8	1.1	0.0	1.4	0.9
	Precommercial thinning	0.7	0.9	0.8	1.2	0.9	0.9
	Commercial	0.2	0.7	0.4	4.1	1.3	0.9
	Totals	1.3	2.4	2.3	6.0	4.0	3.0
Cool/moist forest	Salvage	0.0	0.0	0.0	0.1	0.1	0.0
	Prescribed fire	1.4	0.9	2.7	0.0	2.6	2.0
	Precommercial thinning	0.7	0.7	0.5	0.6	0.6	0.6
	Commercial	1.2	2.0	1.0	7.3	4.6	2.6
	Totals	3.3	3.6	4.2	8.1	7.8	5.2
Dry forest	Salvage	0.1	0.1	0.0	0.4	0.3	0.1
	Prescribed fire	5.7	6.0	7.5	0.0	7.3	7.1
	Precommercial thinning	1.8	2.0	1.4	2.0	1.8	1.8
	Commercial	1.2	3.1	1.3	8.8	6.2	3.9
	Totals	8.8	11.2	10.1	11.1	15.6	13.0
Wallowa-Whitman National Forest							
Cold forest	Salvage	0.1	0.0	0.0	0.2	0.2	0.1
	Prescribed fire	1.4	0.6	0.5	0.0	0.8	0.4
	Precommercial thinning	0.4	0.3	0.2	0.4	0.3	0.2
	Commercial	1.0	0.7	0.4	3.5	1.6	1.0
	Totals	2.8	1.5	1.1	4.1	2.9	1.7

Vegetation Type	Type of Treatment	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Cool/moist forest	Salvage	0.0	0.0	0.0	0.1	0.1	0.0
	Prescribed fire	5.0	2.4	2.3	0.2	3.7	2.3
	Precommercial thinning	0.7	0.6	0.5	0.8	0.6	0.5
	Commercial	1.2	1.2	0.7	5.8	3.1	2.1
	Totals	7.0	4.2	3.5	6.8	7.5	4.9
Dry forest	Salvage	0.1	0.0	0.0	0.3	0.3	0.1
	Prescribed fire	11.2	6.2	5.8	0.3	7.7	6.5
	Precommercial thinning	5.0	2.5	1.4	2.4	1.7	1.6
	Commercial	2.0	2.0	1.1	6.8	3.9	2.8
	Totals	18.4	10.6	8.3	9.8	13.6	11.0

Less than 10 percent of the cool-moist potential vegetation group acres are treated within any national forest (table 310) under any alternative. For the Malheur National Forest, alternative D would pose the least risk to snags, since it would have no prescribed fire. Although minor, the other alternatives, especially C, E, and F would have some prescribed fire. For the Umatilla National Forest, the greatest risk to snags would be posed by the management activities (more prescribed fire) projected for alternative E followed by alternative C. For the Wallowa-Whitman National Forest, alternative D would pose the least risk to snag retention because prescribed fire would not be used and desired conditions for snag density would be met in areas where mechanical treatments take place. Management activities for alternatives A and E would pose the greatest risk to snags, with A having the most risk due to prescribed fire use. Alternatives B, C, E, and F include a standard for the cool moist potential vegetation group to retain all snags greater than 21 inches and one-half of existing snags from 12 to 21 inches, except for danger/hazard trees (WLD-HAB-12), for all three national forests, but it only applies to mechanical treatment. Alternative A includes a standard to maintain 2.25 snags 21 inches d.b.h. and greater per acre after all timber sale activities.

In the dry forest (white-headed woodpecker, western bluebird, and Lewis's woodpecker) within all three national forests, alternative D would pose the least risk to snags as there would be no prescribed fire. Management activities projected for alternatives E and F would pose the greatest risk to snags for the Malheur and Umatilla National Forests. For the Wallowa-Whitman National Forest, alternative A would actually pose the greatest risk to snags as more prescribed fire would be anticipated, and alternatives E and F respectively would pose the next highest levels of risk.

In summary, all alternatives would have desired conditions to maintain snags at historical levels. Because prescribed fire presents the greatest risk to retaining snags on the landscape, alternative D most likely presents the least risk to snags from management actions for all three national forests. Since none of the alternatives are projected to treat more than 20 percent of any one potential vegetation group, the threat to snags from management activities is probably minimal at the landscape scale. The issue of distribution across the landscape, however, would probably continue to be of concern.

Open Motor Vehicle Routes Risk to Snag Density That Could Affect Boreal Owls, Western Bluebirds, White-Headed Woodpeckers, and Lewis's Woodpeckers

Bate et al. (2007), found that the density of snags greater than 9 inches (23 centimeters) d.b.h. were lower adjacent to roads and towns in the pine and larch forests of northeastern Oregon,

presumably due to safety considerations, firewood cutters, and other management activities. Wisdom and Bate (2008) found similar results in western Montana. The snag density data utilized by Wales et al. (2011) came from a modeled data set that did not account for road associated factors. Therefore, in addition to snag densities, the model uses open motor vehicle route density as a variable to account for probable reduced snag densities along those routes. Watersheds were analyzed based on the amount of potential habitat within areas with different open motor vehicle route densities. Watersheds were classified from zero to high based on miles of open motor vehicle routes per square mile:

- Zero: less than 0.1 miles per square mile
- Low: greater than 0.1 to 1.0 mile per square mile
- Moderate: greater than 1.0 to 2.0 miles per square mile
- High: greater than 2.0 miles per square mile

Open motor vehicle route density was maintained as a constant in the modeling of alternative B. In evaluating risk to snag density from the other alternatives, more management activity does not necessarily equate to more motor vehicle routes remaining open to the public, since routes could be designated open only for administrative use. In general and across all potential vegetation groups(see table 311), alternative C would reduce the risk to snags the most as it has the least amount of active management and the lowest desired condition for open motor vehicle route density. Alternative D would have the greatest risk, due to a higher open motor vehicle route density desired condition and more active management.

Table 311. Percent of each national forest by alternative with an open motor vehicle route density desired condition less than 1.5 miles per square mile (based on acres of management areas)

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	5	16	36	12	17	17
UMA	23	42	55	32	41	41
WAW	23	37	58	31	38	38

Alternatives E and F both include a desired condition to reduce the hydrological connectivity of roads within watersheds that have anadromous fish and bull trout. To facilitate this analysis, the following assumptions have been made: 1) densities of 2 miles per square mile of existing road beds in anadromous fish watersheds and less than 1 mile per square mile in bull trout watersheds would achieve this desired condition: 2) the alternative with the most acres projected to be treated would have the greatest opportunity for a reduction in road beds across the national forests: and 3) even though it may not be possible to physically reduce roadbeds to the desired level, it is possible to reduce the open motor vehicle route densities to these levels. The impact by national forest would vary. For example, anadromous fish watersheds, with the assumption of 2 miles per square mile of road beds, make up almost 100 percent of the Umatilla National Forest. This could result in an additional 20 percent (see table 310) of the national forest with open motor vehicle route densities of 2 miles per square mile at the end of the planning period.

Since about half of the Malheur National Forest is in anadromous fish watersheds, it is likely that only half of the 20 percent of acres to be treated (see table 310) would trend toward the desired condition for road bed density within these watersheds. This assumed reduction in open motor vehicle route density, coupled with the results displayed in table 311, would indicate that

alternative C would reduce risks to snags from open motor vehicle route density the most for the Malheur National Forest followed by alternative E and then alternative F (see figure 35 on page 248). For the Umatilla and Wallowa-Whitman National Forests, because of the higher probability of treatments occurring within anadromous fish or bull trout watersheds, alternative E would be likely to reduce risks to snags from open motor vehicle route density the most followed by alternatives F and C.

The impact from open motor vehicle route density to snag density likely would be greatest in the dry forest potential vegetation group since it currently has the greatest open motor vehicle route density per square mile of all the potential vegetation groups. The desired condition for open motor vehicle route density for MA 4A for all alternatives exceeds what was modeled as high (greater than two miles per square mile), and, therefore, the risk as modeled would only change measurably for alternative C since it includes MA 3C, which would have a desire condition that matches the low category. Alternatives E and F also include MA 3C for the Umatilla and Wallowa-Whitman National Forests, but MA 3C represents less than 1 percent of the landscape, which in all probability would not result in a measureable improvement.

The risk to larger snags (21 inches d.b.h. or greater) from firewood harvest is currently ameliorated on all three national forests by restricting harvest to within 300 feet of a road and to snags less than 20 inches d.b.h. per the firewood collection permit. With the exception of alternative D, it is assumed that the restriction on personal firewood collection would continue in order to comply with standard WLD-HAB-12 S-7 to retain snags greater than 21 inches d.b.h.

Livestock Grazing

Livestock grazing was evaluated as a risk factor for the Cassin's finch, fox sparrow, and western bluebird based on the percent of source habitat for each of these species that occurred within an active grazing allotment by watershed. Saab et al. (1995) summarized the results of five studies that evaluated the effects of livestock grazing on Cassin's finch. Three of the five studies found that Cassin's finch responded negatively to grazing (Page et al. 1978, Schulz and Leininger 1991, Taylor 1986), one found a neutral effect (Medin and Clary 1991), and one found a positive relationship (Mosconi and Hutto 1982). Knopf et al. (1988), Page et al. (1978), and Schulz and Leininger (1991) all reported a negative response from fox sparrows associated with cattle grazing.

Livestock grazing is thought to reduce fire frequency in ponderosa pine forests through the elimination of grass that facilitated the spread of low-intensity fires (Hessburg and Agee 2003, Hessburg et al. 2005, Zwartjes et al. 2005). Grazing effects to bird species rarely result from the mere presence of livestock but rather the resulting change in vegetative structure (Bock and Webb 1984, Taylor 1986, Zwartjes et al. 2005). Because bluebirds are insectivorous, a large reduction in grass biomass is likely to have negative impacts on their prey base (Zwartjes et al. 2005). Bull et al. (2001) found western bluebirds to be more abundant at ponds that were protected from livestock grazing than those not protected, suggesting that the increase in vegetation might improve insect availability.

A basic premise in the ranking of alternatives is that an improvement in rangeland health would, for the most part, result in an improvement of source habitat. Dietz (1975) pointed out that excessive removal of grass leaves would have an adverse effect on grass root development. This often results in reduced plant growth, less forage production, lower plant vigor and lower reproduction. Holechek's (1988) literature review indicated that utilization levels of 50 percent or greater were only applicable to humid or annual range lands, and that lower levels are appropriate

for coniferous forests, mountain shrublands, oak woodlands, etc. where ranges are in less than good condition. Additionally, improvement in range condition is a direct reflection of utilization levels, or the residual biomass after grazing (Klipple and Costello 1960). Several studies (Hart et al. 1989, Hart et al. 1993, Herbel 1974, Hughes 1990, Pieper and Heitschmidt 1988, Van Poollen and Lacey 1979) indicate that stocking rate and utilization levels have more to do with successful range improvement than anything else. Other studies have indicated that heavy use (50-plus percent) at any time of the year, including the dormant season, is rarely compensated for by rest (Mueggler 1975, Sauer 1978, Snevea 1980, Trlica et al. 1977) with some plant species requiring more than six years to recover after heavy use. Because of this, those alternatives that propose low utilization levels are assumed to achieve the fastest range improvement.

Therefore, for all three national forests, alternative C would pose the least risk to focal species that are sensitive to grazing. Alternative C would have the least amount of acres suitable for domestic livestock grazing (see tables GR7, GR8 and GR9 in the Livestock Grazing and Rangeland Vegetation section) and it also would have the lowest utilization levels in both the uplands (see table 312) and riparian management areas (see appendix A, MA 4B RMA-RNG-2 G-115, table A-55a). Although alternative D would have the greatest number of upland acres suitable for domestic livestock grazing, both alternatives A and B would have higher utilization levels, which potentially would result in less herbaceous material left for wildlife. Although alternatives A, B, E, and F would have the same amount of acres within active allotments, alternatives E and F should have the least impact due to a lower utilization level, followed by alternative B and then alternative A (see table 312 and appendix A, MA 4B RMA-RNG-2 G-115, table A-55a).

Table 312. Percent maximum utilization levels proposed for upland habitats with moderate to low departure from HRV by alternative and national forest

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Malheur	50-60	35-55	30	45-50	35-40	35-40
Umatilla	50-60	35-55	30	45-50	35-40	35-40
Wallowa-Whitman	50-60	35-55	30	45-50	35-40	35-40

Countryman (2011) conducted an analysis to broadly determine if adequate forage is being produced for domestic livestock grazing, wild ungulate grazing, and the needs of plant and watershed health on those lands deemed suitable for grazing (see table 313). The basic assumptions can be found in the project record, but essentially elk population estimates were converted to a density/acre estimate. This utilizes the assumption that by considering an even distribution across that landscape at all times, this would account for the number of elk that would be found on an allotment at any one time. An additional caveat is that only elk consumption was calculated, as they have the greatest dietary overlap with domestic livestock. Doubling the needs for elk to account for forage needs of other native ungulates, such as deer, which are more of a browser, would only result in a one percent change in the total percent utilization estimates displayed in table 313.

Table 313. Estimated forage needs of grazing ungulates by national forest and the percent of total forage represented by this use on suitable acres in active allotments

National Forest	Annual Forage Needs (million pounds)			Annual Production	
	Domestic Livestock	Elk	Total Needs	Total (million pounds)	Amount Utilized (%)
Malheur	103	2.2	105.2	558	19%
Umatilla	37	3.9	40.9	169	24%
Wallowa-Whitman	72	4.8	76.8	216	36%

In the focal species assessment modeling for alternative B, grazing was held constant. Small areas with high risk could occur for any alternative, but, according to Countryman and Swanson (2008 [revised 2010]), the overall trend for rangeland has been positive within the Blue Mountains, suggesting that the current level of grazing would not be considered high risk. According to Wales et al. (2011) this risk factor was not weighted heavily in the model for the Cassin's finch, and, overall, the departure in the amount of source habitat from the historical amount led to the fairly low viability outcomes for all three of these species.

Besides the desired conditions, which are the same for all but alternative A, there are standards and guidelines that provide management direction for some of the habitat attributes represented by these species. For example, standards and guidelines for shrub utilization would range between 25 percent for alternative C and 45 percent for alternative B, with alternatives E and F falling in between. Alternative D, however, does not have a standard or guideline for shrub utilization.

Summary for Focal Species

For the 23 species modeled for the existing condition within the Umatilla and Wallowa-Whitman National Forests (see table 300 and table 301), and the 22 species modeled for the Malheur National Forest (see table 299; the peregrine falcon was not modeled), the lack of open late old structure, especially in ponderosa pine, and the lack of early successional stages were identified as habitats of concern. Both have also been identified in the literature as concerns.

The six species analyzed in detail had a high level of concern for at least one alternative for at least one national forest. Although it is anticipated that all species would remain viable for any of the alternatives, some alternatives show a higher likelihood for improved species viability than others. Table 314 is intended to display the relative ranking of each alternative in addressing the viability concerns of the representative focal species.

Table 314. Relative ranking of alternatives (1-6 with 1 being the best) for habitat improvement and risk reduction for focal species identified with high or moderate-to-high level of concern for viability for each national forest

National Forest	Species/Risks	Potential Vegetation Group	Habitat	Alternative					
				A	B	C	D	E	F
MAL	White-headed woodpecker	Dry forest	Large/medium trees	3	5	6	1	2	4
	Western bluebird	All forested types	Open forest	4	5	6	1	2	3
	Fox sparrow	All forested types	Open forest	6	4	5	1	2	3
	Lewis's woodpecker	Dry forest	Post fire	3	2	1	6	5	4
	Lewis's woodpecker	Dry forest	Open forest	3	5	6	1	2	4
	Source habitat improvement			4	5	6	1	2	3
	Vegetation management	Cold forest	Snags	1	2	3	6	5	4
		Cool/moist forest		1	2	3	6	5	4
		Dry forest		2	3	4	1	6	5
	Open motor vehicle route management	All	Snags	5	4	1	6	2	3
	Salvage logging	Post fire	Snags	4	3	6	5	1	2
	Grazing occurrence	All	Herbaceous	2	2	1	3	2	2
	Grazing intensity	All	Herbaceous	5	4	1	3	2	2
	Risk reduction			2	3	1	6	5	4
UMA	boreal owl	Cold forest	Boreal forest	1	3	2	6	5	4
	Cassin's finch	All forested types	Large/medium trees	3	5	6	1	2	4
	White-headed woodpecker	Dry forest	Large/medium trees	3	5	6	1	2	4
	western bluebird	All forested types	Open forest	4	5	6	1	2	3
	Lewis's woodpecker	Dry forest	Post fire	3	2	1	6	5	4
	Lewis's woodpecker	Dry forest	Open forest	3	5	6	1	2	4
	Source habitat improvement			2	5	6	1	3	4
	Vegetation management	Cold forest	Snags	1	2	4	6	5	3
		Cool/moist forest		2	1	6	3	5	4
		Dry forest		2	3	4	1	6	5
	Open motor vehicle route management	All	Snags	5	4	1	6	2	3
	Salvage logging	Post fire	Snags	3	2	5	6	4	1
	Grazing occurrence	All	Herbaceous	2	2	1	3	2	2
	Grazing intensity	All	Herbaceous	5	4	1	3	2	2
	Risk reduction			3	1	4	6	5	2
WAW	Cassin's finch	All forested types	Large/medium trees	3	5	6	1	2	4
	White-headed woodpecker	Dry forest	Large/medium trees	4	5	6	1	2	3
	Western bluebird	All forested types	Open forest	4	5	6	1	2	3
	Lewis's woodpecker	Dry forest	Post fire	2	1	4	6	5	3
	Lewis's woodpecker	Dry forest	Open forest	3	5	6	1	2	4
	Source habitat improvement			3	5	6	1	2	4

National Forest	Species/Risks	Potential Vegetation Group	Habitat	Alternative					
				A	B	C	D	E	F
	Vegetation management	Cold forest	Snags	4	2	1	6	5	3
		Cool/moist forest		6	4	2	1	5	3
		Dry forest		6	3	2	1	5	4
	Open motor vehicle route management	All	Snags	5	4	1	6	2	3
	Salvage logging	Post fire	Snags	2	4	5	6	3	1
	Grazing occurrence	All	Herbaceous	2	2	1	3	2	2
	Grazing intensity	All	Herbaceous	5	4	1	3	2	2
	Risk reduction			6	3	1	4	5	2

The quantity of source habitat alone may be interpreted as the upper limit of the potential to support a species (Raphael et al. 2001), and therefore reduction in habitat would be the first attribute to elevate the viability concern. Other factors, such as quality and distribution of habitat, as well as other risk factors, need to be evaluated to refine the ability of source habitat to meet the biological needs of a species (*ibid*).

Three of the species are associated with either early successional or more open habitats. Both of these habitat distributions are generally below what would be expected on the landscape. Swanson et al. (2010) called it the forgotten stage of forest succession and it has been identified by some as important in the conservation of bird species (DeGraaf and Yamasaki 2003, Fontaine et al. 2009). Both of these habitats would be created at higher levels for alternatives D and E. These same three species are also all affected by grazing associated changes in vegetative structure. The threat from grazing would be greatest from alternative D based on more acres being available for grazing, while the threat from the level of vegetative structure alteration would be greatest from alternatives A and B. It is uncertain if there is a level of upland grazing that would still allow adequate vegetative structure for these three species. For example, Saab et al. (1995) reported that Cassin's finch responded negatively to heavy grazing and showed no response to moderate grazing. They also reported that the fox sparrow responded negatively to heavy and variable grazing. The studies used for both species referred to riparian habitats. Holechek et al. (1999) found confusion exists, even among range professionals, as to what heavy and moderate grazing intensity mean and that heavy grazing, as reported in the stocking studies they reviewed, averaged 57 percent utilization of primary forage species and that moderate averaged 43 percent. But when using the best explanation of these terms [as given by Klipple and Bement, 1961] moderate grazing in coniferous forest rangelands was between 35 and 45 percent of forage (*ibid*).

Large snags are important to several species. The analysis does not indicate that risks associated with any alternative would lead to a reduction in existing snag levels. Past management may have led to a reduction of snags and it will take time to replace them on the landscape, but the mechanism to do so for Forest Service management activities is in place for all alternatives. Alternative D would not have a standard or guideline regarding retention of large snags, but the same desired condition for snags across the landscape exists for all action alternatives. Open motor vehicle route density was also considered a threat to snag retention, mostly associated with the harvest of snags for firewood. Currently, there is a restriction on the removal of large-diameter snags for personal firewood use. However, it is recognized that large-diameter snags near open motor vehicle routes would continue to be vulnerable to illegal firewood removal, resulting in a

loss of current snags and of future large-diameter logs. The loss of this habitat component would be most prevalent in areas with high open motor vehicle route densities. As indicated previously, this threat is not really reduced to the level used in the model for any alternative.

Management direction designed to achieve desired vegetative conditions in the forest plan is intended to result in long-term terrestrial wildlife source habitat conditions within the predicted HRV. The rationale for using HRV for this purpose is that biodiversity is assumed to persist, albeit with fluctuations in populations, through centuries or millennia of disturbance and recovery (Aplet and Keeton 1999). Even with the predictions of climate change, HRV presents the greatest potential to respond to expected change. Approximating historical conditions for source habitats provide a management strategy likely to sustain diverse focal species, even for those about which we know little (Hunter et al. 1988, Landres et al. 1999, Swanson et al. 1994). Similarly, because of limited understanding about ecosystems, approximating past conditions offers one of the best means for predicting and reducing impacts to current ecosystems (Kaufmann et al. 1994). Therefore, if the amount and structure of source habitats are within their HRV, associated wildlife species will have a greater likelihood of sustainability than if the amount and structure of source habitats remain outside their HRV (Raphael et al. 2001, Spies et al. 2006).

Based on the analysis, it appears unlikely that changes in threats are of sufficient magnitude to override the importance of source habitat in determining species viability. Although there is a reduction in source habitat for all alternatives for the boreal owl, it is still within the range of HRV after the first two decades, which is believed to be sufficient to maintain viable populations for all alternatives. For the other four species, white-headed woodpecker, Cassin's finch, fox sparrow, and western bluebird, viable populations would be expected for all alternatives. Although a slight reduction in source habitat for some of these species occurs, especially for alternatives A and C, by the end of the fifth decade, the trend in source habitat is either stable or upward. There is a large degree of uncertainty however, especially for the three open habitat species, and therefore all action alternatives should require monitoring of both habitat and risk factors over time. Since the white-headed woodpecker is a management indicator species, monitoring is required for this species.

Focal Species Not Modeled

Approximately half of the species modeled for current viability outcomes were not modeled for alternative B, since it was determined that a reliable way to project and quantify future changes did not exist (Wales et al. 2011). For example, several species were associated with very limited habitat on National Forest System lands (e.g., northern harrier) or habitats that had little active management within them (ash-throated flycatcher). There also was a group of species that were not modeled for existing conditions. Although it was not possible to model viability, a qualitative analysis of forest plan components (desired conditions and standards and guidelines) for the alternatives indicated they would be sufficient to reduce threats and improve habitat for most of these species, thereby improving the likelihood of continued viability for all of the alternatives.

For example species associated with riparian areas would receive protection based on the desired conditions for aquatic habitat and watershed function (see appendix A 1.1 Watershed Function), which describe a desire for continued improvement in abundance and quality of riparian areas. Standard and guidelines also would provide protection (for a complete list see Wales et al. 2011):

- Timber harvest and thinning should occur in riparian management areas only as necessary to maintain, restore or enhance conditions that are needed to support aquatic and riparian dependent resources (guideline MA 4B RMA-FOR-1).

- Where management activities occur within riparian habitat, the quantity, stature, and health of shrubs should not be reduced or degraded (guideline WLD-HAB-25).

Within MA 4B Riparian Management Areas, grazing utilization would be expected to comply with guideline MA 4B RMA-RNG-2 G-115 (see appendix A table 55a).

Detailed analysis of all these species for alternative B is available in Wales et al. (2011). None of the species in this group that initially had viability concerns would be expected to have increased concern because of implementing alternative B (Wales et al. 2011). Since none of the other alternatives differ substantially from alternative B regarding risk to or loss of habitat for these species, they have not been analyzed further, with the exception of bighorn sheep. Bighorn sheep were analyzed due to the risk posed by potential disease transmission from domestic sheep.

Bighorn Sheep

Bighorn sheep (BHS) in Oregon and Washington are of two different subspecies: the California and Rocky Mountain bighorn. Historically, California bighorn sheep occurred in central and southeastern Oregon, the eastern slope of the Cascade Range in Washington, northwestern Nevada, and the mountains of southwestern Idaho. The Rocky Mountain bighorn sheep historically occurred in northeastern Oregon, central Idaho, Montana, Wyoming, and northeastern Nevada (Wisdom et al. 2000). The current range represents an increase in occupied habitat since the 1930s as a result of a combination of reintroductions and protection of remnant populations. However, much of the historical range is still unoccupied. These species are not well distributed within the planning area but were chosen as a focal species to represent grass/shrub environment.

Bighorn Sheep Source Habitat – Bighorn sheep prefer open areas on rocky slopes, ridges, rimrocks, cliffs, and canyon walls adjacent to meadows or grasslands (Verts and Carraway 1998). Alpine and subalpine vegetation are typically summer range for this species. Risenhoover et al. (1988) suggested that the three major components of bighorn sheep habitat are visibility, escape terrain (cliffs, talus areas), and abundant continuous forage. They were chosen as a focal species for grass and shrublands. Wisdom et al. (2000) placed both the Rocky Mountain and California bighorn sheep in family group 22, which are residents of high elevation alpine and subalpine communities.

Source habitats are primarily alpine, subalpine, upland shrubland, and upland herbland community groups as described by Wisdom et al. (2000). They projected a downward change of 47 percent that would result from a decline in big sagebrush, mountain sagebrush, fescue-bunchgrass, interior ponderosa pine, native forbs, western larch, wheatgrass bunchgrass, whitebark pine-alpine larch, and whitebark pine. Wisdom et al. (2000) acknowledged that those trends in source habitats for bighorn sheep were derived without reference to the proximity of cliffs and talus and may not accurately represent changes in the more restricted subset of stands available to bighorn sheep. More recently the Forest Service developed a model for the Payette National Forest using escape terrain defined by Sappington et al. (2007) and combined with a horizontal visibility component (USDA Forest Service 2010) to define source habitat. This analysis utilizes a very similar model (details are available from the project record), with the exception of the vegetation data used. The Blue Mountains forest plan revision analysis utilized existing vegetation polygon and current vegetation survey stake point summaries (Countryman 2009). Only summer source habitat was modeled.

Source habitat by itself does not provide a meaningful metric for evaluating bighorn sheep viability. The distribution and abundance of bighorn sheep have been significantly reduced from

pre Euro-American settlement conditions. Because disease epizootics are an integral factor in bighorn sheep persistence, analysis of bighorn sheep habitat needs to incorporate those factors that contribute to the potential risk of disease transmission. This was accomplished by addressing such things as the availability and connectivity of suitable bighorn sheep habitats, bighorn sheep behavior and movement patterns, proximity of bighorn sheep to domestic sheep, and the likelihood of contact between the species.

Bighorn Sheep Attraction and Disease Transmission – Bighorn sheep are attracted to domestic sheep and goats (Onderka et al. 1988, Schommer and Woolever 2001), and, although the mechanisms of respiratory disease in bighorn sheep are not well understood, the evidence that contact between domestic sheep and bighorn sheep leads to respiratory disease and die-offs in bighorn sheep is overwhelming (Clifford et al. 2009, Foreyt et al. 1994, Silflow et al. 1993). More than 327 bighorn sheep in a 30 square mile area in Hells Canyon died when exposed to *Pasteurella multocida* and *Mannheimia haemolytic*a that was most likely carried by a feral goat (Cassirer et al. 1998, Onderka et al. 1988, Schommer and Woolever 2001). Both *P. multocida* and *M. haemolytica* were isolated from this feral goat and a bighorn sheep found in close proximity to where the Hells Canyon (1995 and 1996) bighorn sheep pneumonia epizootic began (Cassirer et al. 1998, Dassanayake et al. 2008, Weiser et al. 2003). Several authors (Dassanayake et al. 2008, Silflow et al. 1993, Srikumaran et al. 2008, Weiser et al. 2003) have demonstrated that bighorn sheep are highly susceptible to *P. multocida* and *M. haemolytica* strains found in domestic sheep and goats.

As a result of die-offs and suppressed reproduction during the last century, the genetic diversity in bighorn sheep herds has been lost (Schommer and Woolever 2001). At the present time there are no vaccines to protect bighorn sheep from developing pneumonia (Clifford et al. 2009, Schommer and Woolever 2001, Srikumaran et al. 2007, Weiser et al. 2003). The only way to prevent a pneumonia outbreak in bighorn sheep herds is to keep bighorn sheep separated spatially from domestic sheep and goats (Clifford et al. 2009, Dassanayake et al. 2008, Onderka et al. 1988, Schommer and Woolever 2001).

Effects from Each Alternative to Bighorn Sheep – The separation, either spatially, temporally, or both, of bighorn sheep from domestic sheep has been recommended by leading bighorn sheep disease experts (Garde 2005, Schommer and Woolever 2001, Singer 2001). The Western Association of Fish and Wildlife Agencies defines effective separation as spatial and/or temporal separation between wild sheep and domestic sheep or goats resulting in, at most, minimal risk of potential association and subsequent transmission of respiratory disease between animal groups (WAFWA 2010). It is recommended that site-specific solutions for each bighorn sheep population and domestic sheep allotment be developed based on a management strategy appropriate for the complexity of the situation (Schommer and Woolever 2001). Each of the alternatives would take this approach; however, given the complexity of the issue in the Blue Mountains, each alternative would have pros and cons for minimizing the risk of contact between domestic and bighorn sheep.

Alternatives were evaluated on their merits for providing separation and minimizing likelihood of contact between domestic sheep and the 16 bighorn sheep populations within and adjacent to the Blue Mountains national forests (see table 315). Telemetry data was used for the Payette National Forest analysis for herds in Hells Canyon National Recreation Area (HCNRA) to develop Core Herd Home Ranges (CHHR), which are used in this analysis. For those herds outside of the HCNRA, herd home ranges identified by ODFW were used for analysis. Core home range is used in the remainder of the document to refer to either bighorn sheep home range.

Table 315. Crosswalk of bighorn sheep herd names from state agencies and the Payette National Forest analysis within the Blue Mountains forest plan revision analysis effort[1]

Bighorn sheep subspecies	Herd Name	State	Payette National Forest	National Forest
California	Aldrich Mountain	Oregon	NA	MAL
	Potamus Creek	Oregon	NA	UMA
	Burnt River	Oregon	NA	WAW
Rocky Mountain	Lostine	Oregon	Lostine	WAW
	Lower Imnaha	Oregon	Imnaha	WAW
	Bear/Minam	Oregon	Not modeled	WAW
	Wenaha	Oregon	Wenaha	UMA
	Upper Joseph Canyon	Oregon	Black Butte/Red Bird	WAW
	Upper Hells Canyon	Oregon	Upper Hells Canyon[2]	WAW
	Lower Hells Canyon	Oregon	Big Canyon/Muir/Myers	WAW
	Sheep Mountain	Oregon	Sheep Mountain	WAW
	Mountain View	Oregon	Mountain View	UMA
	Asotin	Washington	Asotin	UMA
	Tucanon	Washington	Not modeled	UMA
	Black Butte	Washington	Black Butte/Red Bird	WAW
	Red Bird	Idaho	Red Bird	WAW

1. The Canyon Creek herd identified in the Oregon bighorn sheep management plan is not addressed here based on correspondence that indicated this herd is no longer being monitored, managed, or recognized by ODFW and there are no plans to attempt to reestablish it (Raaf 2011 (11 March).
2. Referred to as McGraw herd initially in the Payette National Forest analysis.

Bighorn Sheep Source Habitat Analysis – Those alternatives that would provide the most summer source habitat in areas identified as unsuitable for domestic sheep grazing and the fewest acres of rangelands considered suited for domestic sheep grazing are considered the best options for bighorn sheep population persistence (see table 316). The Wallowa-Whitman and the Umatilla National Forests would have a large portion of habitat in areas identified as unsuitable for domestic sheep grazing for all alternatives. Although the table displays acres of rangelands suitable for domestic sheep grazing, not all of those acres are currently being or would be grazed by domestic sheep. Many of the acres that could be grazed by domestic sheep are currently in cattle allotments, and, although technically they could be grazed by sheep, it would require a change in the type of livestock permitted on the allotment.

Other considerations for managing to protect summer source habitats for bighorn sheep include the potential for overlap between core home ranges and domestic sheep allotments and distances between core home ranges and domestic sheep allotments. It is assumed that any overlap between bighorn sheep core home ranges and domestic sheep allotments will result in a disease transmission between the species. Only alternative A would have a small sliver of domestic sheep allotment that would overlap with currently occupied bighorn source habitat based on the CHHRs developed for the Hells Canyon herds or the herd home ranges identified by ODFW for the more southern bighorn sheep herds (see figure 33 on page 240).

Table 316. Relative ranking of alternatives by national forest based on proportion of bighorn sheep summer source habitats not available for domestic sheep grazing (protected) and rangelands remaining suited for domestic sheep grazing

National Forest	Alternative	Summer Source Habitat Protected		Rangeland Suitable for Domestic Sheep Grazing		Relative ranking for providing separation between domestic and bighorn sheep
		(percent)	(acres)	(percent)	(acres)	
MAL	A	0	0	100	1,451,000	3
	B	45	21,200	73	1,060,000	2
	C	93	44,900	24	348,000	1
	D	45	21,200	73	1,060,000	2
	E	45	21,200	73	1,060,000	2
	F	45	21,200	73	1,060,000	2
UMA	A	0	0	100	578,000	5
	B	70	158,400	35	205,000	2
	C	82	185,000	12	69,000	1
	D	68	154,500	38	222,000	4
	E	68	154,500	35	205,000	3
	F	68	154,500	35	205,000	3
WAW	A	0	0	100	754,000	5
	B	85	263,600	51	382,000	2
	C	91	282,200	35	266,000	1
	D	85	262,600	51	385,000	4
	E	85	262,600	51	382,000	3
	F	85	262,600	51	382,000	3

Distances from bighorn sheep core habitats to domestic sheep allotments were also evaluated, with the assumption being that the greater the distance between the species, the greater the probability for persistence of bighorn sheep herds. Table 317 displays distances between bighorn sheep core home ranges and domestic sheep allotments. Alternative C would provide the greatest separation between core home ranges and domestic sheep allotments, followed by alternative B, with alternatives A, D, E, and F providing the least amount of separation.

Bighorn Sheep Contact Model – Bighorn sheep, especially rams, make occasional long-distance movements beyond their core herd home range. On Bureau of Land Management (BLM) administered lands in Idaho, bighorn sheep were documented to have traveled nearly 50 miles, including through towns and across major rivers (Coggins 2002). Telemetry data has shown that desert bighorn sheep regularly cross the broad valleys that separate the majority of desert mountain ranges (Krausman et al. 1996, Schwartz et al. 1986). Singer et al. (2001) called this movement forays and defined them as any short-term movement of an animal away from and back to its herd's core home range. Such behavior can put bighorn sheep at risk of contact with domestic sheep, even when domestic sheep use is outside of core herd home range areas. This is especially true where suitable habitats are well-connected and these connections overlap with domestic sheep use areas (Gross et al. 2000, Singer et al. 2000). The risk of contact between dispersing bighorn sheep and domestic sheep is related to the number of bighorn sheep in a herd, the proximity of domestic sheep use areas (allotments) to a bighorn sheep core herd home range, the distribution of bighorn sheep source habitats across the landscape, and the frequency and distance of bighorn sheep forays outside of the core herd home range. It is important to remember the following analysis does not capture the risk associated with wandering domestic sheep or goats.

Table 317. Distance in kilometers from bighorn sheep core herd home ranges to the nearest active domestic sheep allotment

Herd Name	State Herd Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Aldrich Mountain[1]	Aldrich Mountain	43	43	46	43	43	43
Potamus Creek[1]	Potamus Creek	30	30	35	30	30	30
Burnt River[1]	Burnt River	48	48	82	48	48	48
Lostine	Lostine	24	48	48	24	24	24
Imnaha	Lower Imnaha	30	93	97	30	30	30
Bear/Minam[1]	Bear/Minam	22	39	40	22	22	22
Wenaha	Wenaha	11	28	39	11	11	11
Black Butte	Upper Joseph Canyon Black Butte	12	68	72	12	12	12
Red Bird	Upper Joseph Canyon Black Butte Red Bird	31	91	98	31	31	31
Upper Hells Canyon	Upper Hells Canyon	54	99	99	54	54	54
Big Canyon	Lower Hells Canyon	54	118	121	54	54	54
Muir	Lower Hells Canyon	33	107	107	33	33	33
Myers	Lower Hells Canyon	51	117	120	51	51	51
Sheep Mountain	Sheep Mountain	88	115	115	88	88	88
Mountain View	Mountain View	18	46	57	18	18	18
Asotin	Asotin	43	71	83	43	43	43
Tucanon1	Tucanon	44	70	82	44	44	44

1. Core herd home range is based on information provided by states regarding home range.

Alternatives were ranked based on the frequency of interspecies contact as modeled using the core home range and foray analyses. The foray distances and probabilities are based on analysis of more than 50,000 telemetry points associated with bighorn sheep herds from Hells Canyon. This basically utilized the probability of a bighorn ram making a foray, the probability of a ram moving a certain distance from the core home range (in one kilometer rings), and then the probability of an animal that has made a foray and reached a ring that intersects an allotment. Table 318 on page 241 displays relative ranking of alternatives based on the number of contacts per year. It is assumed that the greater the likelihood of contact, the greater the potential for disease transmission and resulting disease outbreaks. Alternative C is the only alternative that would reduce interspecies contact to a level of almost zero.

The analysis demonstrates low yearly contact rates when interaction with all of the various herds is considered for all alternatives. Table 318 displays that there is relatively no risk to the California bighorn herds (Aldrich, Potamus, and Burnt River) that are adjacent to the national forest for all alternatives. Because much of the potential contact on National Forest System lands was dealt with in the establishment of the Hells Canyon National Recreation Area, there are some herds where there is no anticipated contact with domestic sheep. Some level of contact would be expected for the Wenaha bighorn sheep population for all alternatives except alternative C; however, it would be considered an extremely low contact rate.

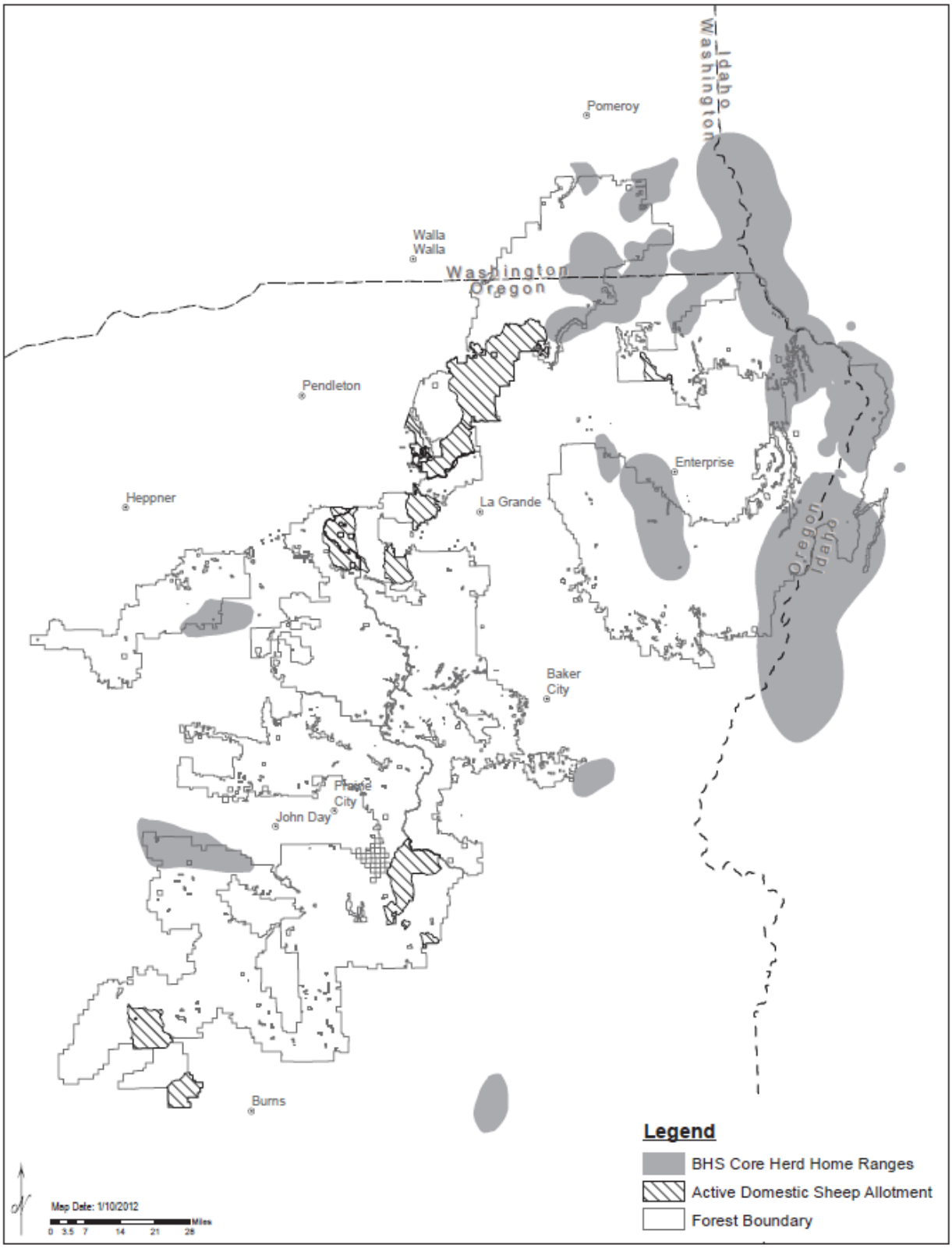

Figure 33. Bighorn sheep core herd home ranges for northeastern Oregon and southeastern Washington

Table 318. Annual contacts by herd and alternative based on modeled contact between bighorn sheep and domestic sheep allotments and relative ranking of alternatives

Herd Name	State Herd Name	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Aldrich Mountain	Aldrich Mountain	0	0	0	0	0	0
Potamus Creek	Potamus Creek	0*	0*	0	0*	0*	0*
Burnt River	Burnt River	0	0	0	0	0	0
Lostine	Lostine	0.0009	0	0	0.0009	0.0009	0.0009
Imnaha	Lower Imnaha	01	0	0	01	0	0
Bear/Minam	Bear/Minam	0.0009	0	0	0.0009	0.0009	0.0009
Wenaha	Wenaha	0.0331	0.0007	0	0.0094	0.0094	0.0094
Black Butte	Upper Joseph Canyon Black Butte	0.007	0	0	0.007	.007	0.007
Red Bird	Upper Joseph Canyon Black Butte Red Bird	0.0001	0	0	0.0001	0.0001	0.0001
Upper Hells Canyon	Upper Hells Canyon	0	0	0	0	0	0
Big Canyon	Lower Hells Canyon	0	0	0	0	0	0
Muir	Lower Hells Canyon	0*	0	0	0*	0*	0*
Myers	Lower Hells Canyon	0	0	0	0	0	0
Sheep Mountain	Sheep Mountain	0	0	0	0	0	0
Mountain View	Mountain View	0.0035	0	0	0.0017	0.0017	0.0017
Asotin	Asotin	0	0	0	0	0	0
Tucanon	Tucanon	0	0	0	0	0	0
Contacts per Year		0.0456	0.0007	0	0.0201	0.0201	0.0201
Relative ranking of alternatives for minimizing contact		4	2	1	3	3	3

* A slight risk of contact exists for these herds but it is so small as to be almost zero.

Alternative C would provide the greatest protection to bighorn sheep habitats, the greatest amount of physical separation, and the least likelihood of contact, which would result in the greatest likelihood of persistence for all bighorn sheep populations. Alternative B would have an extremely low contact rate and would provide a high degree of physical separation that would result in a very high likelihood that bighorn sheep would continue to persist. Alternatives D, E, and F would pose the greatest risk of contact to the Wenaha herd (0.0094 contacts/year), but even this contact rate would be considered extremely low.

The contact rates presented in table 318 are much lower than the lowest rate achieved for the Payette National Forest (USDA Forest Service 2010). Their lowest contact rate of 0.08 resulted in one contact every 11 years, and, even assuming a high probability that contact would result in a disease outbreak, it still resulted in a low likelihood of herd extirpation (USDA Forest Service 2010). The annual contact rate of 0.0201 for alternatives D, E, and F would be equivalent to approximately one contact every 48 years between domestic sheep and a member of one of the 16 bighorn sheep herds. On an individual herd basis, the contact risk for the Wenaha herd for example would be approximately one contact every 100 years. These contact rates combined with the standards and guidelines for all alternatives that would help maintain separation of bighorn sheep and domestic sheep indicate a high probability that bighorn herds would persist within the planning area for all alternatives. It should be kept in mind however, that as modeling completed by Clifford et al. (2009) demonstrated, even a minimal level of contact can have severe

persistence implications for bighorn sheep populations. For one Sierra Nevada bighorn sheep population that they modeled, an estimated two percent annual risk of contact would result in a 50 percent probability of a catastrophic respiratory outbreak that would result in at least 40 percent mortality.

Compatibility with the Hells Canyon National Recreation Area Act – Several bighorn sheep herds utilize HCNRA and move freely back and forth to other National Forest System and BLM lands. Starting in 1994, a sample of bighorn sheep in the HCNRA were fitted with telemetry radio collars and monitored bi-weekly. Utilizing this information, the Payette National Forest completed a core herd home range analysis for each of the 16 herd populations. This analysis demonstrated the inter-connectivity between the herd units and the extent at which bighorn sheep currently move across the landscape. In consideration of the above information, the following determinations have been made regarding compatibility with the HCNRA Act and the HCNRA Comprehensive Management Plan (CMP) for the action alternatives analyzed.

None of the alternatives currently graze domestic sheep within 19 miles of the HCNRA and with the exception of alternative D, the action alternatives do not have domestic sheep grazing within 50 miles of the HCNRA. All alternatives therefore comply with the HCNR CMP by maintaining a separation between bighorn and domestic sheep that is likely to keep the two species apart at the current population levels.

Threatened, Endangered, Proposed, Candidate, and Sensitive Wildlife Species

Projects implemented under the forest plan collect more site-specific resource information for the project area. Biological evaluations and assessments that provide detailed analysis of potential effects from each project are required for threatened, endangered, proposed, and candidate species and those included on the Regional Forester's Sensitive Species List (collectively TEPCS). Historical conditions, current conditions and desired conditions are analyzed at a finer scale of resolution to better predict project outcomes. A determination of effects for TEPCS species would have to be made for any future project under the direction of the forest plan.

As indicated in the Focal Species section, a basic assumption is that the focal species represent ecological conditions that provide for viability of other species in the group and that focal species represent the species group (see table 298) such that, by providing for adequate amounts and distribution of habitat and managing risks for focal species, the ecological conditions needed to maintain viability of other associated species would be provided (USDA Forest Service 2010). Some TEPCS species were analyzed in detail as focal species in the viability assessment for alternative B (Wales et al. 2011). Although some of these focal species had low viability scores, there was no indication that implementing any of the alternatives would threaten the viability of any of those species to the extent that would cause a trend towards Federal listing.

What follows is a description of the broad potential effects at the national forest level for species currently listed in compliance with the Endangered Species Act or the Regional Forester's Sensitive Species List within the planning area. In some cases, standards and guidelines have been included to improve safeguards for certain habitat features of some species. All alternatives assume that direction given in FSM 2670 and FSH 2609 will be followed (e.g., FSH 2670.21 Threatened and Endangered Species 1. Manage National Forest System habitats and activities for threatened and endangered species to achieve recovery objectives so that special protection measures provided by the Endangered Species Act are no longer necessary. Or FSH 2670.22 Sensitive Species 1. Develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions.).

Canada Lynx

The Canada lynx was listed as a threatened species in March 2000 (USFWS 2000). Critical habitat was designated in November 2006, and then was revised in 2009 (USFWS 2009). A recovery plan has not been published; although a Recovery Outline (USDI 2005) was released in September of 2005 (Recovery Outlines carry no regulatory authority). This outline identified northeast Oregon/southeast Washington as peripheral areas defined as areas that contain few verified historical or recent records of lynx. Records are sporadic and usually associated with periods when there were unprecedented cyclic population highs in Canada, such as the early to mid-1960s and/or 1970s. There is no evidence of long-term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. However, some of these peripheral areas may provide habitat enabling the successful dispersal of lynx between populations or subpopulations. At this time, we simply do not have enough information to clearly define the relative importance of secondary or peripheral areas to the persistence of lynx in the contiguous United States (USDI 2005).

Due to a lack of data, the historical and current status of resident lynx populations in the Blue Mountains is uncertain. Only nine museum specimens exist for Oregon- all from 1897-1927 (McKelvery et al. 2000). Although the USFWS Web site[7] indicates that there are "at least 247 bounty records of lynx from 12 counties in the state," ODFW indicated that the lynx is very rare and is known from only 17 verified specimens recorded between 1897 and 1993 and that ODFW records, maintained since 1922, show that four of these individuals were taken during trapping. Only three specimens are recorded for southeastern Washington; one from the Blue Mountains (1931) and two from arid grasslands in 1962 and 1963 (McKelvery et al. 2000). These most current specimens in the Blue Mountains were found in anomalous habitats within several years of peak lynx populations in western Canada (*ibid*)

In May 2005, the Forest Service and the USFWS revised the Canada Lynx Conservation Agreement (CA) that was initially established in 2000. The revised agreement included a commitment that both agencies would jointly refine the criteria for classifying Canada lynx occupied habitat. As a result of that commitment, the revised agreement was amended in May 2006 (USDA Forest Service 2006) to include a definition of occupied Canada lynx habitat. Table 1 of the amendment lists national forests as occupied or unoccupied by Canada lynx and the Blue Mountains national forests are listed as unoccupied based on the completion to protocol of the National Lynx Survey. The CA further states that the Forest Service agrees that forest plans in states where lynx are listed should include guidance to conserve lynx for those portions of administrative units identified as occupied lynx habitat. Direction included in an August 2006 memorandum (USFWS 2006) indicated that "…the lynx should not appear on species lists for proposed Federal actions on national forests determined to be unoccupied by lynx. Compliance with section 7 (a)(2) of the Endangered Species Act is not required for the lynx under this circumstance."

Effects from Each Alternative on Canada Lynx

Canada lynx were identified as a focal species representing boreal forests (USDA Forest Service 2010), but because of their rarity in the Blue Mountains were not used in that capacity for the plan revision effort. According to Witmer et al. (1998), the two issues identified for lynx in the Columbia Basin, were 1) conservation of appropriate mosaics of seral stages in boreal forest habitat, and 2) harvest and human disturbance.

[7] http://www.fws.gov/oregonfwo/Species/Data/CanadaLynx

Habitat

Lynx require early seral stage boreal forest habitats for foraging and relatively small patches of late-successional forest to provide for denning opportunities. Analysis for the two focal species for the cold forest (see table 298) resulted in decreasing the level of concern (boreal owl) or maintaining a low level of concern (water vole) regarding their viability (see table 299 through table 301). This would indicate that at the broad scale, habitat for the lynx is being maintained or moved towards HRV. This is also supported by the vegetation analysis (see figure 16 in the "Forested Vegetation, Timber Resource, and Wildland Fire" section) which indicates that the early seral stage is close to the low range of HRV and that the late successional stage of cold forest is above HRV for multi-storied stands. This coupled with the fact that there is little active timber harvest anticipated in the cold forest for any alternative (see table 341), should result in the maintenance of lynx habitat throughout the life of the plan.

Risks

Witmer et al. (1998) indicated that road density in lynx habitat should be 1 mile per square mile. Where lynx are legally protected, an increase in roads through lynx habitat increases human access and human lynx encounters, as lynx also use roads for hunting and travel (Koehler and Aubry 1994). Increased road density leads to increased poaching, road kills, and incidental mortality of lynx while increased snowmobile use may allow access by other, competing predators (McKelvery et al. 2000).

Currently more than half of the cold forest in the Blue Mountains is in areas that are roadless. Wales et al. (2011) estimated that 24 percent of the cold forest within the Malheur National Forest has less than 1 mile per square mile of open motor vehicle routes, whereas the Umatilla and Wallowa-Whitman National Forests would have 52 and 74 percent of the cold forest respectively with route density below 1 mile per square mile. As displayed in figure 35, alternatives vary in the risk of human interaction associated with open motor vehicle routes by forest. When compared to alternative B, alternatives C, E, and F would reduce the risk of encounters, whereas D would increase the risk. The Blue Mountains are considered unoccupied by resident lynx (USDA Forest Service 2006) and a change in suitable habitat on the fringe of lynx range would not be expected to have any impact on the lynx population, therefore implementing any of the alternatives would have no effect on the Canada lynx.

Gray Wolf

Second only to humans in adapting to climate extremes, gray wolves once ranged from coast to coast and from Alaska to Mexico in North America. Records indicate all wolves were eliminated from the Blue Mountains in the early 1900s after Euro-American settlement. In January 1995, wolves from Canada were transplanted to the Salmon River drainage in central Idaho. In the winter of 1998-99, a collared wolf from this population (B-45-F) moved into northeast Oregon, eventually being captured by the United States Fish and Wildlife Service in March 1999 near the Middle Fork of the John Day River and returned to Idaho (ODFW 2005 (updated 2010)). Another collared wolf, from the White Cloud pack in Idaho, was killed on the freeway just south of Baker City, Oregon in May 2000 (*ibid*). Wolves have successfully colonized portions of Idaho and more recently have become established in northeast Oregon, confirming that suitable wolf habitat exists in the Blue Mountains. ODFW is currently monitoring three wolf packs: the Imnaha, Wenaha, and Walla Walla. The Walla Walla pack is new and wildlife managers are still trying to determine

their range, which could be primarily in Washington state.[8] Currently there are no known packs within the Malheur National Forest.

On April 2, 2009, the USFWS published a final rule establishing a Distinct Population Segment (DPS) of the gray wolf in the Northern Rocky Mountains. Gray wolves within the Northern Rocky Mountains DPS boundaries, except in Wyoming, were removed from the list of endangered and threatened wildlife (USFWS 2009a). The final rule became effective on May 4, 2009 but was vacated in 2010 by U.S. Federal District Court in Missoula, Montana (Defenders of Wildlife et al. v. Salazar, CV 09-77-M-DWM and Greater Yellowstone Coalition v. Salazar, CV 09-82-M-DWM). In 2011, the Department of Defense and Full-Year Appropriations Act carried a rider directing the U.S. Fish and Wildlife Service to reissue the 2009 rule that recognized the Northern Rocky Mountains DPS (USFWS 2011) as well as its 2009 status. The DPS includes that portion of Washington east of Highway 97 and Highway 17 north of Mesa and that portion of Washington east of Highway 395 south of Mesa. It includes that portion of Oregon east of Highway 395 and Highway 78 north of Burns Junction and that portion of Oregon east of Highway 95 south of Burns Junction. This has resulted in a rather unusual situation where wolves are no longer endangered in that area, but in surrounding areas that don't currently have wolves, Endangered Species Act protections are still in place. To address this situation, the U.S. Fish and Wildlife Service is initiating an assessment of the biological and conservation status of wolves in the Pacific Northwest to determine their appropriate listing classification, and when completed, they will evaluate a potential Pacific Northwest DPS in accordance with the agency's existing DPS policy and will reclassify this area through an additional rulemaking process.[9]

Currently gray wolves are considered as endangered west of highway 395 in the Blue Mountains and east of 395 they are included on the Regional Forester's Sensitive Species List (see figure 34) and managed under the wolf management plan for Oregon (ODFW 2005 [updated 2010]). For the Malheur National Forest, the wolf would be considered federally listed on 43 percent of National Forest System lands. For the Umatilla National Forest, the wolf would be considered federally listed on only 20 percent of National Forest System lands. The wolf would be included on the Regional Forester's Sensitive Species List throughout the Wallowa-Whitman National Forest.

Based on the Northern Rocky Mountains Wolf Recovery Plan (USDI 1987), three key wolf habitat components are necessary: 1) year-round prey base of ungulates and alternative prey, 2) secluded denning and rendezvous sites, and 3) open spaces with minimal exposure to humans. Wisdom et al. (2000) suggested four major challenges to wolf conservation within the Interior Columbia Basin: excessive mortality from humans, mortality related to roads, displacement from habitat by human activities, and population isolation. The Oregon wolf management plan recognized that "human tolerance has been and remains the primary limiting factor for wolf survival."

[8] ODFW Web site: Current status of wolves in Oregon (June 6, 2011) http://www.dfw.state.or.us/Wolves/index.asp
[9] http://www.fws.gov/oregonfwo/Species/Data/GrayWolf/default.asp

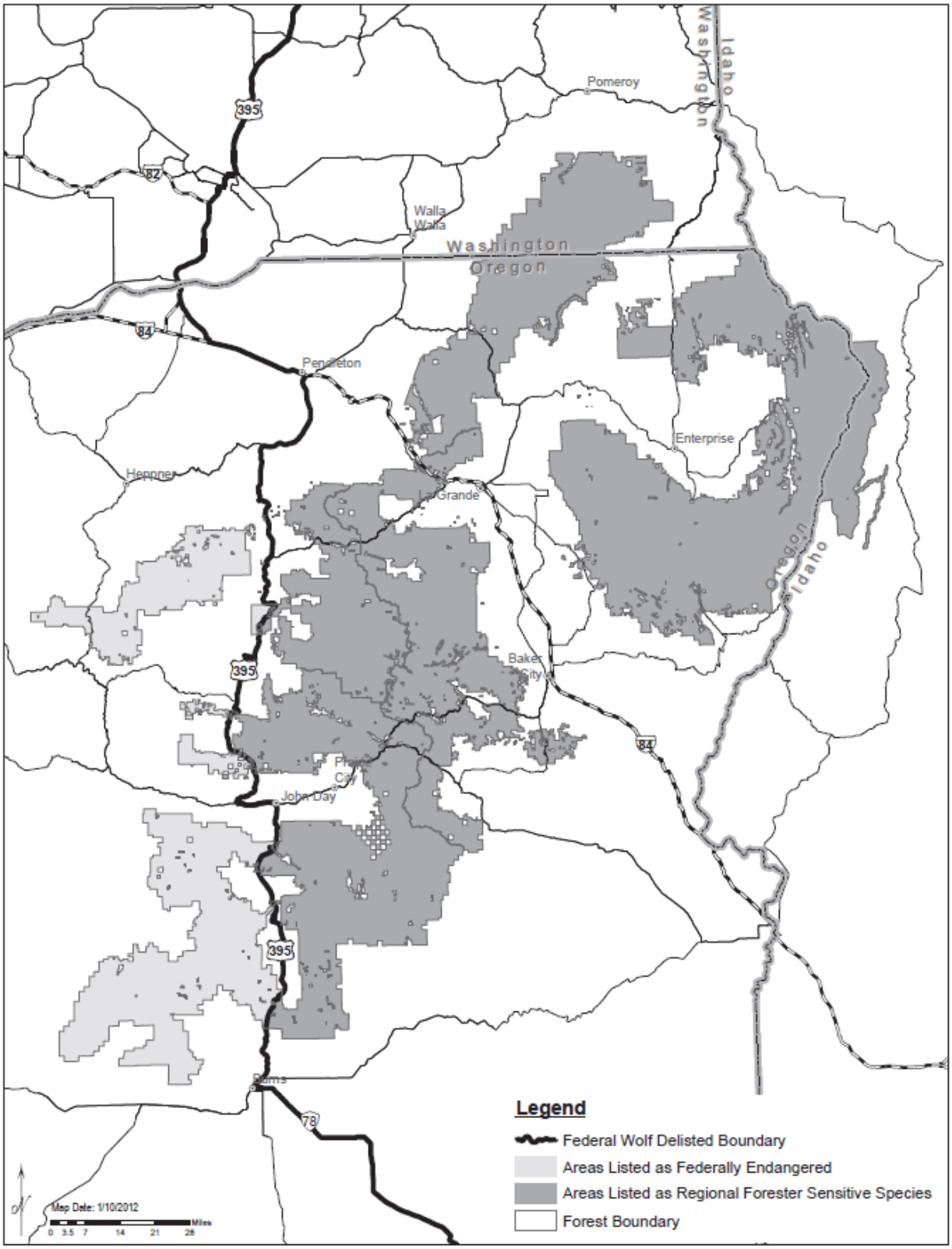

Figure 34. Status of the gray wolf in reference to the national forests within the Blue Mountains

Effects from Each Alternative on Gray Wolf

Humans have changed the landscape to great extent during the past 150 years. Wolves are habitat generalists and theoretically a wide range of Oregon ecosystems are capable of supporting wolves. Nevertheless, it is difficult to predict specific areas wolves will occupy and also difficult to predict where they will persist. The ability to persist will be determined largely by the degree of human tolerance for the species across the state's vast rural landscapes (ODFW 2005 [updated 2010]).

Because wolves are habitat generalists that hunt and den in a wide variety of vegetation types, the alternatives would have little effect on the amount and distribution of habitat used by wolves or their prey species (USFWS 2003). Gray wolf populations are primarily limited by nonhabitat factors, such as direct interaction with humans that cause mortality (Bangs et al. 1998) and to a lesser degree denning disturbance (ODFW 2005 [updated 2010]). In some areas, wolves are capable of occupying habitats with few conflicts that might be considered marginal based on human population densities and land management practices. However, most of the known wolf mortality that has occurred within the DPS has been in response to livestock depredations. Wolves that have a history of livestock depredations are lethally controlled by agents of USDA-APHIS Wildlife Services. Most of the depredation problems in Oregon have been within the Wallowa-Whitman National Forest.

Wolves are most vulnerable to disturbance while denning and rearing pups. Wolf interaction with humans is perhaps most influenced by human accessibility to remote habitats. Two measures have been used to assess disturbance impacts on wolves; miles of desired open motor vehicle routes and acres of management areas with limited motor vehicle access.

Exposure to humans varies for all alternatives due to desired conditions for density of open motor vehicle routes as well as the expanse of the various management areas. For example, although alternative C would have the same desired condition for density of open motor vehicle routes in MA 4A as alternatives B, E, and F, it would have less than half the acres in MA 4A. Figure 35 displays the difference in risk based on the composite of route density and acres in general forest (MA 4A) compared to the proposed action, because a single composite for the existing condition could not be generated.

Additional open motor vehicle routes would likely be obliterated or closed depending on protection and restoration needs and funding available from other resources, such as soil, water, fish and wildlife. The reduction in open motor vehicle routes would have the indirect effect of reducing the likelihood of adverse human interaction with wolves in the form of shooting, harassment, vehicle collisions, and other forms of threats. Open motor vehicle route reduction would likely continue over the long term in gradually diminishing amounts until the national forests have transportation systems that achieve a more desirable balance between access needs, resource impacts, and effective open motor vehicle route maintenance capability.

Another measure of solitude provided wolves would be acres of limited motor vehicle use and/or areas considered roadless or nonmotorized. Areas without open motor vehicle routes are generally represented by management allocations, such as MA 1A Congressionally Designated Wilderness Areas, MA 1B Preliminary Administratively Recommended Wilderness Areas, MA 2B Research Natural Areas and MA 3A Backcountry (nonmotorized use). These management areas are generally seen as providing secure areas for wildlife. Allocations to these management areas will vary between alternatives as displayed in figure 36. In comparison to the no-action alternative (A), all alternatives would have more acres allocated to management areas with the least amount

of human disturbance. Of the action alternatives, alternative C would have the most acres allocated to such management areas followed by alternatives E, F, and B. Alternative D would have the least.

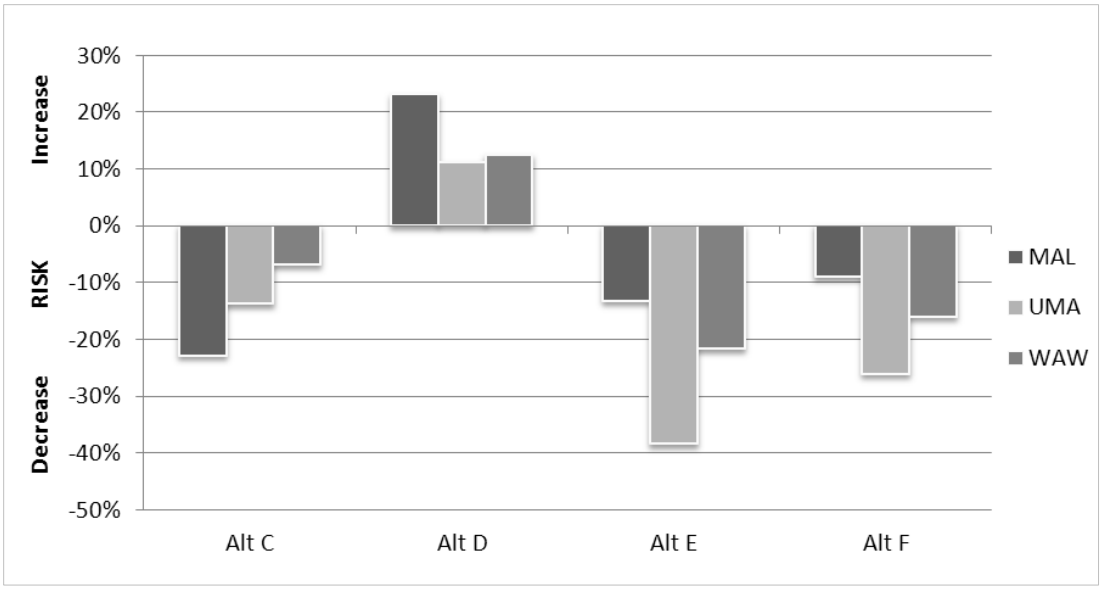

Figure 35. The change in risk of human interaction with the gray wolf for action alternatives in comparison to the proposed action based on desired open motor vehicle route density for each national forest

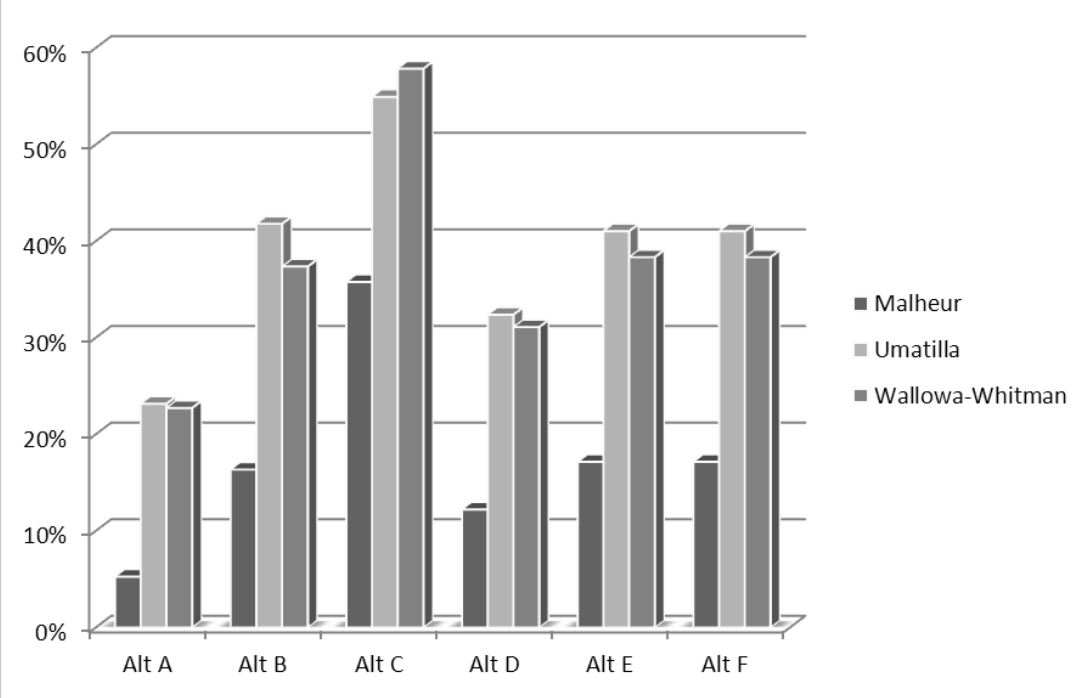

Figure 36. Percent of each national forest that would be considered secure areas for wildlife for each alternative

Malheur National Forest – Depending on location, the wolf is either federally listed as endangered or is included on the Regional Forester's Sensitive Species List. There are no known packs within the Malheur National Forest, although young wolves are beginning to explore more of eastern and central Oregon. Because the Malheur National Forest is unoccupied, individual wolfs would not be affected by implementing any of the management alternatives. Alternative C would reduce the risk of encounters between wolves and humans the most, as it would have the most acres in backcountry management areas (see figure 36) effectively reducing the total open motor vehicle route density within the national forest (see figure 35). Because of the desired condition for road density in bull trout and anadromous fish watersheds, alternatives E and F reduce the risk to wolves based on road density compared to the proposed action. The detailed assumptions for calculating how these standards would be applied during the life of the plan can be found in the project record, but basically the estimated number of watersheds and acres based on projected active management treatments (MA 4A) that would either be in bull trout or anadromous watersheds was used to reduce the amount of MA 4A that would have an open motor vehicle route density of 2.4 miles per square mile.

It is assumed that through implementation of the 2005 Travel Management Rule (36 CFR 212), the Malheur National Forest will limit cross-country travel, except for over-the-snow motor vehicles. Although Creel et al. (2002) found that stress-hormone levels of wolves increase with snowmobile use, it was not clear if it resulted in changes to population dynamics. Alternative C reduces over-the-snow motor vehicle impacts within the Malheur National Forest (see table 319), mostly due to the incorporation of MA 3C, which limits over-the-snow motor vehicle travel to designated routes. None of the alternatives are anticipated to reduce prey abundance for wolves and even though alternative C would provide the greatest reduction in potential human interaction with wolves; the management direction of any of the alternatives would continue to contribute to the viability and persistence of the wolf within the Malheur National Forest during the expected life of the forest plan. All alternatives incorporate standard WLD-HAB-6 S-1, which prohibits management activities near denning sites.

Table 319. Percent of each national forest that is suitable for winter motor vehicle use by alternative

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL	92	91	64	95	92	92
UMA	75	72	46	78	71	71
WAW	78	74	40	76	70	70

Umatilla National Forest – Similar to the Malheur National Forest, the wolf is federally endangered within a portion of the Umatilla National Forest, but a sensitive species on more than 80 percent of the national forest. Currently the national forest is occupied by at least one pack, and most of the known locations of wolves have been in that portion of the national forest where the wolf would be considered a sensitive species. The potential impacts of roads to wolves would be similar to the Malheur National Forest (summer cross-country travel has been restricted); however, because of the prevalence of anadromous watersheds, impacts by alternatives would be different (see figure 35). Alternative C has more acres in MA 3C than either E or F however, the combination of MA 3C with anadromous watersheds indicates that alternative E reduces the risk from open motor vehicle route density the most followed by F and then C. Risk from over-the-snow motor vehicles use is also different, with a noticeable reduction in alternatives C, E and F, although the reductions are more substantial in alternative C. Again, there is no anticipated

reduction in prey availability for the wolf and all alternatives incorporate standard WLD-HAB-6, which prohibits management activities near denning sites. As indicated, the portion of the Umatilla National Forest currently known to be occupied by wolves is that portion where the wolf would be considered a sensitive species. Forest plans do not directly implement activities that could cause disturbance to individual wolves. However, the probability exists that at least one project implemented in compliance with the forest plan could disturb an individual wolf. Using this premise, implementing the plan might affect individuals but implementing the management direction for any of the alternatives would result in the continued viability and persistence of the wolf within the Umatilla National Forest during the life expectancy of the plan.

Wallowa-Whitman National Forest – The Wallowa-Whitman National Forest is occupied by at least one pack and the entire national forest is within the area where the wolf was delisted; as such, the wolf is considered a sensitive species for the national forest. Similar to the Umatilla National Forest, alternative E does the best at reducing the potential for human/wolf conflict based on open motor vehicle route density (see figure 35) followed by F and then C. Alternative C has the most acres in back country management areas that minimize motor vehicle access (see figure 36) and reduce areas for over-the-snow motor vehicle use (see table 319), which may be of a greater benefit as the change in road density is not as dramatic as within the Umatilla National Forest. It is also assumed the Wallowa-Whitman National Forest will restrict cross-country summer motor vehicle use in the near future. There is no anticipated reduction in prey availability for the wolf and all alternatives incorporate standard WLD-HAB-6 S-1, which prohibits management activities near denning sites. The Wallowa-Whitman National Forest is currently known to be occupied by wolves and although Forest plans do not directly implement activities that could cause disturbance to individual wolves, the probability exists that at least one project implemented in compliance with the forest plan could disturb an individual wolf. Using this premise, implementing the plan might affect individuals but implementing the management direction for any of the alternatives would continue to provide for the viability and persistence of the wolf within the Wallowa-Whitman National Forest during the plan period.

Wolverine (Candidate Species)

The North American wolverine became a Federal candidate species December 14, 2010. The wolverine was evaluated as a focal species for the habitat generalist group which included the gray wolf and the peregrine falcon. It is sensitive to risk factors that can cause disturbance (Copeland et al. 2007, Gaines et al. 2003, Krebs et al. 2007) as are the other species in this group.

Wolverines are considered habitat generalists, and their home ranges are so large that they are usually measured in hundreds of square miles rather than thousands of acres. Recent radio telemetry studies of wolverines in the Rocky Mountains of British Columbia (Krebs et al. 2007) and the United States (Copeland 1996, Copeland et al. 2007, Squires et al. 2007) indicate that wolverines are wide-ranging, inhabit remote areas near timberline, and are sensitive to human disturbance at natal and maternal den sites. Interestingly, Aubry et al. (2007), in their historical review of wolverine distribution in the west, concluded that wolverines detected in Oregon in recent decades “probably represent extreme dispersal events that were not representative of self-sustaining populations” because “there is no evidence of wolverine occurrence in eastern Washington or Oregon currently.” Edelmann and Copeland (1999) indicated that of the 150 sightings for Oregon, at least some of them occurred in the Wallowa Mountains. Using remote cameras and bait stations Magoun et al. (2011) recently documented at least three individuals in the Eagle Cap Wilderness Area of the Wallowa-Whitman National Forest. It is still uncertain, however, if breeding takes place in the Blue Mountains planning area.

Suitable wolverine habitat in Oregon is considered to be the high-elevation forests of the Cascade Range, the Blue Mountains, the Wallowa Mountains, and the Ochoco Mountains. Habitat areas for wolverines are usually isolated and described as patchy, often separated by large areas of unsuitable habitat. The assessment model (Wales et al. 2011) identified source habitat as the cool moist and cold dry (including white-bark pine) potential vegetation groups above 4,000 feet in elevation. Alpine cirques with boulder fell fields offer the primary denning habitat for wolverines in Idaho, and may also do so in Oregon (Magoun and Copeland 1998). Montane coniferous forests, suitable for winter foraging and summer kit rearing, may only be useful if connected with subalpine cirque habitats required for natal denning, security areas, and summer foraging (Copeland 1996).

Similar to other large mammalian carnivores in the Rocky Mountains (e.g., *Ursus arctos, Canis lupus*), the current distribution of wolverines may be determined more by intensity of human settlement than by biophysical factors such as vegetation type or topography (Banci 1994, Carroll et al. 2001, Kelsall 1981). Thus, specific habitat needs are not as important as reducing human disturbance, particularly in natal den sites (subalpine talus cirques) during the denning period.

Effects from Each Alternative on Wolverine

Malheur National Forest – The wolverine is listed as suspected within the Malheur National Forest. Wales et al. (2011) found the vast majority (96 percent) of watersheds within the Malheur National Forest had zero to low (1 to 600 acres) amounts of denning habitat (see table 320), with only 4 having moderate amounts. There were no watersheds with high amounts (greater than 1,400 acres). This suggests that a breeding population of wolverines would be unlikely to occur on the Malheur National Forest and that occurrence on this national forest would most likely represent extreme dispersal events that are not representative of self-sustaining populations as suggested by Aubry et al. (2007).

Table 320. Percent of watersheds by national forest having zero, low (1 to 600 acres), moderate (601 to 1,400 acres) and high (greater than 1,400 acres) amounts of wolverine denning habitat

National Forest	Zero	Low	Moderate	High
MAL	75	21	4	0
UMA	87	9	4	0
WAW	58	15	18	10

All alternatives incorporate standard WLD-HAB-6 S-1, which prohibits management activities near denning sites; however, it is unlikely that management actions would occur in the area during the time of denning. Magoun and Copeland (1998) speculated that deep, persistent spring snow cover was an obligate component of wolverine reproductive denning habitat, possibly because it aides in the survival of young by providing a thermal advantage (Pulliainen 1968) and refuge from predators (Persson et al. 2003, Pulliainen 1968). Reproductive denning begins in late February to mid-March, and post weaning den abandonment occurs in late April and May (Magoun and Copeland 1998, Persson et al. 2003), which for the most part is prior to when field activities associated with the plan would begin. Winter recreation then becomes the largest risk for disturbance of denning wolverines (Copeland 1996, Goldberg 2010). Recent advances in snowmobile technology capabilities has raised concerns about their ability to access previously isolated areas (Wisdom et al. 2000) where natal denning may be occurring. Wales et al. (2011) assessed winter habitat effectiveness by calculating the density of designated winter routes in

wolverine habitat and determined that these routes have little effect on wolverine habitat, but recognized this did not account for cross-country winter use. As displayed in table 319, only alternative C measurably reduces the amount of national forest open to cross-country snowmobile use, whereas the other alternatives vary less than four percent between them.

In montane habitats in the southern latitudes, wolverines remain at high elevation throughout the year, avoiding lower elevation habitats with xeric conditions (Copeland et al. 2010). Several authors have attributed this to human influence (Carroll et al. 2001, May et al. 2006, Rowland et al. 2003). Carroll et al. (2001) found areas with road densities less than 1 mile per square mile to be strongly correlated with the presence of wolverine. Rowland et al. (2003), in a test of the Raphael et al. (2001) model, found that road density was a better predictor of wolverine abundance than amount of habitat when applied at the watershed scale. As displayed in figure 37, alternative C does the most for reducing the risk of encounters between wolverines and humans, since it has the most area in backcountry management areas. Additionally, alternative C establishes MA 3C which is intended to be managed for linkages between large blocks of back country. Both alternatives E and F have a desired condition to reduce hydrological connectivity of roads which was assumed to result in a roadbed density below one mile per square mile in bull trout watersheds. Based on assumptions regarding activity acres and percent that could occur in bull trout watersheds, alternative E could implement this standard on an additional 67,000 acres and alternative F would implement it on an additional 44,000 acres. It is not possible to determine how many acres of source habitat would be impacted.

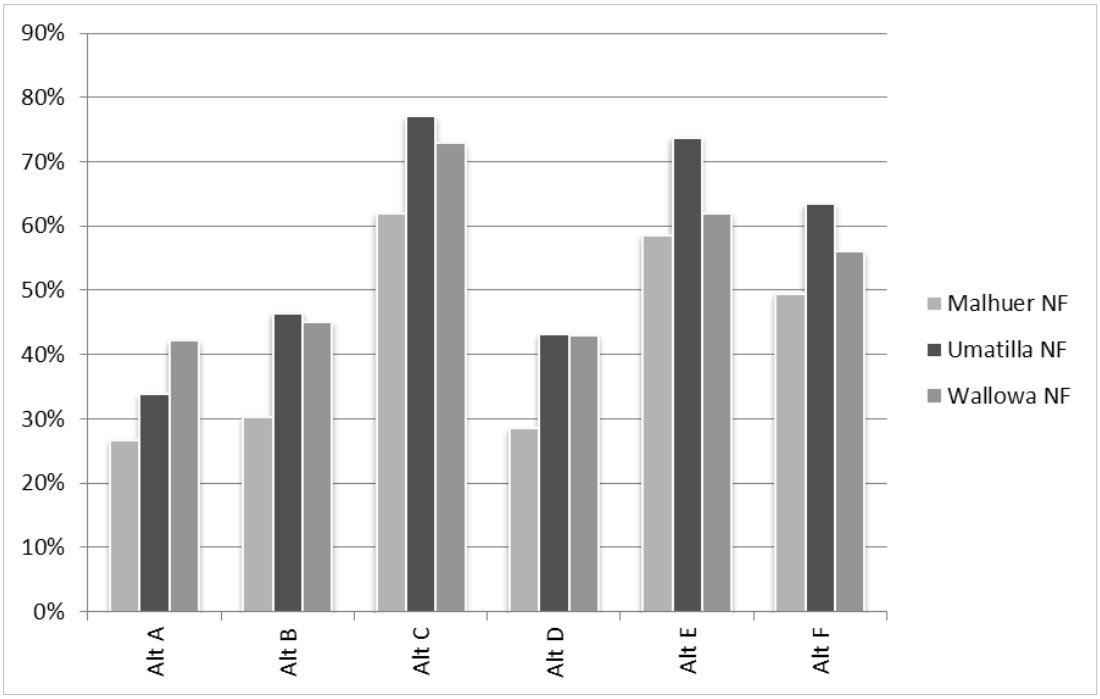

Figure 37. Percent of source habitat for the North American wolverine by alternative and by forest that occurs in Management Areas with an open motor vehicle route density of less than 1.5 mile per square mile

Because the Malheur National Forest is not occupied, it is not expected that individual wolverines would be affected by implementing any of the management alternatives. Although there is a high level of concern for source habitat with all alternatives for the Malheur National Forest (see table

299), all alternatives would provide direction to manage habitats towards HRV. As mentioned for the Canada lynx, the cold forest is relatively close to what occurred historically. Currently, the overall ability to move through the planning area for wolverine was rated as moderate to high, meaning in all likelihood wolverine mobility is not restricted (Wales et al. 2011). There is potential for wolverines from the Rocky Mountain population to enter Oregon from Idaho, Wyoming, or Montana. Although individuals may be impacted, overall management direction of any of the alternatives would contribute to habitat conditions for viability and persistence of this species.

Umatilla National Forest – The wolverine is listed as suspected within the Umatilla National Forest. Similar to the Malheur National Forest (see table 320), 96 percent of Umatilla National Forest watersheds had zero to low (1 to 600 acres) amounts of denning habitat (Wales et al. 2011) with only 4 percent having moderate amounts and there were no watersheds with high amounts (greater than 1,400 acres). Unlike the Malheur National Forest, 87 percent of the watersheds within the Umatilla National Forest have no denning habitat. This would suggest that it would be unlikely that the Umatilla National Forest would support a breeding population of wolverines and that occurrence on this national forest would probably represent extreme dispersal events that are not representative of self-sustaining populations as suggested by Aubry et al. (2007).

All alternatives incorporate standard WLD-HAB-6 S-1, which prohibits management activities near denning sites; however, it is extremely unlikely that management actions would occur in the area and during the time of denning (see discussion for the Malheur National Forest). There is a wider spread between alternatives in reducing over-the-snow travel within the Umatilla National Forest and overall there is less area on the forest open to OSVs (see table 319). Still, alternative C reduces OSV suitability the most, with alternatives E and F, ranking second for improving winter habitat effectiveness for the wolverine. Although there is a high to moderate level of concern for all alternatives for the Umatilla National Forest (see table 300) and individuals may be impacted, overall management direction of any of the alternatives would contribute to habitat conditions for viability and persistence of this species.

Wallowa-Whitman National Forest – The wolverine was most recently documented within the Wallowa-Whitman National Forest in the winter of 2011 (Magoun et al. 2011). Unlike the Malheur and Umatilla National Forests, the Wallowa-Whitman National Forest has watersheds that were categorized as having high amounts of denning habitat (see table 320). Wales et al. (2011) determined that 18 percent of the watersheds had moderate amounts of denning habitat while at least 10 percent had high amounts (greater than 1,400 acres). Less than 58 percent of the watersheds had no denning habitat. As suggested by Magoun et al. (2011), it is possible that the Wallowa-Whitman National Forest supports a small breeding population of wolverines and that their occurrence on this national forest may not represent extreme dispersal events as suggested by Aubry et al. (2007). Wales et al. (2011) determined that the watersheds with the greatest amount of potential denning habitat are all in the Wallowa Mountains (Eagle Creek, Upper Wallowa Creek, Upper Imnaha River, and the Minam River) which would align with the recent documentation of wolverines within the Wallowa-Whitman National Forest (Magoun et al. 2011)

All alternatives incorporate standard WLD-HAB-6 S-1, which prohibits management activities near denning sites; however, it is extremely unlikely that management actions would occur in the area and during the time of denning (see discussion for the Malheur National Forest). There is a wider spread between alternatives in reducing over-the-snow travel within the Wallowa-Whitman National Forest and overall there is less area on the forest open to OSVs (see table 319). Still, alternative C reduces OSV suitability the most, with alternatives E and F, being the next best for

improving winter habitat effectiveness for the wolverine. Although there is a high to moderate level of concern for all alternatives for the Wallowa-Whitman National Forest (see table 301) and individuals may be impacted, overall management direction of any of the alternatives would contribute to habitat conditions for viability and persistence of this species.

Sage-grouse (Candidate Species)

In March 2010, the USFWS determined that the greater sage-grouse warrants the protection of the Endangered Species Act but that listing the species at this time is precluded by the need to address higher priority species first. Sage-grouse are considered a sagebrush obligate species as virtually all studies of sage-grouse have identified the bird's dependence on large, woody sagebrushes (*Artemisia* spp.) for food and cover during all periods of the year (Dalke et al. 1963, Connelly et al. 2000, Connelly et al. 2004). Sage-grouse breed on sites called leks (strutting grounds) which are typically used year after year. Breeding habitats are normally sage-brush dominated shrub-steppe, consisting of large, relatively contiguous stands of sage-brush (Connelly et al. 2011). Much of the original sage-grouse habitat has been permanently lost to agricultural development and urban areas (Leu and Hanser 2011, Pyke 2011) and the remaining habitat ranges from high quality to no longer adequate.

Source Habitat Description

According to Schroeder et al. (1999), sage-grouse use a wide mosaic of sagebrush habitats throughout the west that include:

- Tall sagebrush types such as big sagebrush (*Artemisia tridentata*), three-tip sagebrush (*A. tripartita*), and silver sagebrush (*A. cana*)
- Low sagebrush types, such as low sagebrush (*A. arbuscula*) and lack sagebrush (*A. nova*)
- Mixes of low and tall sagebrush with abundant forbs
- Riparian and wet meadows
- Steppe dominated by native forbs and bunchgrasses,
- Scrub-willow (*Salix* spp.)
- Sagebrush/woodland mixes with juniper (*Juniperus* spp.), ponderosa pine (*Pinus ponderosa*), or quaking aspen (*Popululs tremuloides*)

Call and Maser (1985) summarized characteristics of quality sage-grouse habitat in Oregon as sagebrush steppe between 4,000 and 8,000 feet with annual precipitation of 10 to 16 inches and rolling topography. Within this landscape, sage-grouse need key habitat elements for reproduction and survival. In Oregon, nesting habitat consists of sagebrush plants (*A. tridentata* and *A. arbuscula*) with a strong native herbaceous understory (Hagen et al. 2007).

Sage thrashers were chosen as the focal species to represent species, including the sage-grouse, associated with the Shrub-steppe Group in the Woodland/Grass/Shrub Family (Wales et al. 2011). It was felt that sage thrasher represents the full range of habitats and risks associated with this group, including loss, fragmentation, and degradation of sagebrush (*Artemisia* spp.) habitats. Modeling for the sage thrasher indicated that habitat is only moderately departed from HRV, and the influence of open motor vehicle route is low. As a result, there is a moderate level of concern for the viability of the sage thrasher (see table 299 through table 301), and therefore the group, for all three national forests.

Habitat for the group represented by the sage thrasher was never highly abundant on National Forest System lands in the Blue Mountains. Species of sagebrush vary by elevation and soils but include low sagebrush, silver sagebrush, rigid sagebrush, basin big sagebrush, Wyoming big sagebrush, mountain big sagebrush, threetip sagebrush, bitterbrush, and rabbitbrush (Johnson and Clausnitzer 1992), all of which make up the sagebrush shrubland habitat. Sage-grouse habitat is a subset of the sagebrush shrubland habitat and as indicated by Hagen (2011) is found on less that 0.7 percent of National Forest System lands in Oregon. The habitat mapping effort for greater sage-grouse in Oregon (Hagen 2011) utilizes the concept of core areas as presented by Doherty et al. (2011) with some modifications, explained in detail by Hagen (2011). For Oregon the core area goal is to identify habitats necessary to conserve 90 percent of Oregon's greater sage-grouse population with emphasis on the highest density and important use areas which provide for breeding, wintering and connectivity. In addition, low density areas are to be identified that provides breeding, summer and migratory habitats for the statewide population.

In 2012, the U.S. Fish and Wildlife Service created a Conservation Objective Team (COT) of state and FWS representatives to develop conservation objectives for the sage-grouse. The final report (COT 2013) identifies key habitats necessary for sage-grouse conservation range-wide and has termed these habitats as priority areas for conservation (PACs). These PACs were developed using maps created by individual states and therefore the PACs in their report coincide with the core areas identified by Oregon and displayed in figure 38. The BLM's National Technical Team identified Priority Primary Habitat (BLM 2011) which is the same as core areas and PACs in Oregon. Sage-grouse habitat on the Blue Mountains National Forests actually falls into two different management zones (figure 38), the Snake River Plains and the Northern Great Basin (COT 2013). According to COT (2013), the Malheur National Forest would encompass both management zones and two populations: the central Oregon population, which is considered at risk (C2) or potentially at risk (C3), and the northern great basin population, which is potentially at risk (C3). The Wallowa-Whitman is only in one management zone and encompasses only the Baker population which is considered at risk (C2).

Effects from Each Alternative on Sage-Grouse

The greater sage-grouse is not expected to occur within the Umatilla National Forest (see table 321). Sagebrush habitats were estimated to occur on less than 1 percent of the Forest, none of which were mapped as greater sage-grouse habitat by Hagen (2011). Because the forest is not occupied and there is no known occupied habitat in either Oregon (Hagen 2011) or Washington (Hays et al. 1998) immediately adjacent to the forest, it will not be addressed further.

Malheur National Forest – Sagebrush steppe habitat was estimated to occur on approximately 6 percent of the landscape within the Malheur National Forest; however, not all of this is considered sage-grouse habitat. Habitat mapping completed by ODFW (figure 38) indicates that only 41,600 acres is considered greater sage-grouse habitat, and of this, 30,000 has been mapped as core habitat, and the remainder as low density habitat. Habitat on National Forest System lands is not contiguous, with the largest block within the Malheur National Forest being slightly more than 24,000 acres of Core Area Habitat (PAC) occurring in the Snake River Plains Management Zone and associated with the Northern Great Basin population. The Northern Great Basin population is a large population in Oregon, Idaho, Nevada, and Utah. In Oregon, PACs and low density (nonpriority but managed) habitat combined capture all but three percent of known summer, one percent of known breeding, and one percent of known wintering habitat. Oregon PACs also considered the need to maintain a network of connected habitats. Overall, this part of the population is potentially at risk (C3). Habitat within the Malheur National Forest represents 0.6 percent of sage-grouse habitat in Oregon within this management zone.

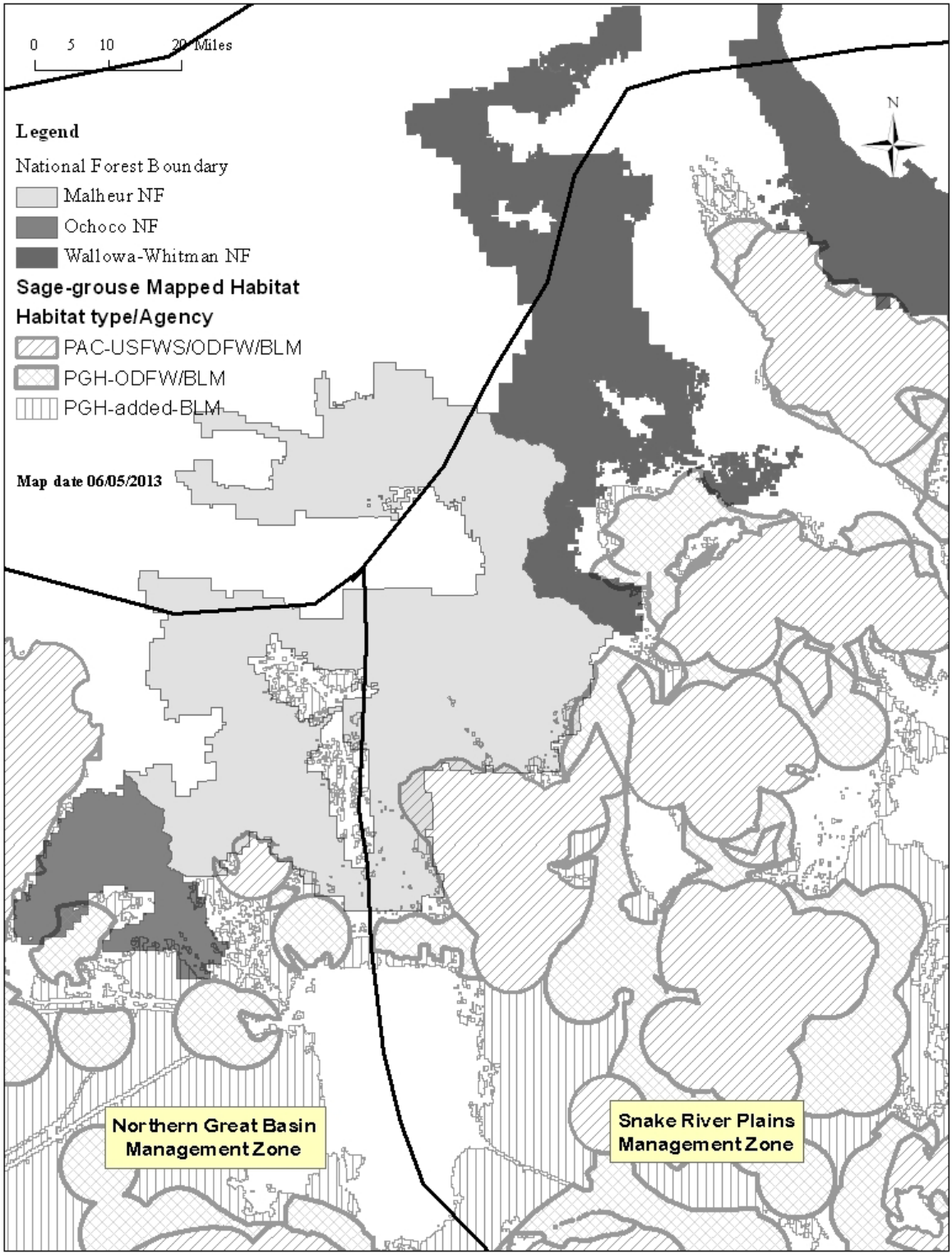

Figure 38. Greater sage-grouse habitat within and adjacent to the Blue Mountain National Forests

The eastern portion of the Malheur is in the Northern Great Basin Management Zone and is associated with the Central Oregon population. This population is estimated to have only 53 percent of historical sagebrush habitat, having lost more historical habitat than any other sage-

grouse administrative unit in Oregon. The area also has more privately owned sage-grouse habitat (48 percent) than most other sage-grouse management zone populations in Oregon. Priority areas for conservation and low density (nonpriority but managed) habitat combined capture all but three percent of known summer, one percent of known breeding, and one percent of known wintering habitat. Although a lot of the known habitat is mapped, it is recommended to retain all PACs in Central Oregon. Less than 14,000 acres of habitat occur within the Malheur National Forest and less than half of this is considered PACs. This represents 0.2 percent of sage-grouse habitat within this management zone in Oregon.

All alternatives include a desired condition to restore habitats including the sagebrush steppe. Sagebrush steppe is identified as a special habitat for all alternatives (see appendix A 1.13 Special Habitats), with a desire of no net loss and at least 70 percent having an understory of native species, resulting in conditions that are sustainable and resilient to disturbance. In other words they are capable of recovering to their potential community without intervention after a disturbance. The other 30 percent of the landscape would include areas of juniper encroachment, non-sagebrush shrub lands, annual grasslands, and nonnative perennial grasslands that potentially could be rehabilitated and enhanced as sagebrush habitat. This would be true no matter which action alternative is being evaluated.

Management activities likely to occur in sage-grouse source habitats are primarily grazing, invasive plant species control, and fire suppression, all of which are discussed below as threats/risks to habitat. Alternatives E and F also identify objectives to reduce juniper encroachment on 800 acres and to reduce sagebrush density on 700 acres in areas where it currently exceeds 25 percent canopy cover during the life of the plan. This represents only a modest gain in habitat, which in all likelihood would not lead to a detectable change in the sage-grouse population.

Threats and Risks

Sage-grouse populations in these two management zones face a wide suite of threats, including juniper encroachment, renewable energy development (both wind and geothermal), energy transmission, roads, OHV recreation, mining development, and residential development. Despite efforts to manage wildfire risks, wildfires and invasive species have continued to reduce the quality of habitat in portions of this area (COT 2013).

Livestock grazing is the most wide-spread use of sage-grouse habitats in the west. There is no doubt that historical grazing had significant impacts on sagebrush habitats throughout the west (Crawford et al. 2004) due to season-long use and stocking levels that far exceeded the carrying capacity of the land. Current livestock grazing, however, can be positive, negative or neutral and will vary with timing, intensity of use and a host of environmental factors (Hagen et al. 2011). Grazing may improve brood use of habitat (Dahlgren et al. 2006), reduce nesting success due to loss of vegetation for cover (Beck and Mitchell 2000, Connelly and Braun 1997), or remain neutral by maintaining perennial bunchgrasses with moderate levels of livestock utilization (Stohlgren et al. 1999). Beck and Mitchell (2000) summarized potential effects of livestock grazing on sage-grouse habitats, and cited only four references that provide empirical evidence of direct negative effects of livestock grazing on sage-grouse, as follow: Of 161 nests examined in Utah, two were trampled by livestock (one sheep, one cattle) and five were deserted due to disturbance by livestock (Rasmussen and Griner 1938). As previously discussed for focal species, data for both uplands and riparian areas indicate an improvement in overall rangeland condition under current management. Although recognized that some of the true rangeland sites are strongly or highly departed from their historical condition (see table 85 in the “Livestock Grazing and

Rangeland Vegetation" section), the cause may not be current livestock grazing but rather historical grazing or invasion of nonnative annuals due to fire. Within sage-grouse source habitat, 77 percent of CVS plots were classified as phase C or better; meaning that a large portion of habitat can be restored through proper management. It is assumed that livestock grazing would be managed to achieve the expressed desired conditions of the plan (see appendix A 1.2 Species Diversity, 1.5 Invasive Species, 1.6 Structural Stages, 1.7 Plant Species Composition, 1.8 Stand Density, and 1.13 Special Habitats), which would result in an improvement of rangeland phases. Alternative C reduces the amount of the national forest considered suitable for livestock grazing by almost 28 percent, eliminating grazing on approximately 400 acres of sage-grouse core habitat and 700 acres of low-density habitat. As previously discussed, stocking rates and utilization levels (residual biomass) have more to do with successful range improvement than anything else. As displayed in table 313, the current forage needs of domestic livestock and wild ungulates is below what has been cited as acceptable use and still see rangeland improvement (Holecheck 1988); however, it is also recognized that small areas of overuse can occur. Because of this, alternative C would lead to the most improved sage-grouse habitat, followed by alternatives E and F, based on exposure to domestic livestock grazing and utilization levels within the uplands (RNG-5 and RNG-6).

Open motor vehicle route density was also identified as a risk factor for the sagebrush group (Wales et al. 2011). Ingelfinger and Anderson (2004) found density of sagebrush obligate birds decreased 39 to 60 percent within a 100-meter buffer of roads with low traffic volumes associated with natural gas extraction in Wyoming. Although the direct effects of recreational activity on sage-grouse is unknown, there are negative correlations between sage-grouse populations and increased human activity (Connelly et al. 2004). Wales et al. (2011) found road density generally to be low in source habitat for the sagebrush group, which is probably true for sage-grouse habitat as well. Neither road density nor distances to nearest roads were significant factors in the long term persistence of sage-grouse throughout its range (Aldridge et al. 2008); however, negative effects to habitat use and productivity, such as abandonment of leks during the breeding season, may occur locally from proximity of roads (Aldridge and Boyce 2007, Lyon and Anderson 2003). All alternatives include standard WLD-HAB-6 S-1, which prohibits activities that would disturb nesting activity within 1,200 feet of these sites. Alternatives E and F, however, improve upon this protection measure by restricting open motor vehicle routes within two miles of a lek during the breeding season (WLD-HAB-14). In general, sage-grouse habitats are within MA 4A, which has an open motor vehicle route desired condition of 2.4 miles per square mile or less. It is assumed that motor vehicle travel will be limited to open designated routes with cross-country travel generally not allowed.

Wildfire, both managed and unmanaged, is considered one of the key threats to sage-grouse habitats (Crawford et al. 2004). As with grazing, fire can be positive, negative or neutral in its effects on sage-grouse. The length of the fire cycle has changed, being more frequent in low elevations and less frequent at higher elevations, resulting in invasion of exotic grasses at lower elevations and woodland expansion at higher elevations (Miller et al. 2011). As previously noted, all alternatives would desire plant communities as well as disturbance regimes (i.e., fire) to be within HRV, which should preclude the use of fire as a management tool in the sagebrush community where the risk of exotic grass invasion is high. Alternatives E and F provide added management emphasis with standards and guidelines (FIRE-4, FIRE-5, and WLD-HAB-22) to call attention to this risk. Additionally there are standards that address the spread of noxious weeds (NOX-3) and that guide restoration (NOX-2).

Energy development on the landscape has been identified as a significant threat within the range of this species (Doherty et al. 2011). This has mostly been associated with oil and gas exploration, but more recently wind farms have become a concern. Although there is little indication that viable energy sources for development exist within the planning area, alternatives E and F do have plan components (WLD-HAB-15, WLD-HAB-16, and WLD-HAB-17) that would consider habitat adjacent to the national forest as well as within the national forest.

Although the Malheur National Forest constitutes relatively little of the overall sage-grouse habitat in Oregon (0.3 percent) and individual sage-grouse may be impacted, overall management direction of any of the alternatives would contribute to habitat conditions for viability and persistence of this species.

Wallowa-Whitman National Forest – Sagebrush steppe habitat was estimated to occur on less than 1 percent of the landscape for the Wallowa-Whitman National Forest, but according to ODFW (see figure 38) a little more than 3,000 acres within the Wallowa-Whitman National Forest would be considered sage-grouse habitat, most of which is mapped as core habitat. Habitat within the Wallowa-Whitman occurs in the Snake River Plains Management Zone and represents 0.07 of a percent of the habitat found in this management zone. And although this management zone supports the largest population of sage-grouse outside of the Wyoming Basin, habitat within the Wallowa-Whitman is only associated with the Baker population, which is thought to have little connectivity with other populations due to habitat and topography. Most (68 percent) of the sage-grouse habitat for the Baker population is in private ownership and 31 percent is administered by BLM (Hagen 2011). Overall, this population is considered at risk (C2). Most of the area used by this population has been mapped as priority habitat of which less than one percent occurs within the Wallowa-Whitman.

The Baker population is more at risk and probably less resilient as connectivity to other populations appears limited. However, recent telemetry information suggests that at least some birds may move between the Weiser population in Idaho and the Baker population (COT 2013). There is no redundancy in this population as everything occurs in one general area. Also, the quality of habitat is more similar to habitat of extirpated populations than extant ones (Wisdom et al. 2011).

As discussed for the Malheur National Forest, all alternatives include a desired condition to restore habitats including the sagebrush steppe. Sagebrush steppe is identified as a special habitat for all alternatives, with a desire of no net loss. Management activities likely to occur in sage-grouse source habitats are primarily grazing, invasive plant species control, and fire suppression, all of which were discussed in detail as threats/risks to habitat for the Malheur National Forest. All of the standards and guidelines discussed for the Malheur National Forest would also apply to the Wallowa-Whitman National Forest. Although less than 0.05 percent of sage-grouse habitat in Oregon occurs within the Wallowa-Whitman National Forest, overall management direction of any of the alternatives would contribute to habitat conditions for viability and persistence of this species even though individual sage-grouse may be impacted.

Forest Service Sensitive Terrestrial Wildlife Species

Sensitive species are defined as those plant and animal species identified by the regional forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and habitat capability that would reduce a species' existing distribution (FSM 2670.5). Management of sensitive species "must not result in a loss of species viability or create significant trends toward Federal listing" (FSM 2670.32). The

regional forester is responsible for identifying sensitive species and shall coordinate with Federal and state agencies and other sources, as appropriate, in order to focus conservation management strategies and to avert the need for Federal or state listing as a result of national forest management activities.

Terrestrial wildlife species that are included on the Regional Forester's Sensitive Species List as occurring within the planning area are displayed in table 321. Selected sensitive species associated with specific habitats are discussed below, but detailed analysis of individual species is documented in the biological evaluation available from the project record.

Table 321. Special status species for the Blue Mountains (from the 2011 Regional Forester's Sensitive Species List), their associated focal species with their level of concern for viability, and effects determination for special status species

Common Name	Status[1]	Focal Species	Level of Concern Outcome[2]		Effects determination[4] special status species		
			Current	Change[3]	MAL	UMA	WAW
Tri-colored blackbird	OR-SEN	Marsh wren	L	=	NI	NA	NA
Grasshopper sparrow	OR-SEN	Northern harrier	L	=	MIIH	NA	NA
Upland sandpiper	SEN	Upland sandpiper	FS	FS	MIIH	MIIH	MIIH
Bufflehead	OR-SEN	Bald eagle	L to M	=	NI	NI	NI
Greater sage-grouse	FC/SEN	Sage thrasher	M	=	MIIH	NA	MIIH
Black swift	OR-SEN	None	FS	FS	NA	NA	NI
Bobolink	SEN	Wilson's snipe	L	=	MIIH	NA	NA
Gray flycatcher	WA-SEN	Ash-throated flycatcher	H	=	NA	NI	NA
American peregrine falcon	SEN	American peregrine falcon	L/M	=	MIIH	MIIH	MIIH
Bald eagle	SEN	Bald eagle	L or M	=	MIIH	MIIH	MIIH
Harlequin duck	SEN	Bald eagle	L to M	=	NA	NA	MIIH
Black rosy finch	OR-SEN	Gray-crowned rosy finch	FS	FS	NA	NA	MIIH
Wallowa rosy finch (subspecies of gray-crowned rosy finch)	OR-SEN	Gray-crowned rosy finch	FS	FS	MIIH	NA	MIIH
Lewis's woodpecker	SEN	Lewis's woodpecker	M/H to M	= MAL - WAW - UMA	MIIH	MIIH	MIIH
White-headed woodpecker	SEN	White-headed woodpecker	H	=	MIIH	MIIH	MIIH
Ash-throated woodpecker	WA-SEN	Ash-throated flycatcher	H	+	NA	NI	NA
Mountain quail	WA-SEN	Macgillivray's warbler	M	=	NA	MIIH	NA
Green-tailed towhee	WA-SEN	Ash-throated flycatcher	H	+	NA	MIIH	NA
Great gray owl	WA-SEN	Northern	L	=	NA	MIIH	NA

Common Name	Status[1]	Focal Species	Level of Concern Outcome[2]		Effects determination[4] special status species		
			Current	Change[3]	MAL	UMA	WAW
		goshawk					
Columbian sharp-tailed grouse	OR-SEN	Northern harrier	L	=	NA	NA	NI
Inland tailed frog	SEN	Inland tailed frog	L to M	=	NA	MIIH	MIIH
Columbia spotted frog	OR-SEN	Columbia spotted frog	L to M	=	MIIH	MIIH	MIIH
Painted turtle	OR-SEN	Columbia spotted frog	L to M	=	NA	MIIH	NA
Striped whipsnake	WA-SEN	Lark sparrow	L	=	NA	NI	NA
Canada lynx	FT	Boreal owl	H to M	+ MAL = WAW = UMA	NE	NE	NE
Gray wolf	FE/SEN	Gray wolf	FS	FS	NLAA MIIH	NLAA MIIH	MIIH
Pallid bat	SEN	Lark sparrow	L	=	MIIH	NA	NA
Pygmy rabbit	OR-SEN	Sage thrasher	M	=	MIIH	NA	NA
Townsend's big-eared bat	SEN	Townsend's big-eared bat	FS	FS	MIIH	MIIH	MIIH
Spotted bat	OR-SEN	Lark sparrow	L	=	NA	NA	MIIH
Fringed myotis	OR-SEN	Western bluebird	H to M/H	=	MIIH	NA	MIIH
North American wolverine	FC/SEN	North American wolverine	H to M/H	=	MIIH	MIIH	MIIH
Preble's shrew	WA-SEN	Northern harrier	L	=	NA	MIIH	NA
Mountain goat	WA-SEN	Northern harrier	L	=	NA	MIIH	NA
Western Bumblebee	OR-SEN	None	FS	FS	NA	NA	MIIH
Intermountain Sulphur	OR-SEN	None	FS	FS	NA	MIIH	MIIH
Lustrous Copper	WA-SEN	None	FS	FS	NA	MIIH	NA
Humped coin	WA-SEN	None	FS	FS	NA	MIIH	NA
Yuma Skipper	OR-SEN	None	FS	FS	NA	MIIH	MIIH
Salmon coil	WA-SEN	None	FS	FS	NA	MIIH	NA
Shiny tightcoil	WA-SEN	None	FS	FS	NA	MIIH	NA
Fir pinwheel	SEN	None	FS	FS	NA	MIIH	MIIH
Meadow fritillary	WA-SEN	None	FS	FS	NA	MIIH	NA
Silver-bordered fritillary	OR-SEN	None	FS	FS	MIIH	NA	MIIH
Barry's hairstreak	WA-SEN	Ash-throated	H	+	NA	MIIH	NA

Common Name	Status[1]	Focal Species	Level of Concern Outcome[2]		Effects determination[4] special status species		
			Current	Change[3]	MAL	UMA	WAW
		flycatcher					
Johnson's hairstreak	SEN	None	FS	FS	MIIH	MIIH	MIIH
Great Basin fritillary	WA-SEN	None	FS	FS	NA	MIIH	NA

1 SEN: sensitive in both Oregon and Washington
OR-SEN: sensitive only in Oregon
WA-SEN: sensitive only in Washington
FE: federally listed as endangered
FT: federally listed as threatened
FC: federal candidate species

2 Level of concern outcomes are described earlier in this section. In general terms, they range from low level of concern (suitable environments are either broadly distributed or of high abundance compared to their historical distribution) to high level of concern (suitable environments are highly isolated and exist at very low abundance). FS indicates species whose habitats are too limited or specialized to assess at the broad scale of the forest using a focal species assessment model.

3 Stable
- downward trend
+ upward trend

4 For ESA and sensitive species, effects determinations are made only for the Federal action (the preferred alternative). The effects determinations are documented in the biological assessment/biological evaluation (BA/BE), included in the planning record.
MIIH: may impact individuals or habitat, but is not likely to contribute to a trend toward federal listing or cause a loss of viability to the population or species.
NLAA: may affect, not likely to adversely affect.
NE: no effect.
NA: not applicable.

Effects from Each Alternative on Sensitive Species

As indicated in tables table 298 and table 321, many of the Regional Forester's Sensitive Species were either analyzed in detail as a focal species or were in a focal species group that was analyzed in detail. For example, the bald eagle was analyzed in detail by Wales et al. (2011) and found to have a low level of concern for viability on the Malheur and the Umatilla National Forests and a moderate level of concern for viability on the Wallowa-Whitman National Forest (table 301). There was no increase in the level of concern between the existing condition and any of the alternatives indicating that although individual bald eagles may be impacted by implementing the alternatives, none would cause a trend toward Federal listing. Another example would be the tri-colored blackbird which was represented by the marsh wren, or the pygmy rabbit represented by the sage thrasher. Both of the focal species had either a low or moderate concern for viability which was not increased in any of the alternatives, indicating that although individuals of a species may be impacted, none of the alternatives would cause a trend toward Federal listing. It is assumed that species in family/groups (table 298) where there is no increase in the level of concern for viability of the representative focal species (table 299 through table 301) would not trend towards federal listing or loss of population viability. Detailed discussions for these species or their representative focal species can be found in Wales et al. (2011). Those species identified as "fine scale" species (FS in table 321) usually have very limited occupied habitat or are locally endemic and are most appropriately addressed at the project level, where the finer scale of analysis allows appropriate identification of their habitats. For example, the shiny tightcoil is only sensitive in Washington, which represents 22 percent of the analysis area, over half of which is in areas not identified for active management. And although associated with ponderosa pine and Douglas-fir vegetation types, it is the talus slopes within these forest types to which they are most closely associated, resulting in a portion of the landscape that cannot be mapped at the forest scale. Such habitats are identified as Special Habitats (1.13) and management would be towards the desired condition, which is that they remain on the landscape and provide high quality habitat for associated species.

Limited Habitats

The gray-crowned rosy-finch is an example of a sensitive species with extremely limited and disjunct habitat on the national forests (Wisdom et al. 2000). The subspecies that occurs in the Blue Mountains is the Wallowa rosy finch (Macdougall-Shackleton et al. 2000). Wallowa rosy finch forage for insects along the edge of snow-fields (Johnson 1965). Breeding and nesting habitat occurs in alpine habitat associations within the plan revision area (Johnson 1975, Miller 1939, Wisdom et al. 2000). Only two isolated patches of breeding and nesting habitat occur within the planning area. One patch is centered in the Eagle Cap Wilderness Area (Wallowa-Whitman National Forest) and the other in the Strawberry Wilderness Area (Malheur National Forest). Although identified as a focal species, an assessment model was not developed for the species due to this limited habitat on National Forest System lands.

Wisdom et al. (2000) placed both the gray-crowned and black rosy-finches (*Leucosticte atrata*) in the same family group (summer residents of high elevation alpine communities) and so it is assumed that the analysis for gray-crowned will be representative of both species.

Grazing and recreation would be the major management actions that may impact habitat for the gray-crowned rosy-finch. The upland rangeland condition has improved from the early 1950s but has stabilized in the last decade (see Livestock Grazing and Grazing Land Vegetation section). For the gray-crowned rosy-finch the amount of source habitat has not changed from the historical situation. However, as Hann et al. (1997) pointed out, while the overall trend may not be changing, site specific instances of loss of habitat quality from past excessive domestic sheep grazing may have already occurred. Current risks would be overgrazing by domestic sheep and human recreational activities in alpine tundra (Lehmkuhl et al. 1997). The amount of source habitat subjected to domestic sheep grazing varies (table 322) from zero within the Wallowa-Whitman National Forest to 15 percent within the Malheur National Forest. This estimate of source habitat is all cold upland/herbland (UH) potential vegetation group found within the range of the species as given by Marcot et al. (2003) and not just the known occupied habitat, although both the gray-crowned and black rosy finches are documented within the Wallowa-Whitman National Forest, with the gray-crowned being suspected within the Malheur National Forest (table 322).

Table 322. Estimated acres of gray-crowned rosy-finch source habitat by national forest and the percent in active grazing allotments subject to domestic sheep grazing and within designated wilderness areas

National Forest	Acres of Source Habitat	Percent Active Allotments	Percent Domestic Sheep Grazing	Percent Designated Wilderness Areas
MAL	1,500	38%	15%	66%
UMA	3,900	13%	8%	45%
WAW	39,000	38%	0%	53%

Only alternative C reduces the amount of source habitat that is subject to domestic sheep grazing: zero within the Malheur National Forest and just slightly more than one percent within both the Umatilla and Wallowa-Whitman National Forests. Although alternatives A, B, E, and F have the same amount of source habitat within active allotments, alternatives E and F should have the least impact due to a lower utilization level, followed by alternative A (table 79 in volume 1) and then alternative B (see livestock grazing discussion for focal species).

Although there are slight differences in the amount of overall backcountry between alternatives, the increase in the amount of source habitat for the gray-crowned rosy finch included in backcountry areas would be negligible. There is little anticipated change in recreation between alternatives and current wilderness area use levels are low. Because of the location of habitats for the gray-crowned rosy-finch (alpine), the change in access (open motor vehicle routes) between alternatives would probably not alter the amount of recreation occurring in their habitat.

The black rosy-finch is considered imperiled in Oregon but apparently secure within its range in the United States (NatureServe 2011). Recent literature has not recognized the nominal subspecies of the gray-crowned rosy-finch (*ibid*) so the species is considered vulnerable (breeding) in Oregon. The nonbreeding status is possibly imperiled, but is considered secure within its range in the United States. Because the majority of the habitat for this species is not grazed by domestic sheep and recreation use levels within higher elevations are considered low, it is assumed that although individuals or habitat may be impacted, implementing any of the alternatives will not cause a trend toward Federal listing nor cause a loss of viability to the population or species.

Limited Distribution

The upland sandpiper is an example of a sensitive species that has extremely limited distribution on the national forests of Oregon and is considered rare and disjunct from the eastern and mid-western U.S. populations. This long-distance migrant winters in South America and rarely farther north, arriving at its nesting grounds in March-May. The upland sandpiper is distributed sparingly west of the Rocky Mountains in high-altitude meadows of Washington, Oregon and Idaho (Houston and Bowen 2001). The main range for the upland sandpiper is the north central portion of the United States east of the Rocky Mountains (Houston and Bowen 2001) with sparse and often isolated populations breeding west of the main range in North America (Dechant et al. 1999 (revised 2002)), including scattered locations in southwest Union, southern Umatilla, southern Grant, and western Lake Counties in central and eastern Oregon (Gilligan et al. 1994). Logan Valley and Bear Valley are the main strongholds for this species in Oregon, and Bear Valley, for the most part is private land (ODFW 2006). Because Oregon is a minor portion of the sandpiper's range, the majority of research available on this species has been conducted east of the Rocky Mountains. Though it is identified as a focal species, an assessment model was not developed due to this limited distribution.

Upland sandpipers seem to prefer large (100 hectares or more) grassland-associated landscapes that offer a mix of vegetation heights, including short grass areas for courtship displays as well as taller grasses for nesting cover on breeding grounds (Vickery et al. 2010). They use a variety of habitats, from natural grasslands to cultivated or grazed fields during migration and on nonbreeding grounds (*ibid*). Upland sandpipers nest in open flats consisting of native grasses and forbs (Akenson 1991). Two key components of upland sandpiper habitat are nesting cover and availability of insects for young sandpipers (Akenson and Schommer 1992).

Grazing and recreation are the major management actions that could impact habitat for this species. The upland rangeland condition in general has improved from the early 1950s but has stabilized in the last decade (see Livestock Grazing and Grazing Land Vegetation section). Since most studies report only the presence of upland sandpipers and not how they use grazed areas, it is difficult to give a general statement on the effects of grazing to upland sandpipers (Vickery et al. 2010). Basically, sandpipers have been found using grazed areas for nesting, foraging, and brood rearing (Bowen and Kruse 1993, Dechant et al. 1999 (revised 2002), Houston and Bowen 2001). Within mixed-grass and tall grass prairie in South Dakota, nest densities did not differ

between idle sites and sites that were grazed in May where 20 to 80 percent of the current year's growth was removed (Kaiser 1979). Fourteen nests were found within a 256-ha fragment of moderately grazed prairie in South Dakota (Lokemoen and Duebbert 1974). Kirsch and Higgins (1976) reported that mean nest productivity was lowest on tilled areas (where no nests were observed), higher on grazed and idle areas, and highest on burned areas. Nest loss occasionally occurs as a result of trampling by cattle (Ailes 1980, Bowen and Kruse 1993). Current grazing assessed at the forestwide scale appears to allow sufficient residual cover to satisfy the needs for nesting and foraging habitat for this species. Although small areas exist that do not allow sufficient residual cover, these would be addressed at the project level.

None of the alternatives propose activities that would attract or reduce the amount of recreation other than restricting motor vehicle access. Assuming that a reduction in motor vehicle access would reduce the amount of recreation, then disturbance to upland sandpiper by alternative would be similar to figure 35, where alternatives E and F would provide the least disturbance and alternative D would have the greatest likelihood of disturbing sandpipers. Because domestic livestock grazing is proposed to be moderate for most alternatives (table 312 and table 313) and should be managed to achieve the desired conditions stated in appendix A, it is unlikely, other than the potential for the trampling of a nest, that grazing would be detrimental to the breeding population of this species.

Species occupying the periphery of their range are often found in less favorable habitats and exhibit lower and more variable densities (Brown 1984, Brown et al. 1995, Gaston 1990). This probably accounts for upland sandpiper's ranking as critically imperiled for Oregon, because nationwide the upland sandpiper is considered to be secure. Since moderate grazing does not appear to be detrimental and recreation uses remain level or decrease, it is assumed that although individuals or habitat may be impacted, implementing any of the alternatives will not cause a trend toward Federal listing nor cause a loss of viability to the population or species.

In addition, several other species have limited distribution in the planning area as they are considered sensitive only in Washington, which represents a very small portion of the planning area. One example is the Barry's hairstreak, a butterfly associated with juniper (Fleckenstein 2006). Juniper accounts for less than one percent of the vegetation within the Umatilla National Forest (see table 231 in the "Forested Vegetation, Timber Resources, and Wildland Fire" section). This would indicate an extremely limited distribution of habitat where this species would be considered sensitive within the Umatilla National Forest and even more limited when compared to the amount of juniper in Washington. The intent of the plan is to restore or maintain terrestrial vegetation, which would include juniper, and large-scale treatment within this vegetation type is not anticipated. Therefore, there is no indication that implementing any of the alternatives would cause a trend toward Federal listing nor cause a loss of viability to the population or species.

Riparian Habitats

Several species are associated with riparian habitats, such as the Lewis's woodpecker, bald eagle, inland tailed frog, Columbia spotted frog, fir pinwheel, and the fritillary butterflies. When considering existing conditions, the bald eagle had a low level of concern for viability for the Blue Mountains. Human activities within or adjacent to riparian habitat was the major concern for the bald eagle. None of the alternatives would cause this to worsen, so it is assumed that the level of concern would remain low.

Both the inland tailed and the Columbia spotted frog had a low viability score for existing conditions. Riparian areas, lakes, and wetlands are protected for all management direction and

Executive Order 11190 (Carter 1977) limits the loss or conversion of this type of habitat. The desired condition for all alternatives is to maintain or increase the extent and diversity of wetlands within the Blue Mountains (1.1.3 Wetland function). Outside the national forests, much of these frogs' habitat is in private ownership. Many historical wetlands occurred on private lands that were converted to agricultural uses. Both species had risk factors of grazing, roads, invasive species, and disease. Invasive species and disease are, for the most part, outside the control of plan components. None of the alternatives envision new road construction unless a commensurate level of decommissioning occurs (KW-1 S-15). All action alternatives envision a reduction of roads open to the public compared to existing conditions, except alternative D which maintains the existing condition. All alternatives establish Riparian Management Areas that have several other standard and guidelines that should alleviate some of the risks posed to each of these species. Monitoring conducted as part of PACFISH/INFISH (Archer et al. 2009) has indicated, at least on a broad scale, that there has been recovery in several parameters most closely associated with livestock grazing effects. Analysis of PACFISH-INFISH Biological Opinion PIBO data for the three national forests also indicates a favorable trend in many of the parameters important to both of these frogs.

In general, alternative C should see the greatest improvement and the most rapid recovery of riparian and wetland areas due to the reduced area subjected to domestic livestock grazing and the stricter utilization levels within those areas that are grazed. Additionally, alternative C establishes the most acres within riparian management areas (RMAs) and with the widest buffer zone. Alternative D would be the least favorable towards riparian species in that more acres are proposed for domestic livestock grazing and the riparian management area is the narrowest of all of the alternatives. Alternatives A and B would be similar in impacts as the amount of area dedicated to domestic livestock grazing is the similar and the RMA widths are the same. Because alternative F has lower utilization levels in anadromous fish and bull trout watersheds (see Table 323) it would have slightly more effect than alternative C, but would greatly reduce impacts when compared to the remaining alternatives. There are several standards and guidelines for RMAs that apply to most alternatives, which also will provide for recovery.

Table 323. Maximum utilization and residual stubble height within riparian sites. The minimum residual stubble height (applies at the greenline) for all alternatives is 4 to 6 inches. The maximum bank alteration for all alternatives is 20 percent.

Measure	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Maximum percent utilization of woody vegetation	40%	25%	40%	25% within bull trout spawning and rearing reaches and 40% for all watercourses including anadromous fish reaches	25% in bull trout spawning and rearing habitat, 35% in anadromous fish reaches within the Umatilla and Wallowa-Whitman National Forests, and 40% in all other water courses
Maximum percent utilization of herbaceous vegetation	40%	10%	40%	25% within bull trout spawning and rearing reaches and 40% for all watercourses including anadromous fish reaches	25% in bull trout spawning and rearing habitat, 35% in anadromous fish reaches within the Umatilla and Wallowa-Whitman National Forests, and 40% in all other water courses

Based on the desired conditions for each alternative and the standards and guidelines for riparian/aquatic habitats, implementing any of the alternatives may impact individuals of those species associated with riparian habitats, but would not cause a trend toward Federal listing nor cause a loss of viability to populations or species.

Special Habitats

Several sensitive species are associated with specialized habitats for which disturbance can be an issue. One broad category of special habitats is nest, roost and denning sites. All alternatives include the standard WLD-HAB-6 S-1, which prohibits disturbance within 1,200 feet of such areas (bald eagle, Lewis' woodpecker). Bat maternity and roost sites (Townsend's big-eared bat, fringed myotis) are not to be disturbed (WLD-HAB-18 G-7). Trees with nest cavities and large snags are also provided protection (WLD-HAB-10 G-11, WLD-HAB-12 S-7, and WLD-HAB-21 G-6).

The forest plan revision identifies a number of desired conditions, objectives, and standard and guidelines for the management of the numerous plant association/seral stages occurring within the planning area specifically developed for the restoration and maintenance of terrestrial vegetation communities. Restoring and maintaining terrestrial vegetation conditions has been identified as one of the top management priorities within the Blue Mountains. Several terrestrial invertebrate species occur primarily in talus slopes associated with dry ponderosa pine or Douglas-fir and the plan provides information for the conservation of special habitats, such as talus slopes (see appendix A, 1.13 Special Habitats).

Cumulative Effects

Focal Species

Boreal owl habitat was estimated by Wisdom et al. (2000) to have decreased by 61 percent within the Columbia River Basin, but only by 3 percent in the Blue Mountains Ecological Reporting Unit (ERU) compared to historical conditions, resulting in a stable trend for the species in the Blue Mountains. Much of their preferred habitat in the Blue Mountains is within National Forest System lands, and therefore few cumulative effects are anticipated from lands under private, state, or other Federal administration. At the broad scale, Nature Serve ranks the boreal owl as apparently secure (N4) in the United States. The effects of climate change, although uncertain, indicate that a reduction in habitat for this species will probably occur during the next 50 to 100 years within the Blue Mountains.

Cassin's finch is distributed from British Columbia southward and into Mexico during winter. Throughout the conifer belts of North America's western interior mountains, Cassin's finch can be one of the most common and conspicuous breeding birds (Hahn 1996).This finch is considered a year round resident in Oregon and regionally they are commonly found breeding throughout the mountainous west. Wisdom et al. (2000) did not address this species but rather the Hammonds flycatcher which was placed in the same group as this finch (USDA Forest Service 2010). Wisdom et al. (2000) estimated a 42 percent decrease in source habitat within the Columbia River Basin, and a 34 percent decrease in the Blue Mountains ERU compared to historical conditions for the Hammond's flycatcher. At the broad scale, Nature Serve ranks the Cassin's finch as secure (N5) in the United States and apparently secure (S4) in Oregon. Although the Cassin's finch is associated with open forested stands, which may be more abundant on private lands, they are associated with larger trees, which may not be more abundant on private lands (see Old Forest section). No information exists to indicate that management of lands under private, state, or other Federal administration would change; therefore, if the downward trend in habitat within the Blue

Mountains as given by Wisdom et al. (2000)is a result of management off-forest, then this continued cumulative effect would be expected.

Western bluebirds breed throughout much of the western United States, Mexico, and southwestern Canada. Apparent declines in numbers of this species in the Pacific Northwest and British Columbia, especially in regions west of the Cascade Range, have generated concern. This was one of the species modeled by Raphael et al. (2001) for the SDEIS for the Interior Columbia Basin, which resulted in an outcome of C currently for National Forest System and BLM administered lands but changed to a B outcome for 2 of the alternatives in 100 years and remained the same for one alternative. At the broad scale Nature Serve ranks the western bluebird as secure (N5) in the United States and apparently secure (S4) in Oregon. Western bluebirds respond positively to artificially constructed nest boxes (Brawn and Balda 1988) and bluebird enthusiasts in Washington, Oregon, and British Columbia have established trails of nest boxes in an effort to reestablish local breeding populations. Cassidy and Grue (2000) estimated that in Washington, more than 57 percent of population occurs on private as opposed to public lands. Continued expansion of residential/industrial areas and changes in agricultural practices could continue to impact suitable areas for breeding and foraging. Some western bluebirds migrate to California and Baja California in winter (DeGraaf et al. 1991) and conditions on these wintering grounds if similar to the above, could affect the status of populations.

Fox sparrows are one of North America's most geographically variable birds with 18 subspecies divided into 3 or 4 distinct groups with equally variable life-history characteristics across its range (Weckstein et al. 2002). Because of its preference for shrubby habitats, fox sparrow probably responds well to the more intensive timber management that occurs on private land, so in this sense the cumulative impacts would be positive. There is no indication that management of lands under private, state, or other Federal administration would change appreciably from current; therefore, few cumulative effects are expected. At the broad scale, Nature Serve ranks the fox sparrow as secure (N5) in the United States and apparently secure (S4) in Oregon. The fox sparrow is migratory, and as such is more likely to be affected by changes in climate, which may result in a phenology mismatch as described by Jones and Cresswell (2009).

Lewis's woodpecker is found throughout ponderosa pine forests in the western United States. The species is migratory within the northern portion of its breeding range with most individuals leaving summer areas during winter. Migratory movements to areas outside of breeding range probably occur annually but vary considerably in magnitude from year to year (Tobalske 1997). Species may winter outside of the breeding range in large numbers one year, but may be almost completely absent from the same areas the next. No data on distances and routes for marked individuals exists. Relatively short-distance migrations (0 to 20 km) occur within the breeding range (Bock 1970, Tashiro-Vierling 1994) and longer-distance migrations (100 to 1,000 km or more) probably occur for individuals breeding in the northern portion of the range. Exact distances are largely unknown due to their irregular movements as breeding and wintering habitat varies and the species is opportunistic in its foraging habits (Bock 1970). Wisdom et al. (2000) in evaluating the migratory population within the Columbia Basin found that source habitat for this species had the largest negative relative change of any of the species they analyzed. Wisdom et al. (2000) evaluated what is termed secondary source habitat in this analysis, and attributed the decline primarily to a basin-wide change from old-forest ponderosa pine to mid-seral structural stages. They also recognized the loss of cottonwood/willow old forest structure due to a change in the historical hydrological regime. The current direction on federally administered lands would be to manage towards more old-forest within ponderosa pine, but much of the low elevation dry forest is on private lands (ODFW 2006) and is most likely to remain in non-old forest conditions.

The vast majority of the cottonwood/willow habitat also occurs on private lands and will probably continue to be managed at an earlier seral structure than preferred by this species. Climate change may actually provide a short term benefit to this species because of the predicted increase in individual tree mortality due to stress (van Mantgem et al. 2009) as well as a warmer climate that has already lead to more frequent and severe fires in the western United States (Westerling et al. 2006), increasing the primary habitat for this species. Association with agricultural settings likely exposes Lewis's woodpecker to herbicides and insecticides (Abele et al. 2004, Tashiro-Vierling 1994), which could have potential negative effects.

Because habitats on a whole are projected to increase in the Blue Mountains for all alternatives, public lands should contribute to viability within the region. The effects of climate change, although uncertain, indicate that a change in habitat for terrestrial species will occur during the next 50 to 100 years within the Blue Mountains. If the anticipated increase in fire severity and frequency due to drier conditions occurs, this could lead to an improvement, at least in the short term, in habitat for the western bluebird and fox sparrow, while reducing habitat for the boreal owl.

Bighorn sheep are native to western North America, from British Columbia to Mexico. Within this range, several sub-species occur. Populations have been greatly reduced throughout its range from a once very common abundance. It has been estimated that half the bighorn sheep habitat within the Columbia River Basin, is currently unoccupied (Wisdom et al. 2000). Disease transmission between domestic sheep and wild sheep is considered the greatest threat to wild sheep populations. There are private lands where domestic sheep currently graze immediately adjacent to public lands. Additionally, domestic sheep are a common 4-H project, which may also place them within foray distances of existing and/or future wild sheep range increasing the risk of disease spreading to wild sheep populations.

Threatened, Endangered, Proposed, and Candidate Species

The gray wolf has circumpolar distribution in the northern latitudes. It occurs in Europe, Asia and North America. In North America, it is considered common in Alaska and most of Canada. Within the recovery areas of the U.S., populations have been increasing, with the largest populations in Minnesota, Michigan, and Wisconsin. Eastern Oregon has recently been colonized by wolves thought to have originated in Idaho. Gray wolf populations are increasing in eastern Oregon and this trend is likely to continue during the short term due to high prey populations, decreasing open motor vehicle route density across the Blue Mountains and management direction to protect denning wolves. As populations increase wolves will continue to disperse into new areas, eventually increasing contact with human populations and activities. Habitat does not appear to be limiting, and therefore the greatest threat is mortality due to interaction with humans. The legal and illegal killing of individuals, both on and off of public lands is of concern. Hunting in Idaho could potentially pressure more individuals to relocate to Oregon. Increased livestock depredation and interaction with humans could lead to lethal removal of individuals by the state game department as well as the illegal shooting of individuals, which has already occurred. Over the long term, human social pressures will likely restrict the distribution of wolves to areas of limited human occupation and away from concentrated domestic livestock production. In the end, the cumulative effect of human tolerance and persecution will have to change to achieve long-term successful recovery.

The wolverine has circumboreal distribution. In North America, it extends across Canada and Alaska, and uses forested and nonforested environments. In the western U.S., wolverine are known to occur in Washington, Idaho, Montana and Wyoming. Wisdom et al. (2000) estimated a

14 percent increase in source habitat within the Columbia River Basin with more than 80 percent of the watersheds in the Blue Mountains ecological reporting unit (ERU) (6) showing an increase of more than 100 percent in source habitat compared to historical conditions. Raphael et al. (2001) evaluated wolverine habitat across the Columbia Basin and showed that likely habitat for wolverine occurred more in the northern Blue Mountains than the southern parts (e.g., Malheur National Forest).

Since most wolverine habitat is found on remote, high-elevation National Forest System lands, few cumulative effects are expected from lands under private, state, or other federally administered lands. Probably the greatest threat to wolverines is the ever-increasing disturbance from activities such as snowmobiling, heli-skiing, cross-country skiing, and snowshoeing. Recent advances in snowmobile technology capabilities has raised concerns about their ability to access previously isolated areas (Wisdom et al. 2000) where natal denning may be occurring. Although none of the alternatives attempts to expand this type of recreation in the future, it is anticipated that expansion of such activities will occur.

As with most species that inhabit high elevation habitats of the Blue Mountains, climate change is of concern, but more so with the wolverine. Spring snow cover, which has been shown to strongly correlate with wolverine denning locations and year-round movement, is also correlated to dispersal pathways across the landscape (Copeland et al. 2010, Schwartz et al. 2009). This bioclimatic niche (Copeland et al. 2010) is likely to continue to be strongly impacted by global climate change (Mote et al. 2005), threatening wolverine throughout their geographic distribution as spring snow cover may decrease.

The vast majority of greater sage-grouse habitat in Oregon does not occur on National Forest System lands, but on lands administered by BLM (71 percent) and private lands (21 percent). The BLM is reviewing their management with the intention of enhancing greater sage-grouse conservation. The Baker Population of greater sage-grouse (Wallowa-Whitman National Forest) occurs mostly on private lands where there are limited regulatory mechanisms making it uncertain as to whether state-recommended conservation measures and practices will be applied on the majority of lands supporting this population. It is assumed that ODFW, in cooperation with USFWS and NRCS, will continue to provide incentives to private landowners for the conservation of sage-grouse habitat. Hunting will continue to be a cumulative impact, but at the current level is not considered to be a threat to the breeding population (Hagen 2011).

Climate change will have an important influence on sage-grouse habitats, as the various scenarios predict increasing temperature, atmospheric carbon dioxide, and severe weather events all of which favor cheat grass expansion and increased wildfire activity (Miller et al. 2011). Increase temperature predictions suggest that sagebrush habitats could be replaced with other woody vegetation causing further decline in sage-grouse habitats (Bradley 2010, North American Bird Conservation Initiative (NABCI) 2010).

Forest Service Sensitive Species

Many sensitive species of birds, especially those that are migratory, have ranges that encompass landscapes outside of the national forest. As such they are exposed to threats beyond the control of the Forest Service. For example, the use of insecticides and other agrochemicals associated with cultivation practices has been identified as one of the main threats to the upland sandpipers on their wintering grounds in South America (Vickery et al. 2010). Many of the riparian associated species have been impacted by loss of habitat to agriculture, especially in the lower valley bottoms. ODFW in cooperation with other government agencies has developed programs

and strategies to improve riparian habitats on non-federally administered land (ODFW 2006). Some species, such as buffleheads and Harlequin duck are migratory and can be legally hunted throughout the flyway.

Wormworth and Mallon (2006) suggest that projected changes in vegetation shifts caused by climate change could affect bird species. They project that alpine vegetation communities within the arctic would likely be reduced. Although there is a high degree of uncertainty, this same projected change would likely occur within the Blue Mountains resulting in the loss and fragmentation of habitat.

Affected Environment – Management Indicator Species

Species are generally selected as management indicator species in order to estimate the effects of each alternative on fish and wildlife populations. The planning rule states that certain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to indicate the effects of management activities (CFR 219.19(a)(1)). Management indicator species can be chosen from five categories of species:

- Endangered and threatened plant and animal species identified on state and Federal lists
- Species commonly hunted, fished, or trapped
- Nongame species of special interest
- Species with special habitat needs that may be influenced significantly by planned management programs
- Additional plant or animal species selected because their population changes are believed to indicate the impacts of management activities on other species of selected major biological communities or on water quality

The terrestrial management indicator species selected during the last plan revision effort (1990) in the Blue Mountains were selected because their habitat requirements encompassed a broad range of conditions. For the 1990 forest plans, the Forest Service identified 24 different species or groups of species as management indicator species. It was anticipated that by selecting and managing for these species the needs of all of the other fish and wildlife species would be adequately met. In the 1990 forest plans, there was one general objective for management indicator species: to provide for the habitat requirements of the selected management indicator species and maintain viable populations of management indicator species. However, the 1982 NFMA regulations do not make a direct link between management indicator species and viability. Attempts to do so in individual plans have been problematic. Simply stated, population trends of management indicator species are not expected to mirror trends of other species.

Within the context of this planning process, management indicator species are used for the purpose of assessing the impacts of the alternatives on wildlife populations as directed in CFR 219.19(a) (1) and (2). The no-action alternative (no change in current management) will be evaluated in terms of the management indicator species listed in the 1990 forest plans.

Detailed rationale for selecting those management indicator species identified for alternatives other than the no-action alternative is found in the project record. What follows is a description of the management indicator species for the no-action alternative, the management indicator species that are common to all alternatives, and the management indicator species common only to action

alternatives. Table 324 is a listing of management indicator species selected for analysis by forest and by alternatives.

According to 36 CFR 219.19(a) (1) management indicator species are selected "in order to estimate the effects of each alternative on fish and wildlife populations." Section 219.19(a) (2) requires that "planning alternatives shall be stated and evaluated in terms of both amount and quality of habitat and of animal population trends of the management indicator species," and refers to forest plans. Indicators should be chosen for specific habitats identified as being at risk, where there is a high level of management actions anticipated, and where there is reasonable certainty that management indicator species population changes can be monitored and attributed to Forest Service activities (Hayward et al. 2004).

Table 324. Management indicator species selected for each national forest by alternative

National Forest	Management Indicator Species	Alt. A	Alts. B, C, D, E, and F (action alternatives)
Malheur	American marten	X	
	Northern three-toed woodpecker	X	
	Primary excavators	X	
	Pileated woodpecker	X	X
	Rocky Mountain elk	X	
	White-headed woodpecker		X
	Mule deer		X
Umatilla	American marten	X	
	Northern three-toed woodpecker	X	
	Primary excavators	X	
	Pileated woodpecker	X	X
	Rocky Mountain elk	X	X
	White-headed woodpecker		X
Wallowa-Whitman	American marten	X	
	Northern three-toed woodpecker	X	
	Primary excavators	X	
	Northern goshawk	X	
	Pileated woodpecker	X	X
	Rocky Mountain elk	X	X
	White-headed woodpecker		X

Estimating the population density, let alone population trend, for most any vertebrate species is at best problematic (Bart et al. 2004). Animals often are difficult to capture or observe, they are harmed in the process, or the associated costs and effort of making absolute counts or censuses are prohibitive (Gibbs 2000). Failure to detect a species' presence in an occupied habitat patch is a common sampling problem when the population size is small, individuals are difficult to sample, or sampling effort is limited (Gu and Swihart 2004). Because accurately estimating absolute population size is difficult, ecologists frequently rely on indices of population size that

they monitor over time as a surrogate for monitoring changes in actual population size (Gibbs et al. 1998).

Few long-term data sets exist for the analysis area. Monitoring of wildlife populations and habitats has been lacking or poorly implemented on national forests due largely to the lack of capacity or commitment to fund data collection, management, and analysis (Manley et al. 2006). Population estimates for some of the hunted species, such as elk and mule deer, are available through the state wildlife agencies. Breeding Bird Surveys (BBS) and Christmas Bird Counts (CBC) represent the only long-term data available to assess broad scale trends in most bird species. Breeding Bird Surveys provide some information regarding status of bird species and the Data is categorized into three credibility ratings. Altman (2000) indicated that a total of 31 routes were at least partially located within the Blue Mountains of Oregon and Washington. Although the BBS provides a huge amount of information about regional population change for many species, there are a variety of possible problems with estimates of population change from BBS data. Limitations of both methods for discerning population trends have been addressed (Sauer et al. 2008). For example, the year-to-year variation in abundance at any one locale may not indicate overall population decline but simply reflect a lack of detection on the part of the surveyor (Sauer et al. 1994) or abandonment on the part of the birds of one location for another.

The Christmas Bird Count data referred to in this document was generated using the number of birds reported per party hour; a measure of the amount of time spent searching for birds or the amount of effort expended. This is one way to standardize Christmas Bird Count data over time. Some years, there may have been many people counting birds, while other years there may have been fewer participants in the field. As CBC participation fluctuates (and as the number of CBC Count Circles increases), raw count numbers may also fluctuate (more counters can often lead to more birds reported). This is one method for correcting the differences in effort over time.

A combination of factors, including experience with implementing forest plans during the last decade, court rulings, scientific discourse concerning management indicator species (Andelman and Fagan 2000, Landres et al. 1988, Niemi et al. 1997, Roberge and Angelstam 2004, Wiens et al. 2008), and better understanding of the role of management indicator species have refined how management indicator species are viewed in planning. Management indicator species have always been defined as useful in assessing management effects, but the array of species actually selected often was driven by a desire to have a representative of each habitat that occurred on the national forest and not to assessing management effects (Hayward et al. 2004). Some of the confusion surrounding management indicator species results from the misperception that management indicator species is a special designation, resulting in more protection for the species. The reality is that management indicator species are simply yardsticks to measure the impact to habitats at risk in the alternative phase of planning and then to measure how well the land management plan is accomplishing what it said it would accomplish and to verify that the chosen management indicator species are responding in the manner predicted. With the focus on management issues, not every habitat will nor should be represented by a species on the management indicator species list.

CFR 219.35(a) and (b) has directed the Forest Service to utilize the best available scientific information during forest land management planning. As such the following analysis will try to incorporate new scientific information into the analysis of Management Indicator Species, especially the concept that they are meant to be measures of how well the forest plan is meeting its desired conditions by focusing management direction developed in the alternatives, providing

a means to analyze effects on biological diversity, and serving as a reliable feedback mechanism during forest plan implementation (Hayward et al. 2004).

Environmental Consequences – Management Indicator Species

Management Indicator Species Only for Alternative A

American Marten for All Three National Forests

The American marten (*Martes americana*) is broadly distributed, extending from the spruce-fir forests of northern New Mexico to the northern limit of trees in arctic Alaska and Canada (Buskirk and Ruggiero 1994). The American marten was considered a focal species in several of the subbasin plans completed within the Blue Mountains and is a focal species for the forest plan revision effort. The Interior Columbia Basin Ecosystem Management Project included the American marten in Family 2 (broad elevation old forest)/Group 5(late-seral, montane forests). Wisdom et al. (2000) reported a moderately or strongly declining trend of American marten habitat within the Columbia Basin. In the Blue Mountains ecological reporting unit (ERU), approximately 40 percent of the watersheds had strongly declining trends for American marten habitat. Review of the maps developed by Wisdom et al. (2000), indicate that the watersheds with the greatest increase of American marten habitat are located in the southern portion of the Blue Mountains ERU.

The American marten was identified as a management indicator species for all three national forests. Although detail differs between the 1990 forest plans, it was selected to represent mature/old forest structure. It was also identified as having a viability concern and Forest Service Region 6 habitat direction was developed. Minimum habitat patches were to include:

- Mature/old growth patches larger than 160 acres with canopy covers of 50 percent or greater
- 1.5 snags greater than 20 inches d.b.h. per 10 acres
- 1.8 snags greater than 12 inches d.b.h. per acre
- 6 down logs per acre

Management was to provide this structure in blocks 160 acres or larger for every 4,000 to 5,000 acres. None of the 1990 forest plans defined habitat any further than forested ecosystems. This leads to the assumption that the forested landscape was anticipated to have 3 to 5 percent of the landscape in marten habitat. This direction was prior to the 1994 Eastside Screens amendment that indicated mature/old forest structure should be managed towards HRV.

Both the Wallowa-Whitman and Umatilla National Forests predicted a decline in marten populations based on implementing the1990 forest plans. The Malheur National Forest did not predict a population trend but rather estimated providing habitat that would support 125 pairs based on the assumptions at that time.

American Marten Habitat - The American marten is closely associated with late-successional stands of mesic conifers, especially those with complex physical structure near the ground (Buskirk and Powell 1994). Bull et al. (2005) concluded that American marten showed a strong preference for old-structure, unlogged stands in subalpine fir and spruce forests with canopy covers greater than or equal to 50 percent, and a high density of dead trees and logs. Resting and denning sites for marten are important habitat components as they provide protection from predators, weather, and thermal stress. Bull and Heater (2000) found that in northeastern Oregon, 43 percent of the marten resting sites were in trees with natural platforms; about 23 percent were

in trees with cavities: about 23 percent were under the snow; and, 10 percent were in hollow logs, slash piles or underground. In the same study, they found that 40 percent of the marten dens were in tree cavities: 37 percent were in hollow logs; 17 percent were underground; and, 6 percent in slash piles.

As displayed in table 298, the American marten was chosen as a focal species and a model was developed to assess source habitats and threats to this species. For the purpose of the following analysis, source habitat for both current and historical conditions was considered to be cold moist and cold dry forests with multi-stories, large-tree structure (greater than 20 inches d.b.h.), and closed canopies (i.e., greater than 60 percent). Other factors that were considered in the evaluation of habitat for this species included open motor vehicle route density, openness of habitat, patch size and riparian habitat (Wales et al. 2011). Patch size has been described by several authors (Baldwin and Bender 2008, Chapin et al. 1998, Hargis et al. 1999, Kirk and Zielinski 2009, Potvin et al. 2000, Slauson et al. 2007, Snyder and Bissonette 1987) with a suggestion by Potvin et al. (2000) of managing for patch sizes greater than 250 acres. The 160 acres found in the original plan is within the range given by the various authors, but is less than the minimum of 200 acres given by Slauson et al. (2007).

Effects from Alternative A on American Marten – Using the data initially found in all three 1990 forest plans, it was predicted that marten habitat would occur on approximately 3 to 4 percent of the landscape. Figure 39 compares what percent of each national forest is marten habitat based on the potential vegetation groups analyzed in Wales et al. (2011), and then projects it forward. These results indicate that all three 1990 forest plans exceed what was originally projected to be in marten habitat, but only the Umatilla National Forest meets or exceeds the desired conditions of the Eastside Screens amendment. The Malheur National Forest would be on a trajectory to reach that desired condition in decade three, whereas the Wallowa-Whitman National Forest would be within the margin of error for the first decade, and maybe the second, but is on a downward trajectory for alternative A.

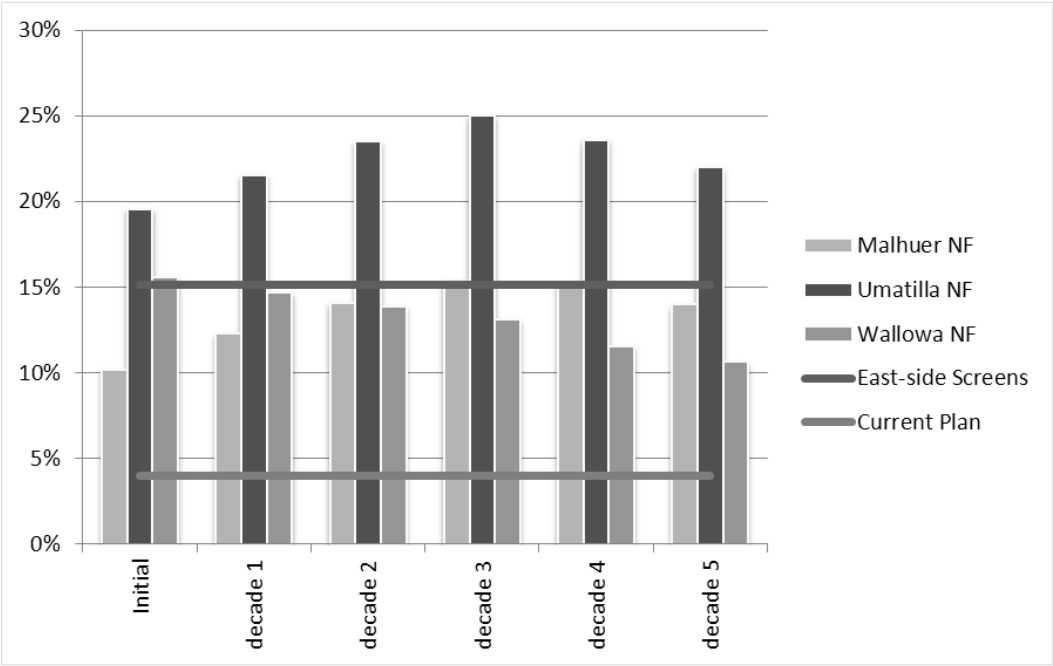

Figure 39. Percent source habitat for the American marten during the first five decades (compared to desired conditions of 1990 forest plans as amended by the Eastside Screens)

American Marten Population Trend – The Umatilla and Wallowa-Whitman National Forests originally predicted a downward trend for American marten populations based on the habitat reduction predicted in the original forest plan. Because of the Eastside Screens amendment, this predicted decline should not have occurred. Indeed, the Malheur National Forest 1990 forest plan predicted providing habitat for 125 martens by the end of the first decade. After two decades of implementation, using the same assumptions as the original forest plan analysis indicates sufficient habitat for 157 martens.

Using the habitat data displayed in figure 39 one could assume that populations of American marten would be stable within the Umatilla and Wallowa-Whitman National Forests, at least for the first two decades, with an increasing trend in the Malheur National Forest. Carnivores are extremely difficult to survey, especially on large geographic areas (Gompper et al. 2006) and population trends within the Blue Mountains are unknown. A method of gaining insight into abundance (and certainly distribution) of a species is examination of harvest and trapping records (Gese 2001). The best information available to help assess trends would be the trapping data (Hiller 2010) collected by the state game agencies. The data is reported per 100 trap nights in an attempt to correct for the difference in effort, but can still only be used to provide a very coarse look at trends (see figure 40). It appears from figure 40 that a slight downward trend may be occurring; however, trapping data is subject to many variables, such as experience of the trapper, pelt prices, differential harvest methods, and environmental and social factors all of which can influence harvest rates (Gese 2001, Gompper et al. 2006, Smith et al. 1984).

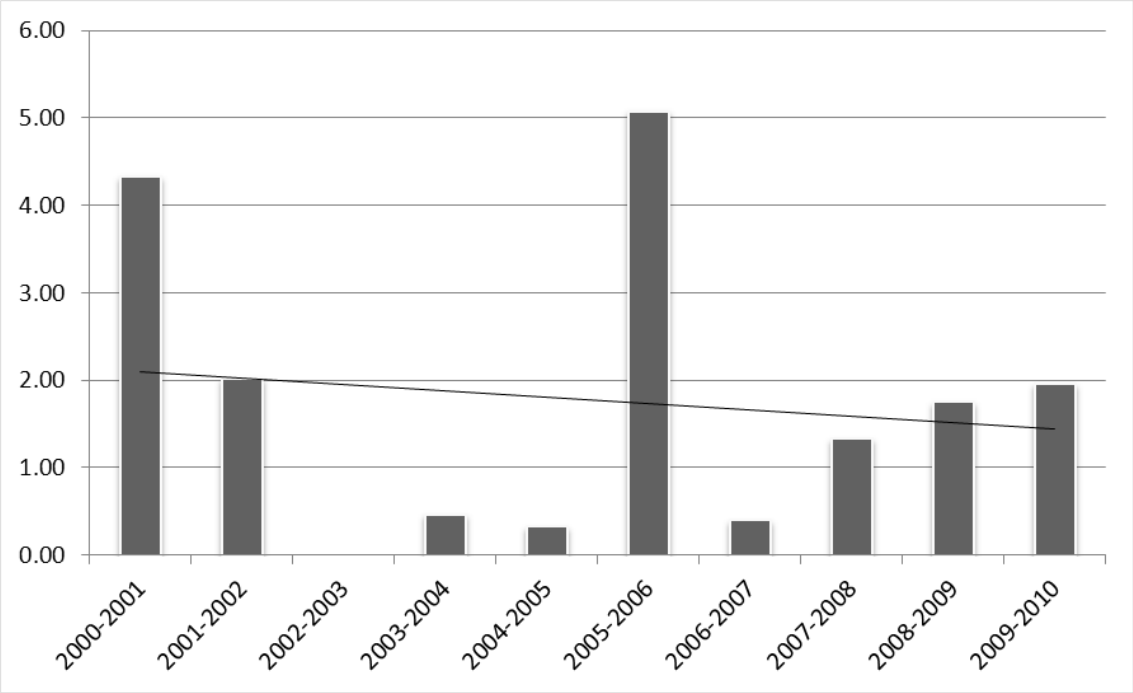

Figure 40. American marten harvested per 100 trap nights in eastern Oregon during the last decade

Primary Cavity Excavators for All Three National Forests

Primary cavity excavators include:

- Northern three-toed woodpecker
- Lewis' woodpecker

- Red-naped sapsucker
- Williamson's sapsucker
- Downy woodpecker
- Hairy woodpecker
- White-headed woodpecker
- Black-backed woodpecker

All three national forests identified primary cavity excavators as management indicator species. The Malheur National Forest provided a list in the forest plan and the Wallowa-Whitman National Forest listed the species it considered as primary cavity excavators in appendix G of the FEIS (USDA Forest Service 1990b). Both the Malheur and the Wallowa-Whitman National Forests included the yellow-bellied and red-breasted sapsuckers in their list. Yellow-bellied, red-naped, and red-breasted sapsuckers form a closely related complex and there has been confusion regarding whether or not they are separate species. Walters et al. (2002) provides this explanation:

> Red-breasted and red-naped sapsuckers, together with the yellow-bellied sapsucker (*Sphyrapicus varius*), form a superspecies. These three species have, for the most part, separate distributions but were long treated as forms of a single species—the yellow-bellied Sapsucker—until 1983, when systematic studies showed distinctions sufficient to warrant taxonomic treatment as separate species. Most of the early literature and research on this complex refer to yellow-bellied sapsuckers of eastern North America (found generally east of the Rocky Mountains). Limited, but more recent, work has focused on populations of the red-naped sapsucker of the Rocky Mountain trench region from central British Columbia to Arizona and populations of the red-breasted sapsucker with coastal distribution from northern British Columbia to California. The biology of these three species appears to be quite similar.

It would appear that neither the red-breasted nor the yellow-bellied sapsuckers occur within the planning area, indicating that the 1990 forest plans were referring to the red-naped sapsucker.

Even though the Malheur and Wallowa-Whitman National Forests actually listed individual primary cavity excavators, management direction was for primary cavity excavators in general. In those areas that were subject to management, the desire was to maintain snags at a level that would maintain at least 60 to 65 percent of the potential population, which relates to appendix 23 in Thomas (1979). Table 325 is based on appendix 23.

Table 325. Snags per 100 acres needed to meet the needs of primary excavators at the 60 percent population level based on Thomas (1979)

d.b.h. (inches)	Juniper	Aspen	Riparian	Ponderosa Pine	Mixed Conifer	White/ Grand Fir	Lodgepole/ Subalpine Fir
≥ zero				8.0	8.0	8.0	
≥ 12	2.3	2.3	6.0	8.2	8.2	8.2	3.5
≥ 10		6.7	3.0	4.5	4.5	1.8	7.3
≥ 6		9.0	9.0				
Totals	2.3	18.0	18.0	13.5	13.5	10.8	10.8

Eastside Screens modified the snag requirements by requiring that all sale activities (including intermediate and regeneration harvest in both even-aged and uneven-aged systems, and salvage) will maintain snags and green replacement trees of 21 inches or greater d.b.h. (or whatever is the representative d.b.h. of the overstory layer if it is less than 21 inches), at 100 percent potential population levels of primary cavity excavators. This plan amendment also states this should be determined using the best available scientific information on species requirements as applied through current snag models or other documented procedures.

The 1990 forest plan snag and down wood standards were based on wildlife species models (e.g., biological potential for snags) and tools that were developed in the 1970s and 1980s. Rose et al. (2001; page 602) determined from monitoring results that the biological potential models are a flawed technique for meeting the needs of primary excavators. DecAID (Mellen-McLean et al. 2009), which was developed to collect and synthesize the best available scientific information on wildlife relationships with dead wood, has demonstrated not only the variability of use between species but also the variability of dead wood distribution across the landscape.

Effects from Alternative A to Primary Cavity Excavators – The following analysis is based on a review of information from DecAID and Marshall et al. (2003). The analysis is only for green forests and compares wildlife species-specific data from DecAID with landscape data from Mason and Countryman (2010). Again, rather than conduct the analysis using the percent of potential population levels, snag levels will be assessed regarding their distribution across the landscape in comparison to what would have been expected for historical conditions. The concept of tolerance levels for individual species of wildlife from DecAID is utilized in this analysis. A tolerance level is the specific value at the edge of a tolerance interval. For example, a 30 percent tolerance level for a wildlife species of 2.5 snags/acre greater than 10 inches d.b.h. means that 30 percent of the population (at least in the population studied) use areas which contain densities of snags up to 2.5/acre. An 80 percent tolerance level of 30 snags/acre greater than 10 inches d.b.h. means that 80 percent of the population use areas which contain densities of up to 30/acre of 10 inch snags. Data was not available in DecAID for Hairy woodpecker, Lewis's woodpecker, northern flicker, northern three-toed woodpecker and red-naped sapsucker.

Mason and Countryman (2010) conducted a snag analysis using CVS plots and made comparisons with the results from the DecAID landscape analysis and then condensed snag distribution into fewer categories. The results in tables 8 and 9 in Mason and Countryman (2010) are based on these categories. What this means for example is that a density of 2.5 snags per acre for snags 20 inches d.b.h. in ponderosa pine would be in the category of 2-4 trees per acre in DecAID, but will be in the 2 to 6 trees per acre using Mason and Countryman (2010). There is a caution for those areas where species tolerance levels were identified as being zero snags per acre (see table 326) and where the values given for current and historical landscape levels (see table 327 and table 328) start with zero. It is unlikely that a large area of the landscape was devoid of snags due to the various disturbance regimes (fire and insects and disease) that historically were at work. It follows then that where 75 percent of the landscape is identified as being in the range of zero to 2 snags per acre in Mason and Countryman (2010), this should not be interpreted as 75 percent of the landscape had zero snags, but rather that snags existed in low numbers.

Table 326. Snag density per acre for 30, 50, and 80 percent tolerance levels at nest and roost sites (10 and 20 inch snags) by species of primary cavity excavator within the Blue Mountains national forests based on data from DecAID (Mellen-McLean et al. 2009)

Species	Potential Vegetation Group Associations	Snag density/acre for 30, 50, and 80 percent tolerance levels					
		10 inches d.b.h. or greater (green)			20 inches d.b.h. or greater (green)		
		30%	50%	80%	30%	50%	80%
Black-backed woodpecker	Ponderosa pine/Douglas-fir	2.5	13.6	29.2	0.0	1.4	5.7
	Eastside mixed conifer	2.5	13.6	29.2	0.0	1.4	5.7
White-headed woodpecker	Ponderosa pine/Douglas-fir	0.5	1.9	4.0	0.5	1.8	3.8
	Eastside mixed conifer	0.3	1.9	4.0	0.5	1.8	3.8
Williamson's sapsucker	Ponderosa pine/Douglas-fir	14.0	28.4	49.7	3.0	8.4	16.3
	Eastside mixed conifer	14.0	28.4	49.7	3.3	8.6	16.6

Table 327. Percent of the landscape that historically met the snag density (10 and 20 inches) tolerance levels for primary cavity excavators based on tables 8 and 9 of Mason and Countryman (2010)

Species	Potential Vegetation Group Associations	Snag density/acre for 30, 50, and 80 percent tolerance levels					
		10 inches d.b.h. or greater (green)			20 inches d.b.h. or greater (green)		
		30%	50%	80%	30%	50%	80%
Black-backed woodpecker	Ponderosa pine/Douglas-fir	64.3	7.2	4.6	78.5	78.5	14.5
	Eastside mixed conifer	34.0	14.8	12.0	62.1	62.1	20.1
White-headed woodpecker	Ponderosa pine/Douglas-fir	64.3	64.3	19.5	78.5	14.5	14.5
	Eastside mixed conifer	34.0	34.0	24.9	62.1	62.1	20.1
Williamson's sapsucker	Ponderosa pine/Douglas-fir	7.2	4.6	2.7	14.5	1.7	1.2
	Eastside mixed conifer	24.9	12.0	8.0	20.1	3.6	3.9

Table 328. Percent of the landscape that currently meets the snag density (10 and 20 inches) tolerance levels for primary cavity excavators based on tables 14 and 15 of Mason and Countryman (2010)

Species	Potential Vegetation Group Associations	Snag density/acre for 30, 50, and 80 percent tolerance levels					
		10 inches d.b.h. or greater (green)			20 inches d.b.h. or greater (green)		
		30%	50%	80%	30%	50%	80%
Black-backed woodpecker	Ponderosa pine/Douglas-fir	66.4	4.1	6.0	80.6	80.6	13.1
	Eastside mixed conifer	35.1	13.7	11.9	61.2	61.2	20.4
White-headed woodpecker	Ponderosa pine/Douglas-fir	66.4	66.4	19.3	80.6	80.6	13.1
	Eastside mixed conifer	36.4	36.4	24.3	61.2	61.2	20.4
Williamson's sapsucker	Ponderosa pine/Douglas-fir	4.1	6.0	2.6	13.1	1.6	1.1
	Eastside mixed conifer	13.7	11.9	9.6	20.4	3.8	4.2

As displayed in table 328, in some cases snag levels are within the expected historical range for a given species and outside in other cases (usually less than is needed). It should be pointed out that for both table 327 and table 328, the percentages for the 30, 50, and 80 percent species tolerance levels do not add up to 100 percent because of the overlap between categories. For example, the 30 and 50 percent tolerance levels for 20 inch plus snags for the white-headed woodpecker are 0.5 and 1.8 (see table 326) both of which fall in the zero to 2 trees per acre of tables 8 and 15 of Mason and Countryman (2010). One of the assumptions being made is that an increase in older forests would result in a commensurate increase in snag levels. It must be recognized that it will take time to observe densities of large snags increasing, but the 1990 forest plans as amended are directed to provide for high levels of primary cavity excavators. Granted, threats continue to exist for retention of snags on the landscape (see focal species discussion), but in general because of the direction for snag management with the Eastside Screens Amendment, management of dead wood on National Forest System lands for the current alternative would continue to improve.

The zero values in table 326 and the tables from Mason and Countryman (2010) make it difficult to compare the existing versus the historical condition for the 30 and 50 percent tolerance levels. Comparing the 80 percent tolerance level also is problematic, since the tolerance level for the black-backed woodpecker is at the upper end of the category given by Mason and Countryman (2010) and the white-headed woodpecker would be in the middle. Given this, the existing condition of the category containing the 80 percent tolerance level for all three species analyzed is close to what would be expected across the landscape historically.

Primary Cavity Excavators' Population Trend – Population trends were not predicted per se in the 1990 forest plans, but rather the plan's ability to provide snag densities for a percent of the total population as described by Thomas et al. (1979). This was based on determining how many snags per acre were needed to support a nesting pair of primary cavity excavators and then providing a percentage of that total to achieve what was considered the biological potential. The methodology/models that supported this perspective are no longer considered appropriate (Rose et al. 2001). Rather than a one-size-fits-all approach, the focus is to use HRV for reference conditions and attempt to mimic natural levels and distributions of snags on the landscape. For example, the landscape historically only provided snag levels on five percent of the landscape that would coincide with where 80 percent of the observations of black-backed woodpecker have been documented. Because of the Eastside Screens amendment, population trends of primary cavity excavators for this alternative would be expected to continue to improve or remain stable.

Northern (American) Three-toed Woodpecker: Malheur and Umatilla National Forests

The three-toed woodpecker (*Picoides dorsalis*) is similar to the black-backed woodpecker (*P. arcticus*) in having three toes (versus four) and an absence of red in all plumages. The distribution of the three-toed woodpecker often coincides with that of spruce (*Picea* spp.) forests; the black-backed woodpecker occurs in spruce as well as in other coniferous forests, a habitat difference reflected in the distributions of these closely related species (Leonard 2001). The Interior Columbia Basin Ecosystem Management Project (ICBEMP) included the three-toed woodpecker in Family 2 (broad elevation, old forest)/Group 11 (late seral sub-alpine, montane forests). Wisdom et al. (2000) reported that source habitats were likely distributed throughout most of the mountainous regions of the basin but generally occupied less than 25 percent of any given watershed. The Blue Mountains ERU supports significant amounts of habitat for the group and had moderately or strongly increasing trends in more than 60 percent of watersheds.

The three-toed woodpecker (*Picoides dorsalis*) was identified as a management indicator species for all three national forests. The Malheur and Umatilla National Forests specifically name this

species whereas the Wallowa-Whitman National Forest included it in a list of the species it considered primary excavators. Although details differ between the 1990 forest plans, the Malheur and Umatilla National Forests selected it to represent mature old forest. It was also identified as having a viability concern and Forest Service Region 6 direction was developed for habitat. Minimum habitat patches should include:

- Mature old forest patches greater than 75 acres with canopy covers of 50 percent or greater
- 6 snags greater than 12 inches d.b.h. per 10 acres
- 1.4 snags greater than 10 inches d.b.h. per acre

Such habitat patches should occur at a minimum of 1 per 2,000 to 2,500 acres.

Effects from Alternative A to the Northern (American) Three-toed Woodpecker – Using the above description of habitat, all three 1990 forest plans predicted that northern three-toed habitat would occur on approximately 3 to 4 percent of the landscape. Using the dry forest and cool moist forest potential vegetation groups, figure 41 displays what percent of each national forest is three-toed habitat, and then projects it forward. These results indicate that all three 1990 forest plans exceed what was originally projected. The reason for a different eastside screens level for the Malheur National Forest is that it was assumed that closed canopy was important to this species and therefore only closed canopied mature forests were summarized as habitat. Historically the Malheur National Forest was dominated more by open canopied old forest in comparison to the Umatilla and the Wallowa-Whitman National Forests. In any case, it would appear that habitat for this species is abundant on the three national forests and is projected to increase.

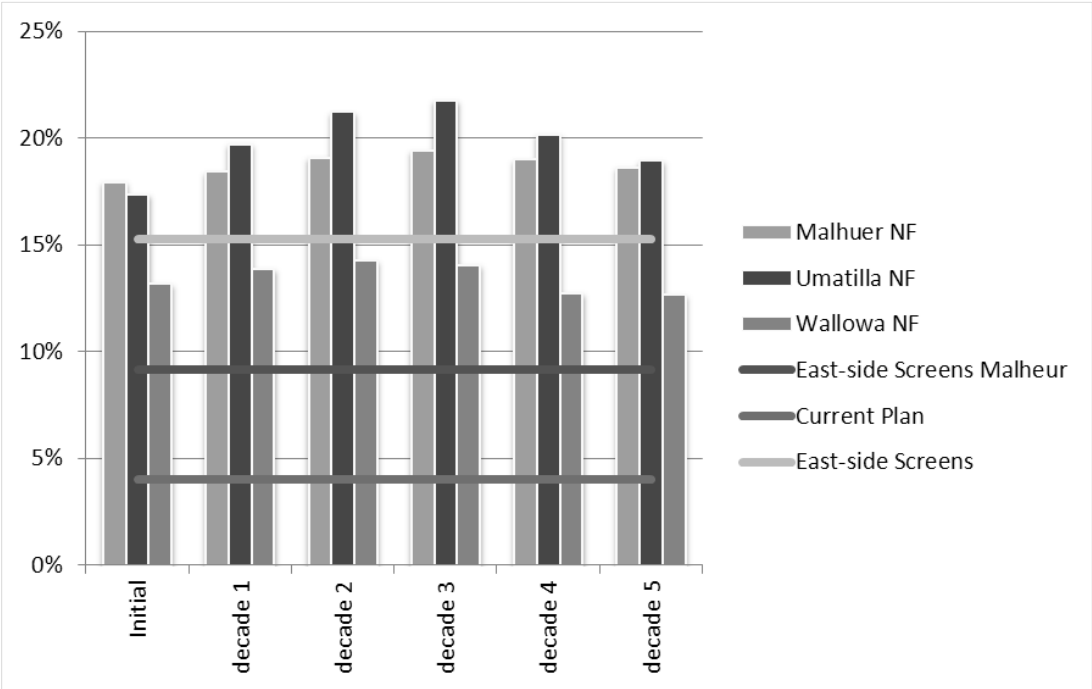

Figure 41. Percent source habitat for northern three-toed woodpecker projected for the next 5 decades (compared to original desired conditions of 1990 forest plans and as amended by Eastside Screens)

Northern (American) Three-toed Woodpecker Population Trend – American three-toed woodpeckers (*Picoides dorsalis*) are not federally listed in the United States or Canada and according to the PIF database (see table 329) there is not a regional concern for this species. Because of the species' low abundance and retiring habits, it is not well sampled with range-wide population sampling efforts such as bird breeding surveys (BBS) and consequently, data on which to assess population trends of American three-toed woodpeckers is lacking at the regional and range-wide scales (Wiggins 2004).

All three 1990 forest plans predicted a decline in old growth habitat, which would indicate an anticipated decline in populations. Only the Umatilla National Forest actually indicated a decline in population for this species, based on their original plan. For the 1990 forest plans as amended, it would be expected that population trends would be stable or increasing.

Table 329. Population trends of some primary cavity excavators from large-scale data sets based on data from Mellen-McLean (2011)

Species	Breeding Bird Surveys[1]				Partners in Flight Database[2]	
	OR	Reliability	WA	Reliability	BCR 9	BCR 10
Black-backed woodpecker	stable	yellow			15	14
Hairy woodpecker	stable	blue	stable	yellow	11	10
Northern flicker					13	13
Northern three-toed woodpecker					12	13
Red-naped sapsucker	no trend	red	no trend	red	16	17
White-headed woodpecker	no trend	red	no trend	red	18	18
Williamson's sapsucker	stable	yellow			18	17

1 Breeding Bird Survey (Sauer et al. 2008)
(http://www.mbr-pwrc.usgs.gov/bbs/cred.html).
Increase: significant (p less than 0.05) increase from 1966-2005.
Decrease: significant (p less than 0.05) decrease from 1966-2005.
Stable: yellow or blue reliability and no significant increase or decrease.
No trend: red reliability and no significant increase or decrease.
2 Partners in Flight (PIF) Database (http://www.rmbo.org/pif/scores/scores.html).
Regional combined scores can range from 5 to 25. Regional combined score greater than 13 may be a species of regional concern (Panjabi 2005).
BCR 9: Great Basin.
BCR 10: Northern Rockies

Northern Goshawk: Wallowa-Whitman National Forest (Focal Species Group: Forested Communities, Forested Mosaic)

In North America, the northern goshawk (*Accipiter gentiles*) nesting range includes the boreal forests of central Alaska and northern Canada, the Sierra Nevada, Rocky Mountains, northern Mexico, northern Minnesota, Wisconsin, central Michigan, New York, Pennsylvania, and southern New England. Northern goshawks have extended (or reoccupied) their breeding range south into the Appalachian Mountains and probably into the Great Smoky Mountains as far south as North Carolina following the return to maturity of forests that were logged in the 1800s (Marshall 1992). The goshawk was identified as a focal species in several of the subbasin plans completed within the Columbia Basin and is considered a focal species for the Blue Mountains plan revision effort. ICBEMP placed the northern goshawk in two separate habitat families: broad-elevation old forest (summer habitat) and forests, woodlands and montane shrubs (winter

habitat). Within these families the goshawk was assigned to groups 5 and 25. Group 5 pertains to summer habitat (broad-elevation old forest) and includes the flammulated owl, American marten, and fisher. Group 25 (forests, woodlands, and montane shrubs) deals with winter habitat and includes only the northern goshawk. As noted for the American marten, a strong declining trend in source habitat was reported for the Blue Mountains. A similar trend was also reported for northern goshawk winter habitat in the Blue Mountains.

The northern goshawk was identified as a management indicator species for the Wallowa-Whitman National Forest. It was selected to represent another indicator of the abundance of mature/old forest patches and was considered associated with dense-canopied mixed conifer, white fir, and lodgepole pine associations. As indicated in table 301, the northern goshawk was chosen as a focal species and a focal species assessment model was developed to assess source habitats and threats to this species.

The northern goshawk uses a complex mosaic of landscape conditions to meet various life history requirements for nesting, post fledgling, and foraging (Reynolds 1992). Goshawk nesting habitat in eastern Washington and Oregon is generally composed of mature and older forests (McGrath et al. 2003). Typical nest stands are composed of large trees with high canopy cover (greater than 50 percent), multiple canopy layers, and a relatively high number of snags and downed wood (McGrath et al. 2003). Substantial disagreement regarding the habitat needs of this species occurs in the literature (Beier et al. 2008, Capan 1996, Greenwald et al. 2005, Reynolds et al. 2001, Reynolds 2004, Reynolds et al. 2008). Because of the importance of late-successional forests in many of the life history stages of the goshawk, Wales et al. (2011) mapped late-successional forests as a factor that influenced the quality of source habitat using the following variables:

- Potential vegetation types: dry ponderosa pine, dry Douglas-fir, dry grand fir, cool moist, cold dry
- Tree size: greater than 20 inches d.b.h.
- Layers: single/multistory
- Canopy cover: greater than 40 percent dry types, greater than 60 percent cool moist, cold dry

The results of this analysis indicated that suitable habitat for this species was broadly distributed and of high abundance within each national forest.

Effects from Alternative A to the Northern Goshawk – As a management indicator species for the Wallowa-Whitman National Forest 1990 forest plan, the habitat that it was to represent was much narrower and did not include the dry ponderosa pine. As with the other species associated with older forests, habitat was predicted to decline over time based on the initial plan. Figure 42 displays the projection for habitat in this analysis in relation to the 1990 forest plan original desired conditions as well as the desired conditions of the plan as amended. The eastside screens specifically mentioned the northern goshawk and provided some management direction for this species.

Northern Goshawk Population Trend – Data needed to assess population trends of the northern goshawk is lacking at the national forest, regional, and range scales. Based on the amount of habitat displayed in figure 42, it would appear that populations would be stable for at least the first three decades, after which habitat would begin to decline, which may or may not lead to a downward trend in populations.

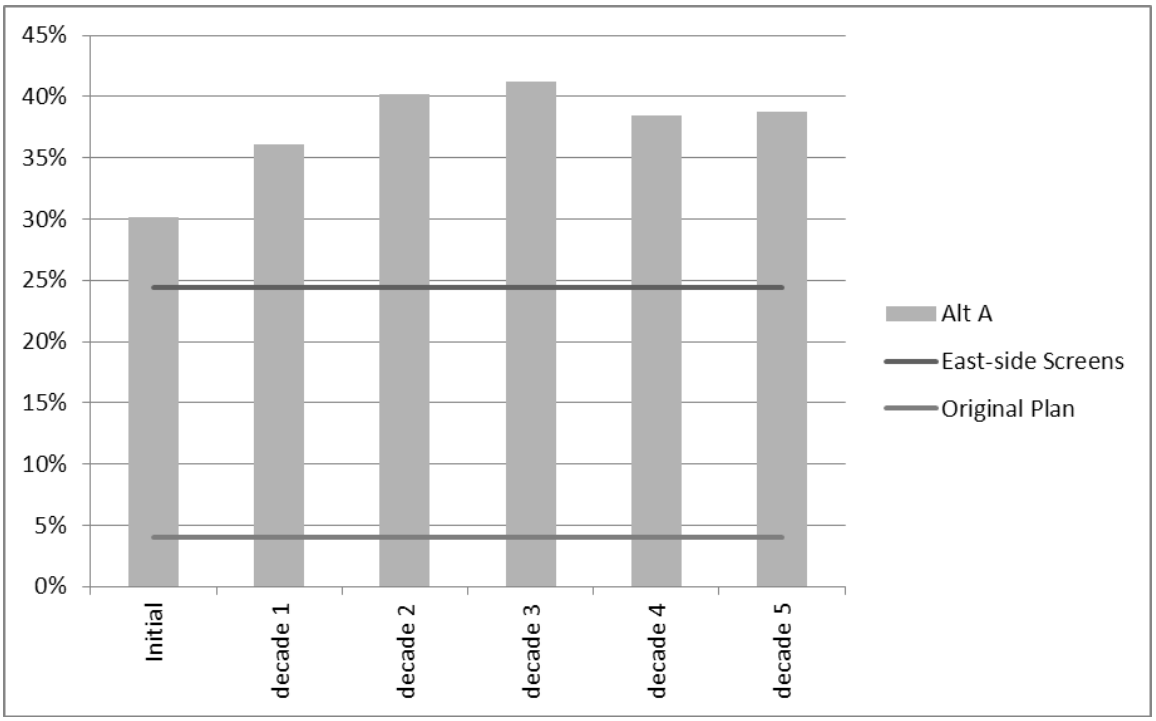

Figure 42. Percent source habitat for the northern goshawk within the Wallowa-Whitman National Forest projected for the next five decades (compared to original desired conditions of 1990 forest plans and as amended by the Eastside Screens)

Management Indicator Species Common to All Alternatives

Pileated Woodpecker

Other than the ivory-billed woodpecker (*Campephilus principalis*), the pileated woodpecker (*Dryocopus pileatus*) is the largest woodpecker species in the United States. It has been identified as a sensitive species and a strategy species for the Blue Mountains by Oregon (ODFW 2006) and is a state candidate for listing within Washington (WDFW 2005). The U.S. Fish and Wildlife Service identified the pileated woodpecker as a species of concern. The pileated woodpecker was considered as a focal species in several of the subbasin plans completed for the Northwest Power and Conservation Council within the Columbia Basin and is considered a focal species for the Blue Mountains plan revision effort. ICBEMP included the pileated in late-seral, multi-stratum forests (Family 2/Group 6). Wisdom et al. (2000) indicated that source habitats basin-wide have declined moderately or strongly in more than 50 percent of watersheds containing appropriate habitat types for this species. The Blue Mountains Ecological Unit showed a balanced mix of increases and decreases of habitat within watersheds (ibid).

Habitat

The pileated woodpecker prefers late seral stages of coniferous or deciduous forest, but will also use younger forests that have scattered, dead trees (Bull and Jackson 1995). In northeast Oregon, the pileated woodpecker selects unlogged stands of old-growth grand fir with closed canopies (Bull and Holthausen 1993) and in some cases open stands with high densities of large snags and logs (Bull et al. 2007). Pileated woodpeckers are rarely found in pure ponderosa pine stands. The association with late seral stages stems from the need for large diameter snags or living trees with some decay for nest sites, roosts and foraging (Bull 1987, Bull et al. 1992, Bull 2001).

The availability of snag habitat is an important feature within source habitat for pileated woodpeckers (Bull et al. 1986, Bull et al. 1992, Raphael and White 1984). Snags used for roosting and nesting in Eastern Oregon normally are greater than 25 inches in diameter (Bull 1987, Nielsen-Pincus 2005, Nielsen-Pincus and Garton 2007). In northwest Montana, nest trees were large western larch (*Larix occidenatalis*) and averaged 74.9 cm d.b.h. (McClelland 1979).

Risks and Threats

Snag density – Timber harvest has the most significant effect on habitat for this woodpecker (Bull 2003, Bull et al. 2007). Removal of large-diameter live and dead trees, of down woody material, and of canopy eliminates nest and roost sites, foraging habitat, and protective cover. In addition, prescribed fire may eliminate or reduce the number of snags, logs, and cover (Bull 2003). Predation is reported to be one of the main causes of mortality for the pileated woodpecker. Bull and Jackson (1995) suggest that fragmentation of forested habitat may lead to reduced population densities and increased vulnerability to predation. Bull et al. (2005a) found that pileated woodpecker foraging activity was highest in untreated forested stands, intermediate in stands that had been thinned, and lowest in stands that were prescribed burned.

Open Motor Vehicle Route Density – In addition to snag densities, the model uses road density as a variable to account for the probable reduced snag densities along roads. Bate et al. (2007), found that snag numbers were lower adjacent to roads due to safety considerations, firewood cutters, and other management activities. Other literature has also indicated the potential for reduced snag abundance along roads (Wisdom et al. 2000). The loss of snags due to firewood gathering was acknowledged in all three 1990 forest plans.

Alternative A (No Action)

The pileated woodpecker was identified as a management indicator species for all three 1990 forest plans. Although details differ between the 1990 forest plans, it was selected to represent mature/old forest structure. It was also identified as having a viability concern and Forest Service Region 6 direction was developed for habitat. Minimum habitat patches should include:

- Mature/old growth patches greater than 300 acres
- 1.5 snags greater than 20 inches d.b.h. per 10 acres
- 1.8 snags greater than 12 inches d.b.h. per acre

Such habitat patches should occur at a minimum of 1 per 12,000 to 13,000 acres. Although the preference is to have 300 continuous acres, if this is not possible, habitats could be arranged in 50 acre blocks no more than one-quarter mile apart.

Effects from Alternative A to the Pileated Woodpecker

It is difficult to assess how well the 1990 forest plans met their intended desires for several reasons. One is that each plan assessed old growth somewhat differently. For example, the Umatilla National Forest provided a table of acres, but only for areas outside of wilderness areas. The Wallowa-Whitman National Forest on the other hand included all lands. Additionally, it is unclear whether the figures for old growth include all vegetation types.

Using the specifications developed at the regional level that required 300-acre areas be managed for pileated woodpeckers within every 12,000-13,000 acres of habitat, all three 1990 forest plans predicted that pileated woodpecker habitat would occur on approximately 2.5percent of the landscape. Using the habitat types that were modeled in Wales et al. (2011), all three 1990 forest plans greatly exceed their initial predictions and both the Umatilla and Malheur National Forests

exceed their 1990 forest plan desired conditions as amended (see figure 43). The Wallowa-Whitman National Forest is slightly below desired conditions, and as implemented, alternative A appears to reduce habitat for this management indicator species over time. The first two decades show only a slight reduction in source habitat (less than 4 percent), which could easily be within the accuracy error of modeling.

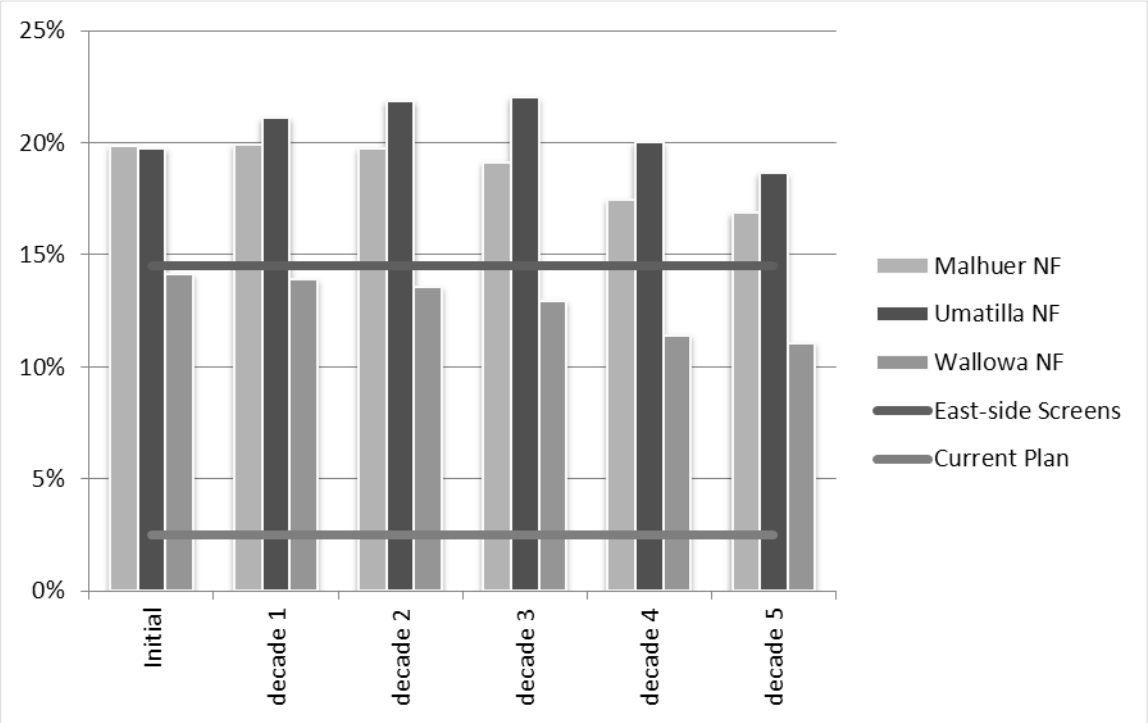

Figure 43. Percent source habitat for the pileated woodpecker projected for the next five decades (compared to original desired conditions of 1990 forest plans and as amended by the Eastside Screens)

Large snags were recognized as important in the initial planning effort, and although the method of analysis is different (see primary excavators discussion), this habitat attribute is still important. The following discussion is applicable to all alternatives and so will not be repeated within the discussion of the action alternatives.

Table 330 displays the tolerance levels for snag densities associated with the pileated woodpecker, derived from DecAID (Mellen-McLean et al. 2009) and the historical and current densities on the landscape as calculated by Mason and Countryman (2010). Based on the data displayed in table 330, it would appear that snag densities meeting the pileated woodpeckers tolerance levels are within what would have been expected historically. This could be the result of implementing the Eastside Screens amendment beginning early in the 1990s. Alternative A would continue to implement the standards that would protect all live trees 21 inches d.b.h. and greater thereby protecting existing and future snags and providing for future recruitment trees. Additionally, for alternative A, snag levels would still have to meet 2.25/acre for snags 21 inches d.b.h. and greater after all post sale activities.

Table 330. Snag density greater than 20 inches d.b.h. per acre for 30, 50, and 80 percent tolerance levels found at pileated woodpecker nest and roost sites in the eastside mixed conifer forest, larger trees vegetation condition class and what percent of the landscape would be expected to meet these levels and what percent of the landscape meets these levels based on Mason and Countryman (2010)

Species tolerance levels from DecAID table EMC_S/L.sp-22			Percent of landscape that historically met species tolerance levels (snags per acre)				Percent of landscape that currently meets species tolerance levels (snags per acre)			
30%	50%	80%	30% or less (0-3)	30-50% (3-8)	50-80% (8-18)	80% or more (> 18)	< 30% (0-3)	30-50% (3-8)	50-80% (8-18)	80% or more (> 18)
3.5	7.8	18.4	62%	15%	15%	3%	15%	4%	15%	4%

Population Trend – Data needed to assess population trends of the pileated woodpecker are lacking at the national forest, region, and range scales. The breeding bird surveys for Oregon appear to be stable (Sauer et al. 2008); however, the accuracy is considered to be very imprecise (Red) and would not be able to detect a five percent per year change over the long term. The Christmas Bird Counts have a similar pattern to the BBS for Oregon, but again the precision of this data is uncertain. Huff and Brown (2006) found low annual variation in abundance of pileated woodpeckers between 1994-2001in the Blue Mountains and found a stable or slightly upward trend in abundance. Populations of pileated woodpeckers are considered secure (N5) in the United States and apparently secure (S4) in both Oregon and Washington (NatureServe 2011).

The Malheur National Forest (USDA Forest Service 1990) estimated approximately 200 potential pairs for the selected alternative but did not indicate whether or not this was an increase or decline in populations. Both the Umatilla (USDA Forest Service 1990a) and the Wallowa-Whitman National Forests (USDA Forest Service 1990b) predicted a decline in this species for all alternatives. Based on habitat alone, figure 44 would indicate that expected populations of pileated would not only be greater than what the original forest plans envisioned, but would also exceed the expectations of the Eastside Screens for the Malheur and the Umatilla National Forests.

Alternatives B, C, D, E, and F

For the plan revision effort, the pileated woodpecker was chosen as a management indicator species to represent the cool/moist forest source habitat. As indicated in table 298, the pileated woodpecker was also chosen as a focal species and a model was developed to assess source habitats and threats to this species. Source habitats were defined to include:

- Potential vegetation: dry Douglas-fir, dry grand fir, moist, and cold forests
- Tree size greater than or equal to 20 inches d.b.h.
- Canopy greater than or equal to 40 percent in dry forests and greater than 60 percent in cool/moist and cold/dry forests
- Snags greater than 20 inches d.b.h. in the following density categories:
    - Low: less than 0.5 per acre
    - Moderate: 0.5 to 2.5 per acre
    - High: 2.5 to 7.5 per acre
    - Very high: more than 7.5 per acre

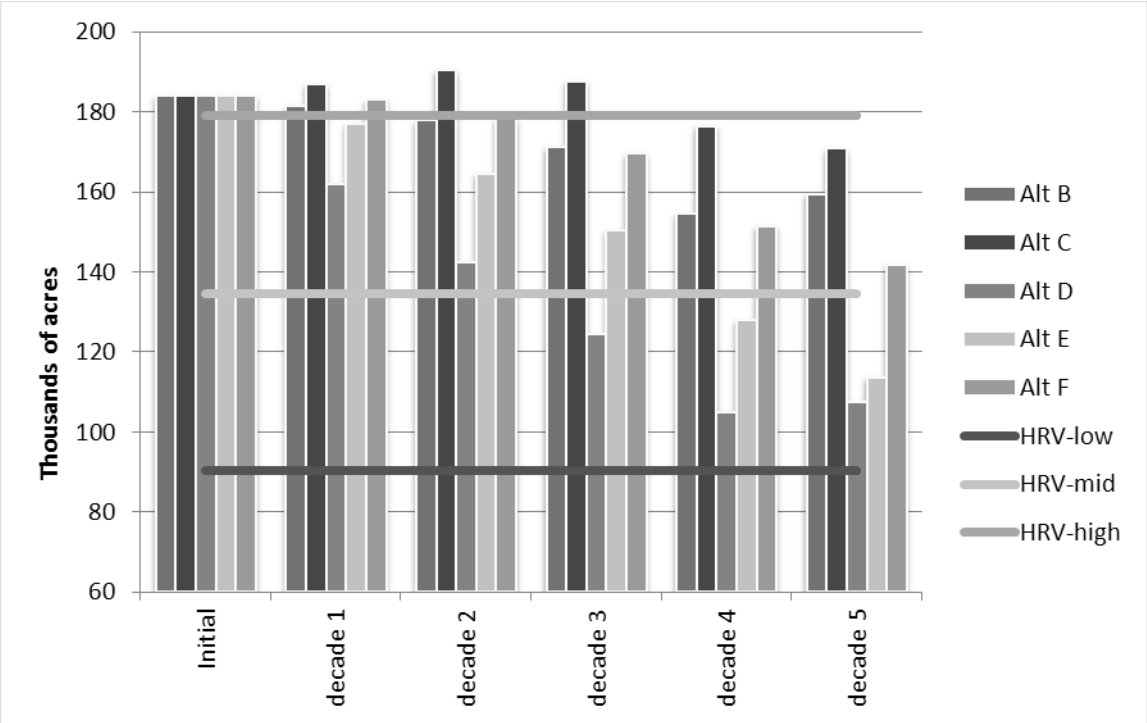

Figure 44. Malheur National Forest pileated woodpecker source habitat in relation to HRV displayed for each alternative for the first five decades

Effects from Alternatives B, C, D, E, and F to the Pileated Woodpecker

This species is well distributed within the planning area year round and was chosen as a focal species (USDA Forest Service 2010) to represent medium/large trees in the cool/moist forest. As a management indicator species, it was chosen to represent large trees in the late seral stage of cool/moist forest with its corresponding conditions for snags and coarse woody debris. The analysis that follows uses the habitat types as modeled in Wales et al. (2011). The potential vegetation group grouping of cool/moist forest as used in the plan analysis does not include all of the habitat types modeled in Wales et al. (2011) and therefore as a management indicator species for the action alternatives the habitats represented by the pileated would include the cool/moist and cold dry potential vegetation groups, as well as the dry grand fir and Douglas-fir from the dry potential vegetation group. Although ponderosa pine is a preferred nest tree, pileated rarely select nest sites in pure ponderosa pine stands, possibly due to such stands lack the abundance of snags and downed wood necessary for foraging habitat for pileated woodpeckers (Bull et al. 1986, Bull 1987).

Bull and Holthausen (1993) found that density of large snags (20 inches d.b.h. or greater) was the best predictor of density of pileated woodpeckers. Certain management activities that pose potential risks for snag retention on the landscape were previously discussed for focal species so will not be discussed here. Based on the data displayed in table 330, it would appear that current levels of snags 20 inches d.b.h. or greater are what would be expected to meet the need of this species.

Effects to Pileated Woodpeckers in the Malheur National Forest – As displayed in figure 44, during the first two decades all alternatives maintain source habitat within the range of HRV, although habitat is reduced over time for all alternatives. Alternative C does the most in regards to

maintaining source habitat and alternative D does the least. It was assumed that increases in source habitat would result in increases in large snag density. Only alternative C actually shows an increase in source habitat, therefore suggesting that for all of the other alternatives, snag density would remain stable or decrease. In all likelihood, snag density would not be reduced in any alternative other than D due to safeguards (WLD-HAB-12 S-7) within each alternative to protect large snags. All alternatives include the same desired condition for snags on the landscape that was based on HRV; therefore, if met, the desired condition should provide adequate levels of this habitat attribute.

Effects Specific to the Umatilla National Forest – As displayed in figure 45, all alternatives would maintain source habitat above the mid-point range of HRV during the first two decades, although over time a reduction in habitat would occur for all alternatives. For the first decade, all alternatives would have an increase in source habitat. It is not until the third decade that source habitat would begin to decrease to less than the existing condition. Although the first decade shows slight differences between alternatives, it is so slight as to be in the range of error. The trend, however, is similar to what is evident from the other forests in that alternative C shows the largest benefit to the pileated and alternative D demonstrates the least benefit. Because all alternatives show an increase in source habitat during the first decade, it would be assumed that a commensurate increase in large snags would also occur.

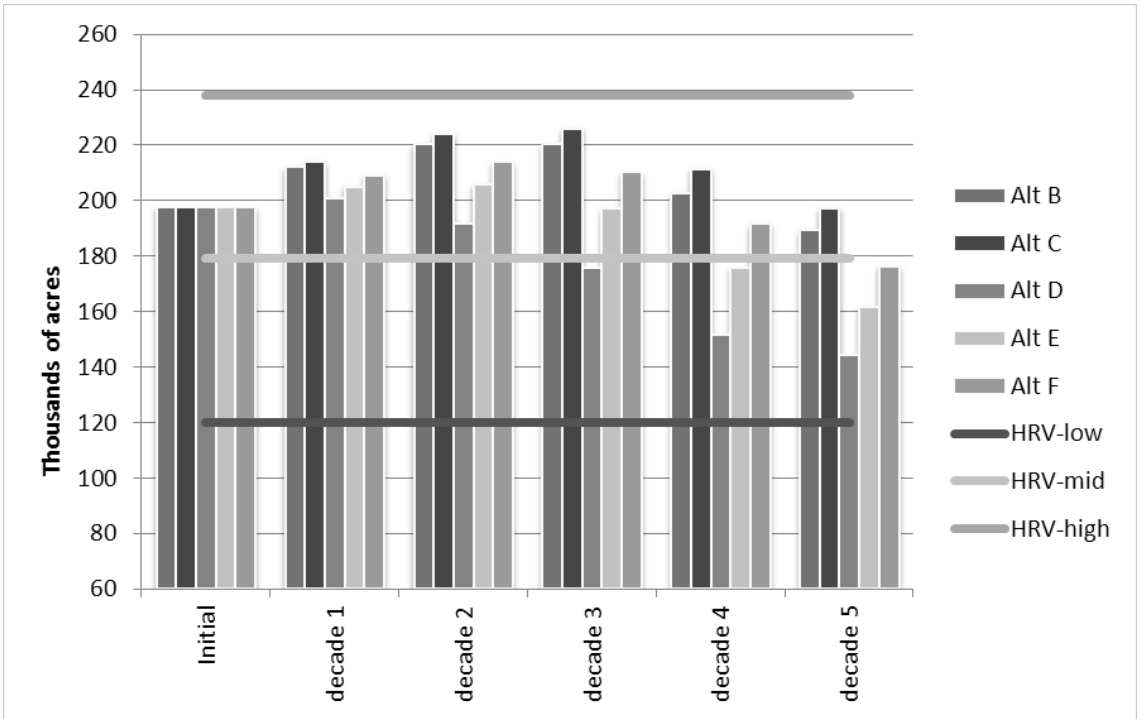

Figure 45. Umatilla National Forest pileated woodpecker source habitat in relation to HRV displayed for each alternative for the first five decades

Effects Specific to the Wallowa-Whitman National Forest – As displayed in figure 46, all alternatives maintain source habitat above the low range of HRV during the first decade, although all alternatives show at least a slight reduction in habitat. All alternatives show a decrease in source habitat over time, with alternative D dipping below the estimated low value for HRV by

the second decade. Alternative C shows only a slightly better outcome than alternatives B or F for the first decade. Alternatives B and C remain relatively the same during the first three decades, and are the only alternatives that maintain source habitat within the estimated range of HRV for the Wallowa-Whitman National Forest through the first three decades.

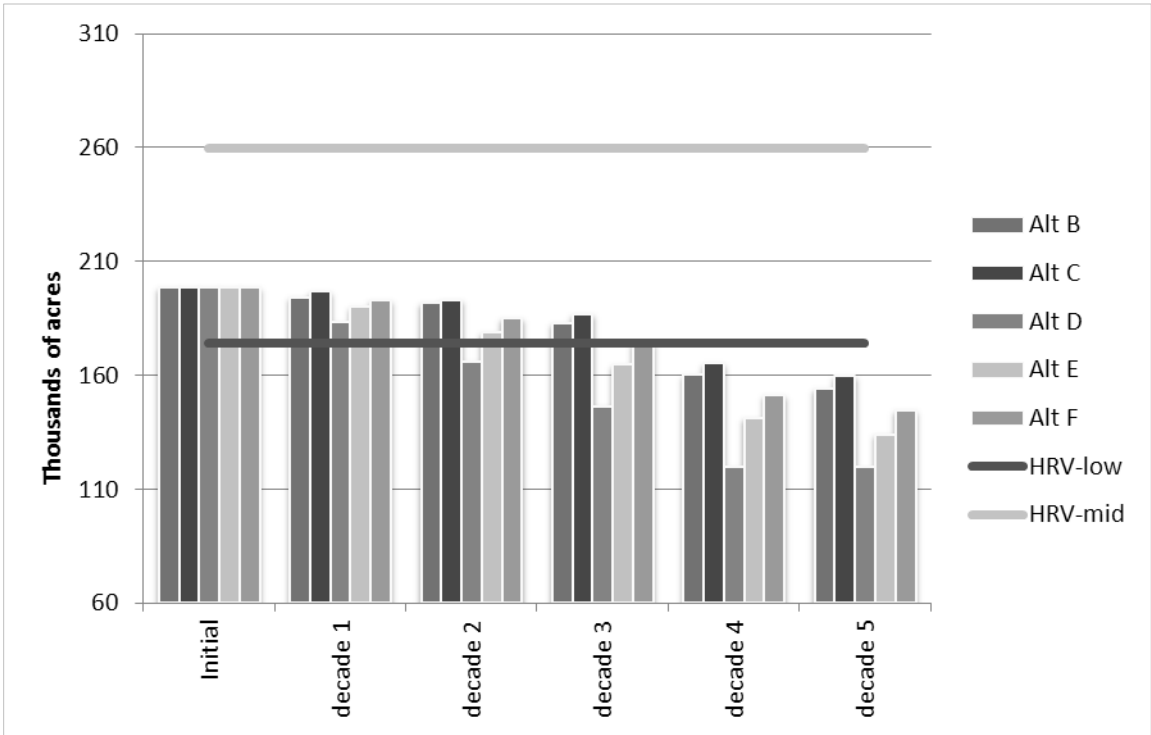

Figure 46. Wallowa-Whitman National Forest pileated woodpecker source habitat in relation to HRV displayed for each alternative for the first five decades

Because some overlap in source habitats occurs with the white-headed woodpecker, a reduction in source habitat for the pileated was anticipated. Altman (2000) considered the pileated woodpecker a principal species of the late-successional mesic mixed conifer forest. He describes this as occurring mostly at higher elevations, wetter sites, northerly aspects, and in draws where soils are mesic and well developed. It includes coniferous forest composed primarily of cool moist Douglas-fir/grand fir, cool dry Douglas-fir, western larch, hemlock, and occasional ponderosa pine. He emphasized this habitat does not include sites that were historically ponderosa pine but are mixed conifer now due to fire suppression and encroachment of other conifers. The white-headed prefers open canopied stands compared to the pileated that prefers closed canopied stands. The HRV analysis conducted by Countryman and Justice (2010) indicated that for both the cool moist and dry potential vegetation groups, open canopied old forest was substantially underrepresented within the Blue Mountains. Restoration of more open canopy ponderosa pine forest towards historical levels will likely reduce populations of species that are provided suitable habitat in the closed canopy, dense understory, mixed conifer forests that now dominate what was historically ponderosa pine forest (Altman 2000).

Population Trend for All Three Forests – The current population information available for the pileated woodpecker was discussed for alternative A and will not be repeated here. Based on the habitat analysis presented above, population trends in the Umatilla and Malheur National Forests should be stable for at least the first two decades for all alternatives, although a slight downward

trend might be associated with alternatives D and E. This same trend is evident within the Wallowa-Whitman National Forest, only by the second decade, alternative D drops outside of what was estimated as the range for HRV. Population decline for pileated woodpeckers would be expected as ponderosa pine forests are restored as eluded to by Altman (2000); however, if source habitats are maintained within HRV, then populations should also be within that range.

Rocky Mountain Elk

Distribution – Historical records indicate elk were numerous and widely distributed in Oregon prior to arrival of nonnative settlers. According to Vernon Bailey, Rocky Mountain elk (*Cervus elaphus*) occupied the whole of the Blue Mountains Plateau in Northeastern Oregon (ODFW 2003a). Elk were nearly extirpated from Oregon by the late 1800s (Verts and Carraway 1998). Through hunting regulation and reintroductions, populations have recovered (ODFW 2003a) to the point where they have become depredators of crops in some areas, particularly on private lands, near the interface of valley and montane zones (Sallabanks et al. 2001).

Habitat – Thomas et al. (1979, p. 109) stated, "Optimum…elk habitat is the amount and arrangement of cover and forage areas that result in the maximum possible proper use of the maximum possible area…." Thomas et al. (1988), in developing a habitat-effectiveness model for winter ranges in the Blue Mountains of Oregon, identified the following habitat attributes as important: 1) size and spacing of cover and forage areas, 2) road density of open roads, 3) quantity and quality of forage, and 4) the quality of available cover. Armentrout et al. (1997) identifies similar management needs, but cautions that because of their (elk and mule deer) complex habitat needs, habitat management should be at the landscape scale and not the scale of individual units. Additionally, desired habitat conditions need to be expressed in relation to the landscape's ecological potential.

Thomas et al. (1979) indicated that optimum habitat for elk requires cover, which was defined as two types: thermal and hiding. Thomas et al. (1988) defined cover as either satisfactory or marginal and stated that if a stand was neither satisfactory nor marginal cover then it was a forage stand. Satisfactory cover was defined as a stand of coniferous trees 40 feet or greater in height with an average canopy cover of 70 percent or greater and marginal cover is defined as a stand of coniferous trees 10 feet tall or taller with an average canopy cover of 40 to 69 percent (*ibid*). The quality of available cover is important, and is best expressed by what percent of available cover is considered marginal and what percent is satisfactory. Obviously, the higher the amount of satisfactory cover, the better the habitat would be for elk.

Elk use a mixture of habitat types in all successional stages in both forest and grassland vegetation. Their uses of these habitats change in daily and seasonal patterns. In winter, native bunchgrasses are dormant and are low in digestible protein. Elk use early succession grasses, if available that are still growing, and provide high-quality digestible protein when other forage is dormant. Guidelines that target a cover to-forage ratio of 40:60 have been widely accepted (Skovlin et al. 2002).

During the 1980s and early 1990s, elk management on National Forest System lands often centered on providing hiding and thermal cover (ODFW 1989, Sally 2000, Smith and Long 1987, Thomas et al. 1988, Winn 1985). Although security cover is still an important habitat consideration for elk management, the more recent scientific information highlights open motor vehicle routes (Rowland et al. 2000, Rowland et al. 2004) and the quality, quantity, and availability of forage as key determinates of habitat suitability (Cook et al. 1998, Damiran 2006, Findholt et al. 2004).

Habitat effectiveness for elk is adversely affected by the presence of roads open to vehicular traffic (Thomas et al. 1979). Thomas et al. (1988) indicated a habitat effectiveness rating of 40 percent (0.4) for elk when open road densities are approximately 3 miles per square mile of habitat. Towry (1984) indicated that, miles of road per square mile of habitat should not exceed 1 for primitive road, one-half for secondary, and one-quarter for primary roads. Habitat models considered adequate to provide quality elk habitat in a forest managed for timber production do not and never were intended to provide adequate security for elk during hunting seasons (Lyon and Christensen 2002).

Elk numbers are managed through legal hunting to meet state management objectives. Other factors, including predation, disease, accidents, and poaching, also influence elk numbers.

Rocky Mountain Elk Management Indicator Species Status Under Alternative A (No Action)

All three 1990 forest plans selected elk as a management indicator species. The Wallowa-Whitman National Forest chose elk because it "is a highly-valued game animal and is selected as a management indicator species because of the quality of habitat diversity, the interspersion of cover and forage areas, and the security of cover provided" (USDA Forest Service 1990b). The Umatilla National Forest selected this species for general forest habitat (USDA Forest Service 1990a). The Malheur National Forest stated that it was chosen because it was a commonly hunted species (USDA Forest Service 1990).

Rocky Mountain elk habitat was analyzed within the Blue Mountains during the 1990 planning effort using a habitat model developed by Thomas et al. (1979, 1988). Though the winter habitat model developed by Thomas et al. (1988) was never intended for application on spring-summer-fall ranges, it has been widely applied on nonwinter ranges. Elk management on National Forest System lands has centered on providing hiding and thermal cover (ODFW 1989, Sally 2000, Smith and Long 1987, Thomas et al. 1988, Winn 1985). A large body of research has been conducted during the 27 years since publication of these models and this research needs to be incorporated into a new model. For example, Cook et al. (2005) saw little justification for retaining thermal cover as a primary component of habitat evaluation models for elk, and postulated that it may be time to shift attention towards the relationships between herd productivity and nutrition-based attributes of habitat.

The indicators used to describe elk habitat conditions in the no-action alternative include: Habitat Effectiveness Index (HEI), cover and forage ratio, road density, and hiding and thermal cover. HEI uses quality of cover, cover and forage, and open roads to indicate the effectiveness of elk habitat. Optimum habitat has a value of 1.00.

Forage is defined as areas having less than 40 percent canopy cover, which includes grasslands, meadows, and riparian areas. Forage is available in grasslands, meadows, and riparian areas, and also within forested areas where grasses, sedges, forbs, and shrubs grow. Elk and deer also consume lichen, leaves, and bark from trees, especially during winter months. Optimum amounts of forage prepare elk and deer for winter survival.

Cover in the cover to forage ratio is a combination of satisfactory and marginal cover. Optimum elk habitat is approximately 40 percent cover (20 percent hiding cover, 10 percent thermal cover, 10 percent either hiding or thermal cover) and 60 percent forage (40:60 ratio) (Thomas 1979). Satisfactory cover is greater than 70 percent canopy cover, marginal cover is 40 to 70 percent canopy cover, and forage has less than 40 percent canopy cover.

The 1990 forest plans recognize that the HEI model was designed for habitat analysis at the subwatershed level or 3,000 to 15,000 acres in size but stated that for "planning purposes and analysis and comparison of alternatives, the HEI has been used to give a forestwide picture of habitat conditions for elk. Forestwide application of the model has masked the more subtle differences between alternatives during the 50 year planning horizon. However, generalized differences between alternatives can be addressed and are discussed below…" (USDA Forest Service 1990). The 1990 forest plans also recognized that the forestwide analysis did not account for the size or distribution of habitat components, but assumed that forage and cover areas were properly distributed throughout the national forest and were of usable size (USDA Forest Service 1990a). All three 1990 forest plans recognized that only those lands that have the potential for active management would be modeled. Since the 1990 forest plans were implemented, the HEI model has gone from being a computer model in DOS (Ager and Hitchcock 1994) to a model in ARCgis. The ARCgis model developed for the national forests in the Blue Mountains was used for this analysis.

The most significant amendment that affects achieving the conditions set forth for elk is the 1995 Regional Forester's Eastside Forest Plan Amendment 2 (Eastside Screens), which essentially altered the management direction envisioned in the 1990 forest plans (Lowe 1995). In 1993, interim direction, similar to the Eastside Screens, was adopted which recognized the threat to late and old structure forests. The intent of Eastside Screens was to move stands towards the desired HRV and especially toward late and old structure. Although there was a shift in how the national forests were to be managed, there was no corresponding shift in the cover requirements for elk. Table 331 displays the results based on vegetation dynamic development tool (VDDT) modeling and resulting acres that would meet elk cover requirements based on the potential vegetation group. Baty et al. (1995) concluded that although elk might benefit from the ecosystem management on ponderosa pine dominated winter ranges, a concern for security exists. The difficulty of meeting the standards for elk cover, especially within the Malheur National Forest, based on the landscape was recognized early on and resulted in 11 site-specific plan amendments between 1992 and 2004.

Table 331. Percent of the forested landscape that would meet cover and forage requirements for Rocky Mountain elk by Potential Vegetation Group based on VDDT modeling*

Elk Habitat	Cold Forest (percent)	Moist Forest (percent)	Dry Forest (percent)
Hiding cover	50-60	45-55	5-10
Thermal cover	40-50	30-40	10-15
Forage	25-30	25-35	75-95

* Results from HRV VDDT model (years 200 to 500 average)
Dry forest thermal = 40-plus percent canopy cover
Moist and Cold forest thermal = 60-plus percent canopy cover

Effects from Alternative A to Rocky Mountain Elk

In order to project alternative A, the no-action alternative, the existing condition was calculated for each of the management areas identified by the forests has having an HEI requirement (see project record for detailed discussion). The forest plan revision effort has classified vegetation into broad categories of either forested, woodland, herbland, or shrubland. The classification is further broken out as upland or riparian. The forested groups are classified into potential vegetation groups and densities of open or closed (Countryman 2007), which correspond to canopy covers of 40 percent or more in the dry vegetation group and 60 percent or more in the moist and cold vegetation groups. Within the VDDT model, vegetation is broken into structural

stages, which were then classified as whether they met the needs for hiding or thermal cover. Using these break downs could overestimate the amount of satisfactory cover compared to the original definitions (using 60 percent instead of 70 percent), but should still provide an accurate portrayal of total cover since they reflect the combination of marginal cover and satisfactory cover. However, it may also lead to an overestimate of the amount of forage, because in the moist and cold vegetation groups, open stands would be considered forage stands but could have canopy covers up to 59 percent, exceeding the definition of forage areas as being those of less than 40 percent canopy cover. As previously mentioned, existing conditions were calculated by national forest for each management area designation that had an existing targeted HEI or cover requirement (see table 332). Satisfactory cover in two of three management areas within the Malheur National Forest and one of three within the Umatilla National Forest is below the desired condition, but overall cover and the HEI are at or above the desired condition.

For alternative A, the existing HEI was calculated using the existing management strata (i.e., 3a, A10, 1, etc.) and the current cover-forage map. Because projections for the future are not spatial, no attempt was made to calculate an HEI for future decades. The amount of cover and forage at the end of each decade was calculated for each potential vegetation group and treatment strata (Active, Reserve, Wilderness) and then proportioned back out to the management areas identified in table 1 (appendix A) to produce projected cover based on potential vegetation group and management area (see table 333). It is assumed that if open motor vehicle route density remained constant then changes in cover would reflect changes in HEI. A slight improvement in satisfactory cover is noted for those management areas currently below desired conditions (table 332); however, they still remain below desired conditions. As pointed out by Powell (2005 (revised 2008)), it may be difficult to achieve satisfactory cover based on potential vegetation group, especially within the Malheur National Forest.

Rocky Mountain Elk Population Trend – According to CFR 219.19(a)(6), “Populations trends of the management indicator species will be monitored and relationships to habitat determined. This monitoring will be done with State fish and wildlife agencies, to the extent practicable.” All three national forests rely on survey data collected by state fish and wildlife agencies [Oregon Department of Fish and Wildlife (ODFW) and the Washington Department of Fish and Wildlife (WDFW)] for population numbers and trend analysis of all game species. Additionally CFR 219.19(a)(1) states, “These species shall be selected because their population changes are believed to indicate the effects of management activities.”

Although two of the 1990 forest plans referred to populations and predicted changes, all three 1990 forest plans acknowledged that populations of elk are influenced by many factors, such as predation, hunting, disease, competition with other animals, weather, etc., and that “habitat effectiveness might decline but have no influence on the number of elk”(USDA Forest Service 1990b). Population management through hunting has the greatest influence on population trends; however, most elk populations reach a social carrying capacity (the willingness of landowners and local residents to accept elk) well before they reach their environmental carrying capacity (ODFW 2003a). For current trend analysis, the population trend data provided by each agency has been used. Elk numbers (state management objectives) are managed by hunting, both sport and depredation. Habitat in general and conifer vegetation types in specific have not proven to be a limiting factor for population expansion. Population levels will instead be determined by hunting pressure.

Table 332. Current Habitat Effectiveness Index (HEI) and cover percentages by national forest and management area compared to current desired condition (the shaded areas are those that are below desired conditions). Optimum habitat has a value of 1.0.

National Forest	Management Area	HEI_S[1]	HEI_R[2]	HEI_F[3]	HEI_C[4]	HEI	Cover			HEI	Current Cover Desired Condition		
							Satisfactory	Marginal	Total		Satisfactory	Marginal	Total
MAL	MA 1, MA 2, MA F22	0.23	0.38	0.5	0.55	39%	3%	30%	33%	40%	12%	20%	32%
	MA 20, MA 20B, MA 21	0.69	0.86	0.5	0.59	65%	8%	39%	47%	70%	NA	NA	40%
	MA 4A, MA F20, MA F21	0.62	0.45	0.5	0.53	52%	2%	27%	29%	50%	10%	15%	25%
UMA	A10,C4,F4	0.64	0.57	0.5	0.72	60%	21%	27%	48%	60%	15%	15%	30%
	C3,C3A,C8	0.67	0.64	0.5	0.58	60%	7%	34%	41%	79%	10%	20%	30%
	C7,E2	0.56	0.52	0.5	0.65	56%	14%	33%	47%	45%	10%	20%	30%
	E1	0.62	0.40	0.5	0.50	50%	0%	64%	64%	30%	NA	NA	NA
WAW	MA 1, MA1 W	0.62	0.45	0.5	0.65	55%	15%	35%	50%	50%	NA	NA	30%
	MA 3, MA 3A, MA 18	0.62	0.56	0.5	0.65	58%	12%	29%	41%	74%	NA	NA	NA

1. HEI_S derived from the size and spacing of cover and forage areas
2. HEI_R derived from the density of roads open to vehicular traffic
3. HEI_F derived from the quantity and quality of forage
4. HEI_C derived from cover quality

Table 333. Projected cover percentages by national forest, management area, and decade for alternative A compared to current desired condition (the shaded areas are those that are below desired conditions)

National Forest	Management Area	Cover Decade 2			Cover Decade 5			Current Cover Desired Condition		
		Satisfactory	Marginal	Total	Satisfactory	Marginal	Total	Satisfactory	Marginal	Total
MAL	MA 1, MA 2, MA F22	6%	34%	40%	6%	31%	37%	12%	20%	32%
	MA 20, MA 20B, MA 21	13%	40%	53%	12%	37%	49%	NA	NA	40%
	MA 4A, MA F20, MA F21	3%	29%	32%	3%	28%	31%	10%	15%	25%
UMA	A10,C4,F4	23%	22%	45%	20%	13%	33%	15%	15%	30%
	C3,C3A,C8	8%	24%	32%	7%	15%	22%	10%	20%	30%
	C7,E2	20%	30%	50%	17%	21%	38%	10%	20%	30%
	E1	0	36%	36%	0%	18%	18%	NA	NA	NA
WAW	MA 1, MA 1W	18%	28%	46%	15%	20%	35%	NA	NA	30%
	MA 3, MA 3A, MA 18	15%	24%	39%	13%	18%	31%	NA	NA	NA

Effects to Rocky Mountain Elk in the Malheur National Forest – Figure 47 displays the estimated population and management objectives (MOs) for game management units that have at least 10 percent of the Malheur National Forest within the boundary. This includes Desolation, Northside, Murderers Creek, Beulah, Malheur River, and Silvies. It would appear that most years the total management objective for the national forest is being met or exceeded. For 2001, data was missing for three of the six GMUs, but based on estimates for 2000 and 2002 the management objective for 2001 was probably met or exceeded as well.

Cover, especially security cover is still important and according to table 333, even though the desire is to move towards HRV, the amount of treatment that could alter cover is so small (less than one percent per year) that in the first decade, cover remains close to what was envisioned in the 1990 forest plan. Open motor vehicle route density is not expected to increase above what was currently modeled for the HEI results previously discussed (see table 332), and in fact is expected to be reduced. This, coupled with the elimination of cross-country travel and the projected cover, would result in maintaining the current HEIs. Therefore, no measurable change in elk populations would be expected based on Forest Service management actions.

Effects to Rocky Mountain Elk in the Umatilla National Forest – Figure 48 and figure 49 display the management objective and estimated population for those game management units that contain at least 10 percent of the Umatilla National Forest within unit boundaries. This includes Desolation, Heppner, Ukiah, Wenaha, Mt. Emily, and Walla Walla in Oregon. The Umatilla National Forest also extends into Washington, incorporating all or portions of game management units Dayton, Lick Creek, Mountain View, Tucannon, and Wenaha. The Wenaha and Mountain View herds are interstate herds and the best population data for Wenaha is actually from Oregon (Fowler 2010). Therefore, data for Wenaha was not included in figure 49.

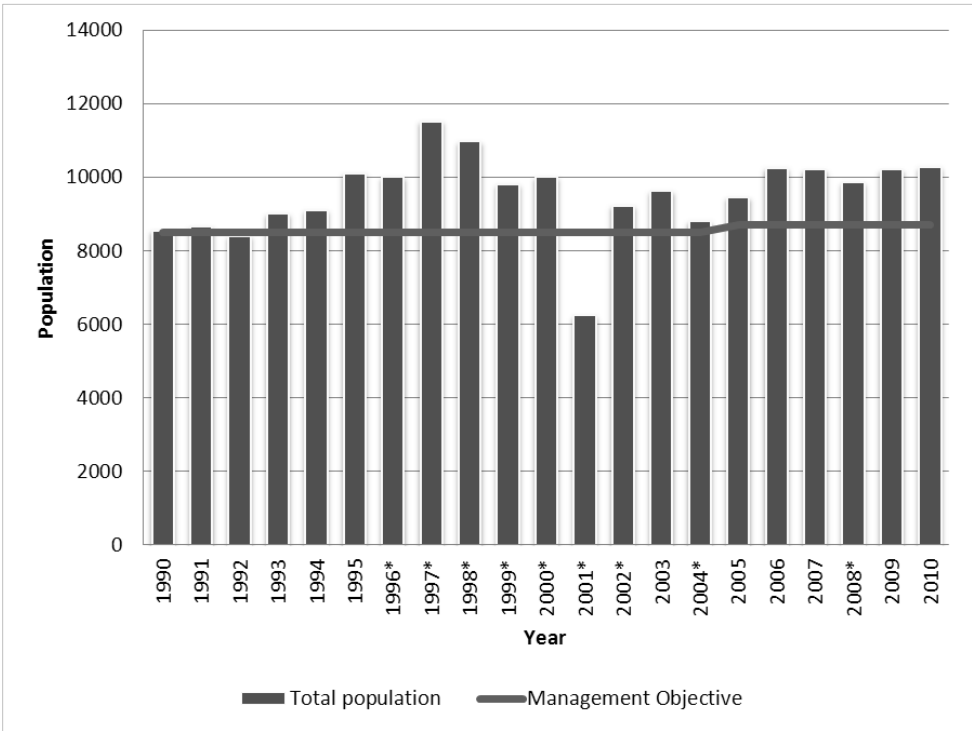

Figure 47. Estimated elk population for game management units within the Malheur National Forest compared to the management objective for 1990-2010 (asterisk indicates data missing for at least one game management unit)

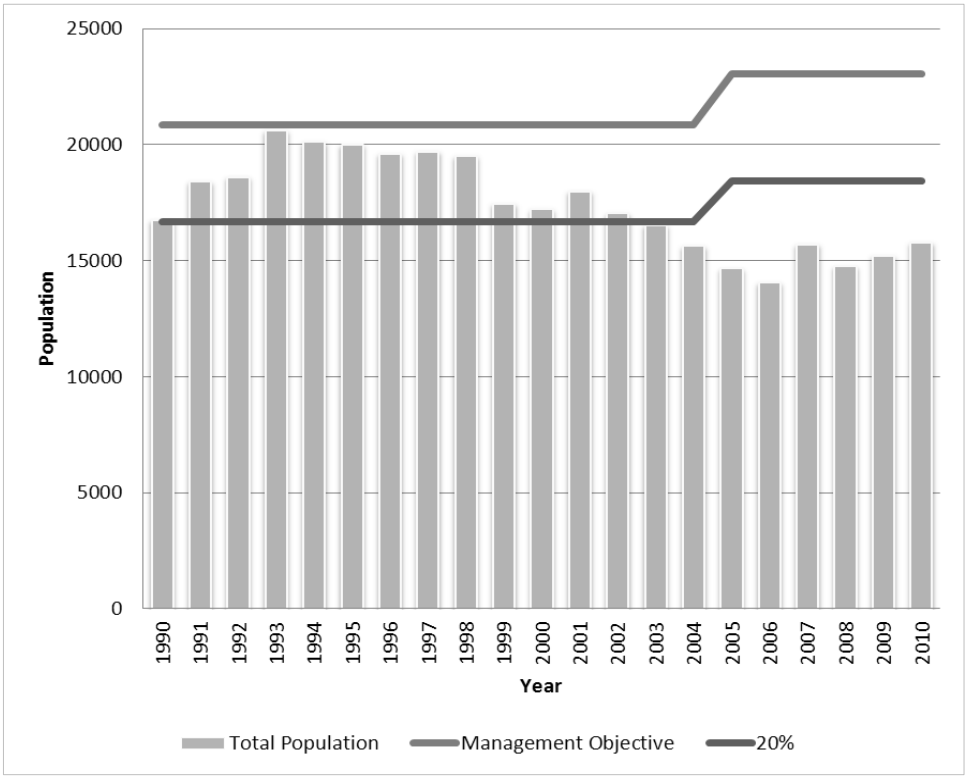

Figure 48. Estimated elk population for Oregon game management units within the Umatilla National Forest compared to the management objective for 1990-2010

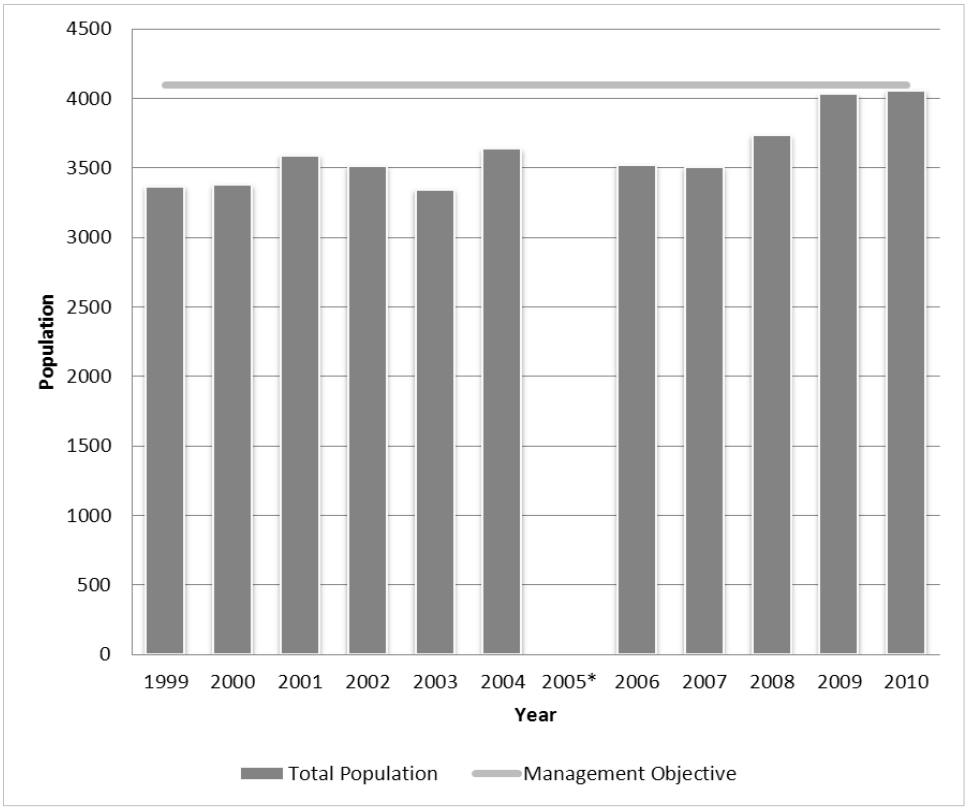

Figure 49. Estimated elk population for Washington game management units within the Umatilla National Forest compared to the management objective for 1999-2010 (asterisk indicates data is not available for at least one game management unit)

As displayed in the figures, the management objectives for the two states have not been met during the last decade. The forest plan indicated that when populations fell below 20 percent of the management objective for a herd unit, it should be determined if the cause is from Forest Service management. Oregon increased the management objective in 2005 for the Heppner Unit, which led to the change in figure 48, but populations would have still been below the 20 percent threshold even without this change. As displayed in table 332 and table 333, the national forest has generally met or exceeded desired conditions for HEI as well as for cover, indicating that forest management may not be responsible for this decline in population. Since 2004 two units, Wenaha and Mt. Emily, have consistently been 20 percent below the management objective(see table 334). The Wenaha unit has been documented as having low calf survival for several years, which has been attributed to predation (Fowler 2001, ODFW 2003a, ODFW 2006, Johnson 2011). ODFW is conducting a study within the Mt Emily unit on cougars, which are thought to be one of the leading factors for the decline to 50 percent of the elk management objective for that unit (Johnson 2011).

Similar to the discussion for the Malheur National Forest, the Umatilla National Forest still achieves the cover requirements as projected in the original plan also partly due to a predicted treatment level of less than 1 percent of the suitable acres.

Table 334. Percent of elk population management objective achieved by year and by game management unit (GMU)

GMU	2003	2004	2005	2006	2007	2008	2009	2010
Wenaha	33	32	34	38	38	36	35	38
Walla Walla	85	80	77	83	82	83	83	83
Mt. Emily	81	75	68	60	53	53	43	49
Ukiah	100	96	90	82	80	80	80	81
Desolation	105	95	92	108	108	95	84	98
Heppner	95	90	79	59	64	70	80	90

Effects to Rocky Mountain Elk in the Wallowa-Whitman National Forest – Figure 50 displays the estimated population and MOs for those game management units that have at least 10 percent of the Wallowa-Whitman National Forest within the unit boundaries. These units include: Minam, Imnaha, Catherine Creek, Keating, Pine Creek, Lookout Mountain, Snake River, Chesnimnus, Sled Springs, Starkey, Sumpter and Desolation. It would appear that in the last four years, the total management objective for the national forest has been met or exceeded. Between 1998 and 2005, a drop occurs and several units were not within the 15 percent identified as a trigger point in the forest plan. Most recently, even though the national forest is at or above the combined MO, two units, Keating and Sumpter, have been below the 15 percent level 4 out of the last 4 years.

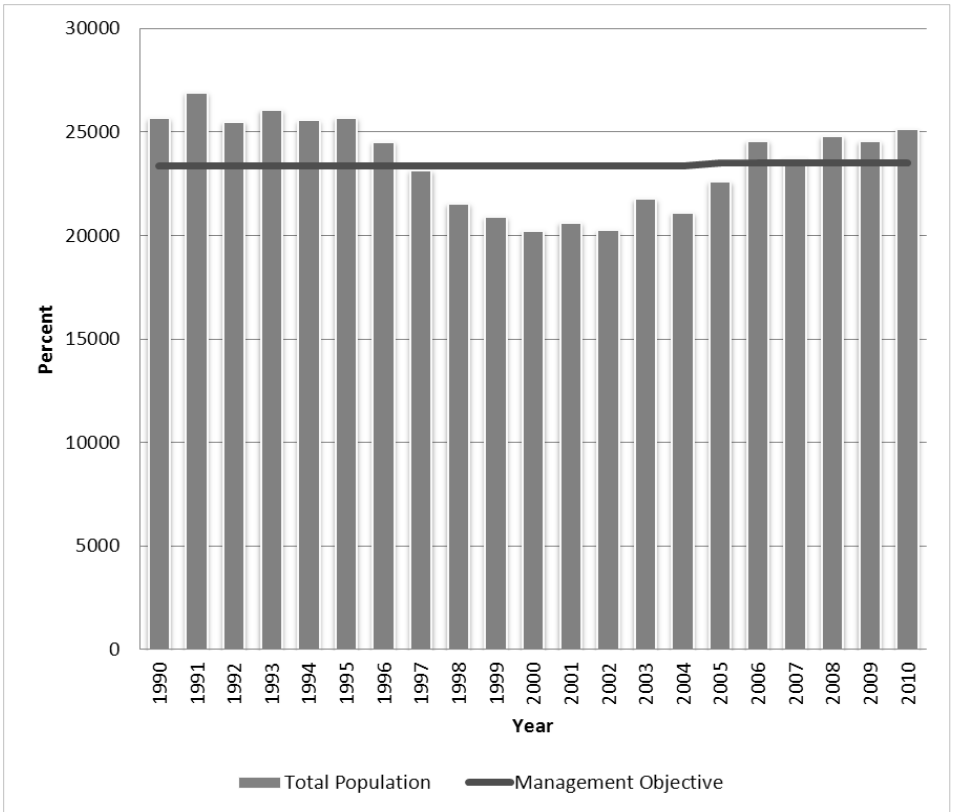

Figure 50. Estimated elk population for Oregon game management units within the Wallowa-Whitman National Forest compared to the management objective for 1990-2010

Again from table 332 and table 333, it would appear that the national forest has been achieving most of its standards for HEI and cover, so it is unlikely that Forest Service management was the cause of not meeting the population objectives.

Rocky Mountain Elk Security in Areas of Motor Vehicle Access – Rocky Mountain elk were selected as a management indicator species for the new planning effort for the Wallowa-Whitman (Farnsworth 2011) and Umatilla National Forests (Martin 2010) and will be used to represent security areas/motorized use management. Elk were selected as a management indicator species for the previous planning effort to represent general forest conditions. After review of several other forest plan revision efforts (Caribou, Medicine Bow, Payette, Boise, Sawtooth, Uinta, and Wasatch-Cache National Forests) and reviews of the intent of a management indicator species (Cooperrider 2002; Niemi et al. 1997; Owen 2010), it was decided that although hunted species such as elk do not truly meet the criteria to fulfill the purpose of management indicator species (changes in populations can be directly attributed to Forest Service management), they are very important both socially and economically and, as such, should be carried forward. Because elk occur in every habitat type and at virtually every elevation across the Blue Mountains, it was felt that they would be a useful species to monitor the effectiveness of motor vehicle use management and the change in availability of secure habitat. Open motor vehicle route density is a key element in determining whether or not elk remain in an area after the hunting seasons have started. If open motor vehicle route density is high, and security cover is low, elk will move until secure areas are found. Open motor vehicle route density is often the easiest and most effective attribute to manage since hiding cover criteria may take many years to meet the desired future condition.

Managing access to reduce elk vulnerability to hunting has some inherent problems in that the same controls used to restrict hunter travel also restricts sightseers, firewood gatherers, motorcyclists and others who use public lands (Moroz 1991). Unless the nature of the landscape somehow impedes human travel, access management will largely rely upon the willingness of people to voluntarily comply with travel restrictions (*ibid*). Open-road density of one mile per square mile has been considered a threshold above which elk will displace to avoid human disturbance (Christensen et al. 1993, Lyon 1983). Lyon and Christensen (2002) concluded that hiding cover alone cannot satisfy hunting season security requirements and neither can road closures and prevention of habitat fragmentation.

As such, the forest plan management question to be answered by selecting elk as a management indicator species is, "Can the state management objectives for populations continue to be achieved as the desired conditions for vegetation are achieved through the management of security areas (wilderness and roadless areas) and meeting the desired conditions for open motor vehicle routes?"

Many wildlife species, respond negatively to human disturbance (Boyle and Samson 1985, Gaines et al. 2003, and Tempel et al. 2008). Although two species were identified as focal species for human disturbance (USDA Forest Service 2010), Rocky Mountain elk and their relationship to human disturbance have probably received the greatest amount of study (Edge and Marcum 1991, Lyon 1983, Naylor et al. 2009, Rowland et al. 2004). The Blue Mountains are a popular area for resident and nonresident hunting and receives some of the greatest hunting pressure for elk in the State. Providing security areas, especially during the fall hunting seasons, is important for elk management. Many studies during the last three decades have shown that elk, when disturbed by humans, will leave an area that lacks sufficient cover (Hillis et al. 1991). Where forest canopy is greater than 50 percent, hiding cover and security areas can generally be provided.

Intrusion from sources other than hunting is increasingly a problem for elk managers (ODFW 2003a). This is particularly true on multiple-use public lands where access by motor vehicle and nonmotorized traffic is largely unrestricted and increasing (*ibid*). Traditional elk habitat models recognized the impacts from access, and used road density in order to evaluate impacts of proposed land management actions. This approach was better suited to the 1980s when most proposed projects were timber sales and associated roads needed for implementation. Since the early 1990s, both road building and timber sales have decreased while recreational, nonmotorized and motor vehicle cross-country activities and facilities have dramatically increased. While road density is still important, the impact from recreational access that doesn't use designated roads or trails is emerging as a pressing issue. Many federally administered public lands are open to cross-county travel by any means unless specifically closed (i.e., wilderness, seasonal area closures, etc.). The past growth of motor vehicle and nonmotorized recreational pursuits is believed by elk managers to threaten some herds and to have contributed to shifts of elk from some public lands onto adjacent private lands. When the forest plans were approved in 1990, cross-country motor vehicle travel was prohibited within much of the Umatilla National Forest; however, the Wallowa-Whitman National Forest did not prohibit cross country travel unless an area was closed to it by order. It is assumed that through implementation of the 2005 Travel Management Rule (36 CFR 212), both national forests will have very limited cross-country summer travel.

Security is provided through limiting open motor vehicle road and trail densities (Unsworth and Kuck 1991); maintaining vegetation that adequately shields elk from a hunters view (Edge et al. 1990) and the topography of the landscape (Edge and Marcum 1991). The Hillis paradigm (Hillis

et al. 1991) is often cited for the criteria that define security areas. Briefly, it identifies the size (250 or more acres), shape (nonlinear), and distance from open roads (more than 0.5 mile) for security areas as well as how much of the area (more than 30 percent) should be dedicated to security. At some point, however, the availability of security areas will not compensate for hunter density (Unsworth and Kuck 1991). Lyon and Christensen (2002) concluded that hiding cover alone cannot satisfy hunting season security requirements, and neither can road closures and prevention of habitat fragmentation.

Effects from Alternatives B, C, D, E, and F to Rocky Mountain Elk

Effects to Rocky Mountain Elk in the Umatilla National Forest – Security areas are those areas that have open motor vehicle route densities below 1 mile per square mile. As displayed in figure 51, for alternative C, 55 percent of the Umatilla National Forest would be considered security areas for Rocky Mountain elk. This is a result of the establishment of MA 3C, which would have a desired condition for open motor vehicle route density of less than 1 mile per square mile. In actuality, MA 3C currently would have open motor vehicle route densities higher than the desired, but during the life of the plan it is anticipated that the desired condition would be achieved. Alternatives E and F are essentially the same, and achieve a greater amount of security habitats through the anticipated implementation of the desired condition for roads in bull trout watersheds. Only slight differences occur between alternatives A, B, and D, with less than 25 percent of the landscape in security areas.

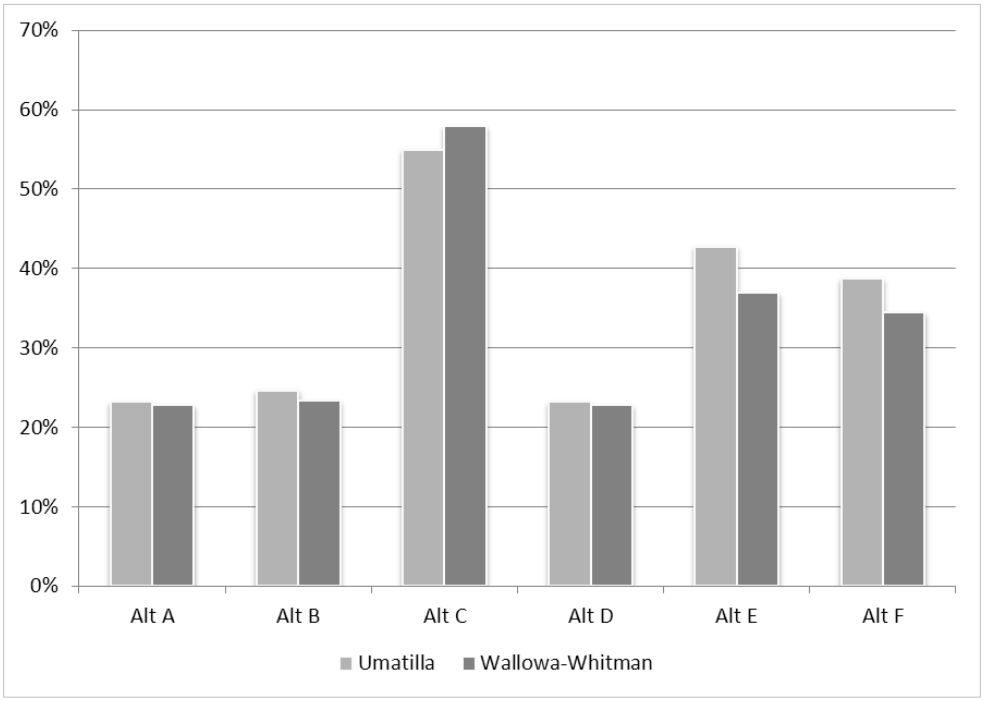

Figure 51. Percent of the Wallowa-Whitman and Umatilla National Forests in security habitats available for Rocky Mountain elk by alternative

Open motor vehicle routes (roads and trails) and security cover are the greatest consideration on summer range relating to habitat effectiveness (Christensen et al. 1993). Open motor vehicle route density during the hunting season is primarily an elk vulnerability consideration, since hunting is the primary source of elk mortality (Lyon and Christensen 2002). The alternatives

address travel management by providing a range of desired open motor vehicle route densities (open miles/square mile) by management area and forest landscape scales (see the access management effects discussion). Security cover then becomes important in those areas that have open motor vehicle routes in excess of 1 mile per square mile. It becomes a requirement for maintaining elk populations where hunting or human harassment occurs, and humans have easy access to elk habitat. Edge et al. (1990) believed this was the crux of the issue concerning the potential effects of timber harvesting on elk habitat effectiveness on spring-summer-autumn ranges. As displayed in figure 52, for three alternatives, less than half of the Umatilla National Forest has road densities that increase the importance of security cover for elk. For alternatives B and D, security cover would be important on more than 60 percent of the national forest. Assuming that the amount of land base in lower road density would indicate improved habitat for elk, then alternative C followed by E and then F would be the better alternatives for elk.

Although the Hillis paradigm (Hillis et al. 1991) indicates a need to have at least 30 percent of an area in security areas, historically this probably did not occur in all areas. Vegetation within the Blue Mountains national forests was modeled using VDDT to establish HRV (Countryman and Justice 2010). This data was then evaluated by potential vegetation group and structural stages to determine what percent of the landscape would come close to meeting the various definitions of cover (see table 333). The need for vegetative cover is reduced in areas of steep, convex topography which limits human access during hunting season as well as enhances the probability of elk escapement (Edge and Marcum 1991).

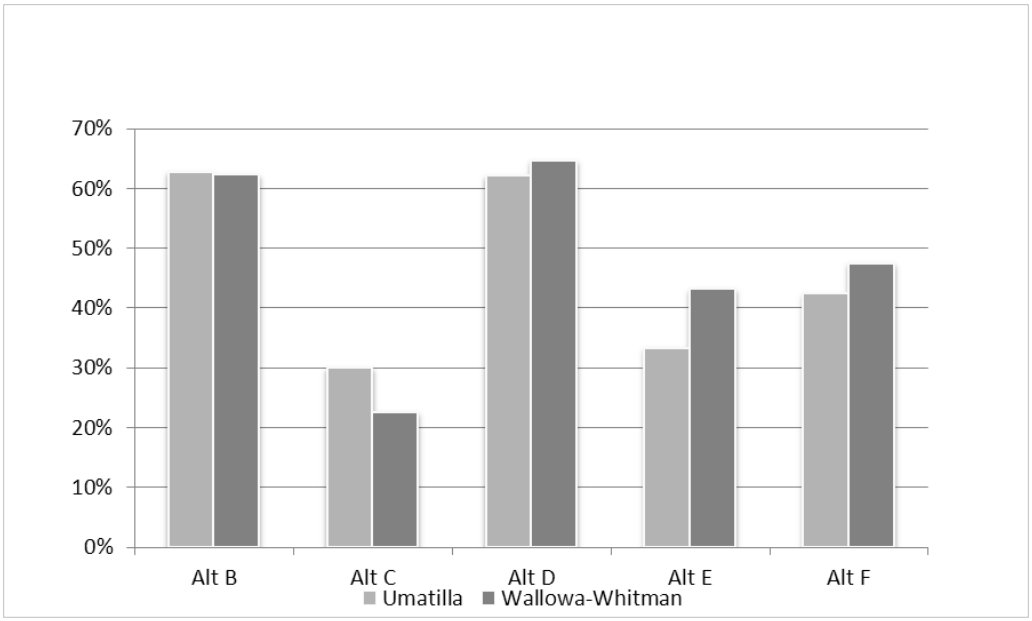

Figure 52. Percent of each National Forest by alternative that have open motor vehicle route densities higher than one mile per square mile

Using the HRV analysis as a basis, historical levels of hiding cover were determined for each alternative and each national forest for lands outside of the security areas presented above (wilderness, roadless, etc.). At the end of the second decade, none of the alternatives would have 30 percent of MA 4A General Forest in security cover (see figure 53) within the Umatilla National Forest. However, alternative D, the most aggressive treatment alternative, maintains

security cover within the expected range of historical variability (see figure 54) at the scale of MA 4A.

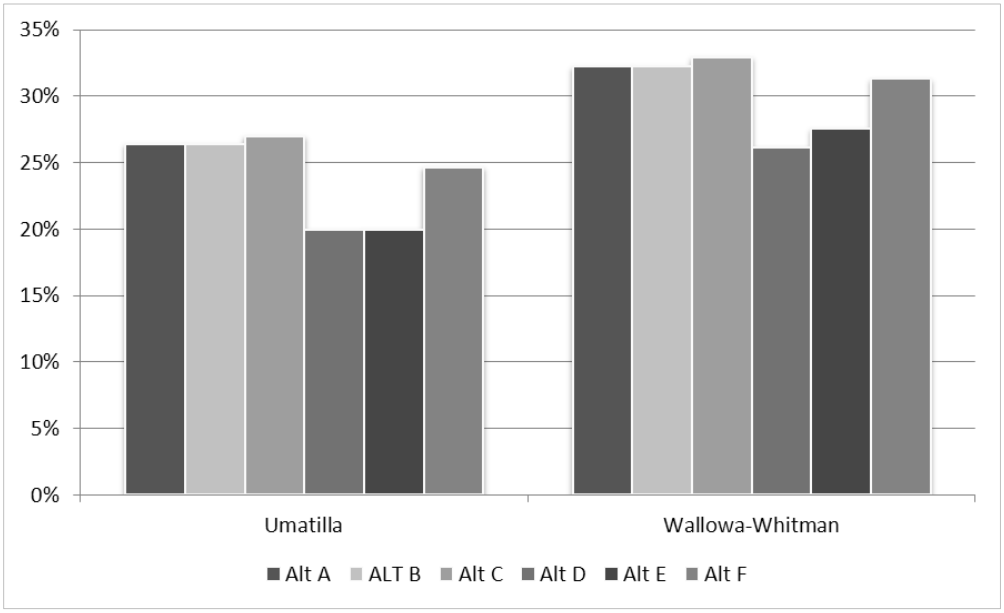

Figure 53. Hiding cover available for Rocky Mountain elk by alternative and national forest at the end of the second decade

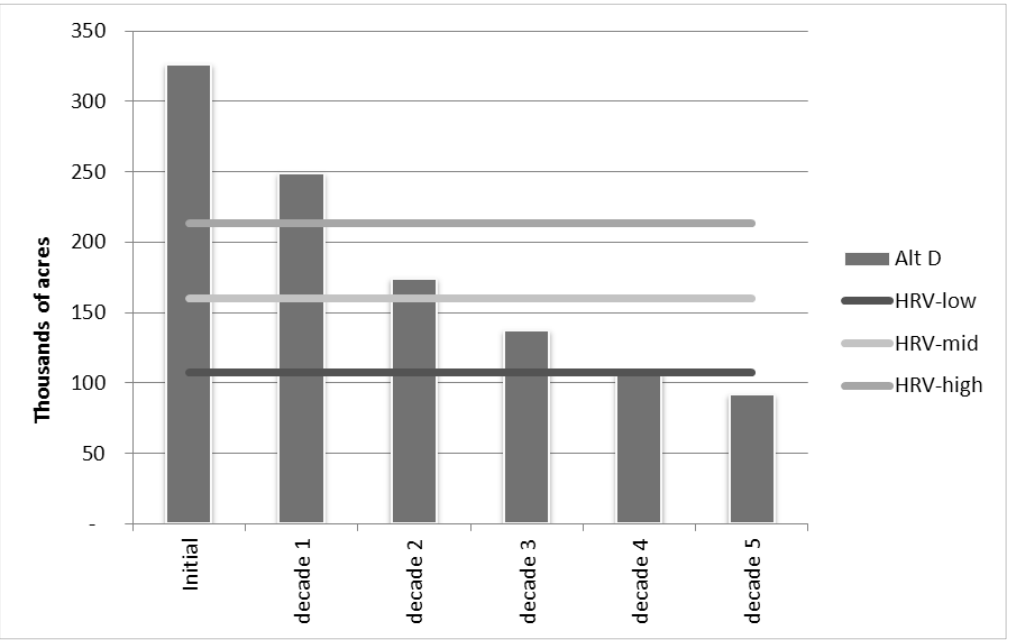

Figure 54. Elk hiding cover within active management areas in relation to HRV for alternative D during the first five decades for the Umatilla National Forest

None of the alternatives meet the paradigm of 30 percent security cover presented by Hillis et al. (1991); however, all alternatives would maintain levels of security cover that exceed what would

have been expected historically. The effect of this lack of security cover is ameliorated somewhat by the amount of wilderness areas and backcountry areas within the Umatilla National Forest.

Alternative D is the only alternative that has a desired condition for open motor vehicle route densities greater than 2.4 miles per square mile. Although it appears that the proposed desired condition for open motor vehicle route density within the Umatilla National Forest (2.4 miles per square mile) is greater than the 1990 forest plan desired condition (two miles per square mile), the 1990 forest plan desired conditions are for the entire national forest, which includes using wilderness areas and roadless areas to calculate road density per square mile. It is recognized that there will be areas where achieving the desired density will not be possible due to the high standard of a road and its connectivity to other end points, but these hopefully will be the exception and not the rule. Taking all of these factors together, alternative C provides the greatest security for elk, followed by E, F, B, and finally D.

Effects to Rocky Mountain Elk in the Wallowa-Whitman National Forest – At the end of the second decade, all alternatives except D and E maintain more than 30 percent of the landscape in security cover within the Wallowa-Whitman National Forest (see figure 53). Security cover begins to dip below the 30 percent level by the fourth decade. At the scale of MA 4A, alternative D, the most aggressive treatment alternative, maintains vegetative conditions that meet security cover definitions within the range of historical variability (see figure 55).

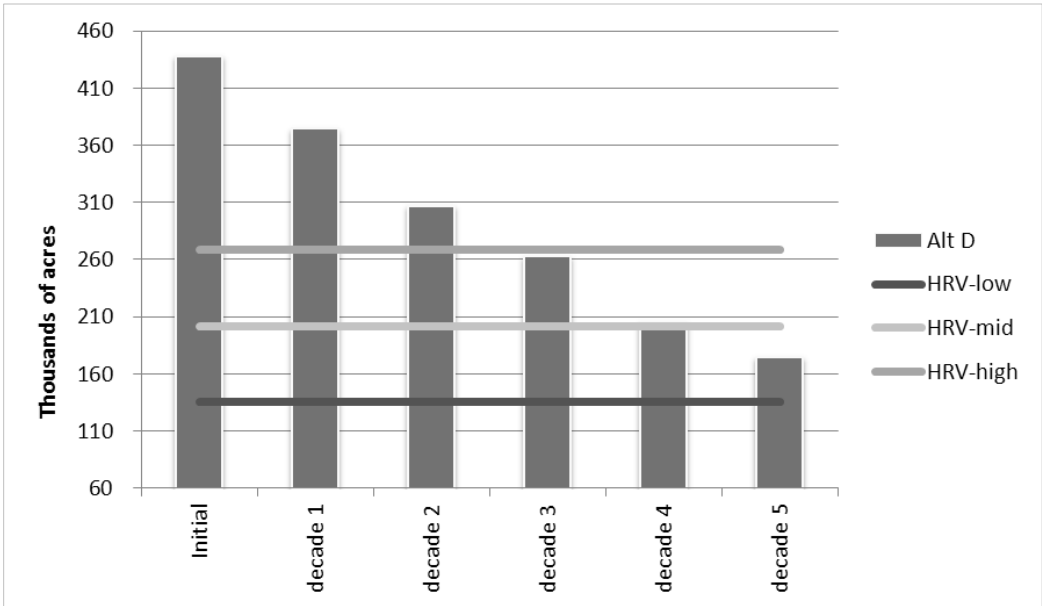

Figure 55. Hiding cover available for Rocky Mountain elk for the first five decades compared to HRV for alternative D within the Wallowa-Whitman National Forest active management areas

Similar to the discussion for the Umatilla National Forest, alternative D is the only alternative that has a desired condition for open motor vehicle route densities greater than 2.4 miles per square mile. It is recognized that there will be areas where achieving the desired density will not be possible due to the high standard of a road and its connectivity to other end points, but these hopefully will be the exception and not the rule. Taking all of these factors together, alternative C provides the greatest security for elk, followed by E, F, B, and finally D.

Rocky Mountain Elk Population Trends – Current population trends were discussed in detail for alternative A and all alternatives anticipate continuing the use of population data collected by the state game and fish agencies to assess population trends. Although alternative C reduces access to a large portion of all three Blue Mountains national forests and alternative D maintains the current situation, the population of Rocky Mountain elk is expected to remain stable during the life of the plan for any of the alternatives. This is because herd numbers are managed by the state game agencies to stay within the population objectives that have been set by the respective agency.

State elk populations objectives within the Blue Mountains are displayed in table 335. Of the 23 game management units encompassing portions of National Forest System lands, nine are not currently within plus- or minus-10 percent of the population objectives and four units exceed the population objectives. It could be important to assess motor vehicle access management to help bring populations within the desired objective. Most units contain multiple ownerships, which must be considered in attempting to either increase or decrease access to achieve population objectives. Elk populations are expected to remain abundant due to their social and economic importance, management emphasis by state wildlife agencies, and the adaptability of the species.

White-headed Woodpecker

The white-headed woodpecker is considered a sensitive species within Region 6 and is listed as apparently secure in the United States and imperiled and vulnerable to extirpation or extinction for both Oregon and Washington (Natureserve 2011). It has been identified as a focal species in several of the subbasin plans completed for the Northwest Power and Conservation Council within the Columbia Basin and is currently considered as a focal species for the Blue Mountains national forests plan revision effort. Wisdom et al. (2000) indicated that source habitats basin-wide have declined moderately or strongly in more than 50 percent of watersheds containing appropriate habitat types for this species. The Blue Mountains Ecological Unit showed a balanced mix of increases and decreases of habitat within watersheds (*ibid*).

Because the white-headed woodpecker was discussed in some detail as a focal species previously, only the analysis associated with its function as a management indicator species is discussed here.

Effects from Alternative A to the White-headed Woodpecker – The white-headed woodpecker was a member of the primary cavity excavators identified as a management indicator species for all three national forests. The Malheur National Forest specifically named this species, whereas the Wallowa-Whitman National Forest included it in a list of the species it considered primary excavators, The Umatilla National Forest indicated primary excavators, which would have included this species. As previously mentioned, areas subject to management were to maintain snags at a level that would maintain at least 60 to 65 percent of the potential population. Based on appendix 22 from Thomas et al. (1979), this would include 13.5 snags per acre greater than or equal to 10 inches d.b.h. in both ponderosa pine and mixed conifer.

Because all three national forests were actually using the suite of primary cavity excavators as management indicator species, an analysis of alternative A for the white-headed woodpecker is not presented here. Rather, the reader is referred to the analysis that has already been presented for primary cavity excavators.

Table 335. Percent of Rocky Mountain elk population objective achieved by management zone, game management unit, and year for the last decade for units containing National Forest System lands in the Blue Mountains

Management Zone	GMU	National Forest		Year									
		UMA	WAW	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Wallowa	Minam	NA	73%	90	90	100	100	105	105	105	105	105	105
	Imnaha	NA	74%	100	119	125	138	138	138	150	238	225	225
	Catherine Creek	NA	23%	68	84	67	64	90	117	117	140	180	160
	Keating	NA	41%	60	50	54	64	43	82	72	61	75	85
	Pine Creek	NA	57%	120	105	125	162	158	77	81	106	87	168
Totals				**95**	**90**	**105**	**112**	**113**	**107**	**119**	**134**	**136**	**158**
Wenaha-Snake	Snake River	NA	93%	81	79	88	89	92	97	97	105	95	95
	Chesnimnus	NA	47%	69	83	83	86	89	97	97	100	106	106
	Sled Springs	NA	18%	73	76	78	78	95	95	95	91	91	91
	Wenaha	69%	NA	26	27	33	32	34	38	38	36	35	38
	Walla Walla	30%	NA	85	85	85	80	77	83	82	83	83	83
	MT Emily	36%	8%	85	85	81	75	68	60	53	53	53	49
Totals				**70**	**73**	**75**	**73**	**76**	**78**	**77**	**78**	**77**	**77**
Umatilla-Whitman	Starkey	3%	60%	89	88	100	92	100	123	107	100	101	97
	Ukiah	27%	6%	120	102	100	96	90	82	80	80	80	81
	Sumpter	NA	29%	100	100	102	84	90	88	80	79	72	76
	Desolation	53%	15%	145	125	105	95	92	108	108	95	84	98
	Heppner	27%	NA	110	100	95	90	79	59	64	70	80	90
	Fossil	3%	NA	150	130	125	125	169	67	67	64	67	75
Totals				**119**	**108**	**105**	**97**	**103**	**88**	**84**	**81**	**81**	**86**
Washington State	Blue Creek-Watershed	8%	NA	136	128	88	91		105	90	122	128	121
	Dayton	23%	NA	106	76	79	92		74	86	92	111	105
	Tucannon	80%	NA	65	69	66	75		62	87	76	65	67
	Wenaha	100%	NA		20				62	47			34
	Mountain View	33%	NA	42	65	97	83		101	87	55	88	93
	Lick Creek	71%	NA	77	88	79	98		89	79	103	91	102
Totals				**72**	**74**	**67**	**73**		**82**	**79**	**75**	**81**	**87**

Effects from Alternatives B, C, D, E, and F to the White-headed Woodpecker – The white-headed woodpecker was chosen as a management indicator species to represent the open-canopied ponderosa pine forests and specifically the medium to large trees and snags associated with older stands. The following management indicator species assessment utilizes the same definition for source habitat used by Wales et al. (2011).

Effects to White-headed Woodpecker in the Malheur National Forest – Figure 56 displays the predicted amount of source habitat for each alternative for the next five decades. As illustrated for all alternatives, although they are well below HRV, they have a positive trend for increasing source habitat. The results of the focal species assessment model indicated that habitat for the white-headed woodpecker is not well distributed. There is relatively little change in source habitat between alternatives B, C, E, and F in the first decade. All alternatives indicate an upward trend in source habitat over time and such a trajectory would indicate that populations should be stable throughout the plan period, assuming no other complicating factors occur. Alternative C shows the slowest recovery rate in source habitat over time, whereas alternative D shows the fastest. Habitat levels are a result of past management activities and even the increase (nearly double) projected for alternative D, is not sufficient to reach the 40 percent level often cited in the literature as a critical threshold (Landres et al. 1999, Lindenmayer and Luck 2005, Rompré et al. 2010, With and Crist 1995). Because of this, a key management concern for this species will be the spatial arrangement of habitat. Flather and Bevers (2002) suggest that as habitat amount falls below a critical threshold (i.e., 40 percent); the arrangement of that habitat becomes an even more important factor in enhancing viability of species.

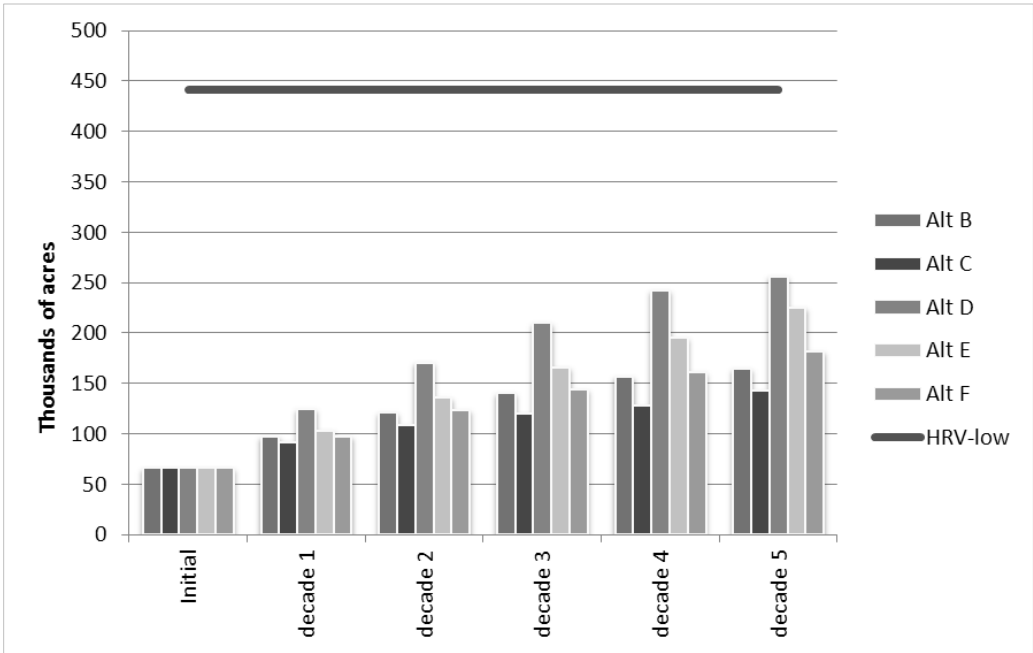

Figure 56. Decadal changes of white-headed woodpecker habitat on the Malheur National Forest compared to what would have been expected historically

Effects to White-headed Woodpecker in the Umatilla National Forest – Figure 57 displays the predicted amount of source habitat for each alternative for the next five decades. As illustrated for all alternatives, although they are well below HRV, the alternatives have a positive trend for increasing source habitat. Essentially the same trend described for the Malheur National Forest would occur for the Umatilla National Forest. The discussion will not be repeated.

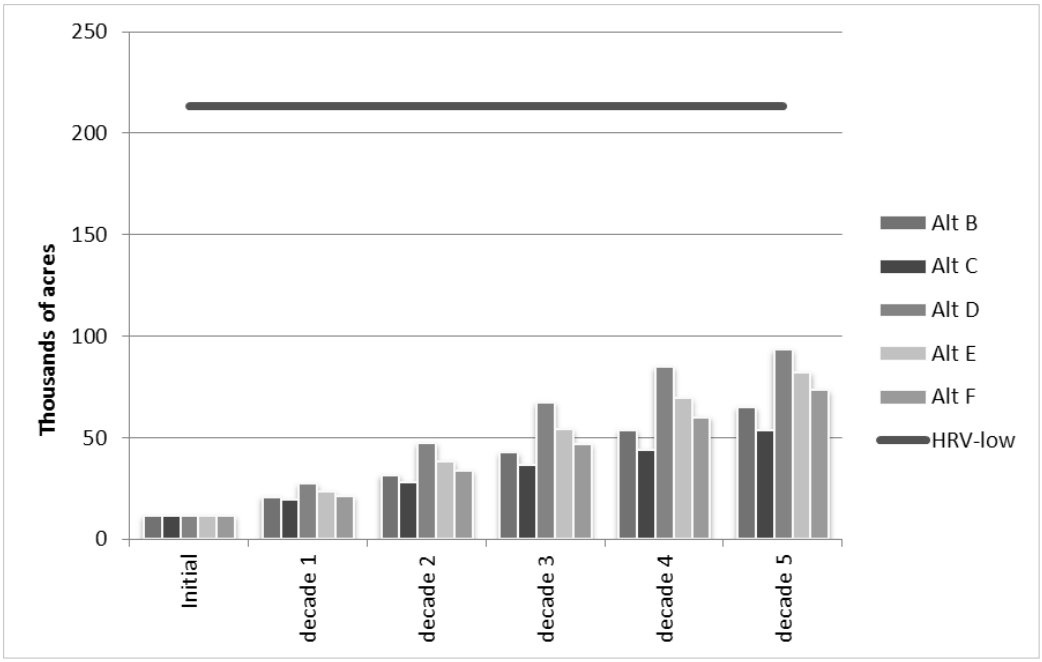

Figure 57. Decadal changes of white-headed woodpecker habitat on the Umatilla National Forest compared to what would have been expected historically

Effects to White-headed Woodpecker in the Wallowa-Whitman National Forest – Figure 58 displays the predicted amount of source habitat for each alternative for the next five decades. Again, the trend for the Wallowa-Whitman National Forest would be the same as for the Malheur and the Umatilla National Forests. The discussion will not be repeated.

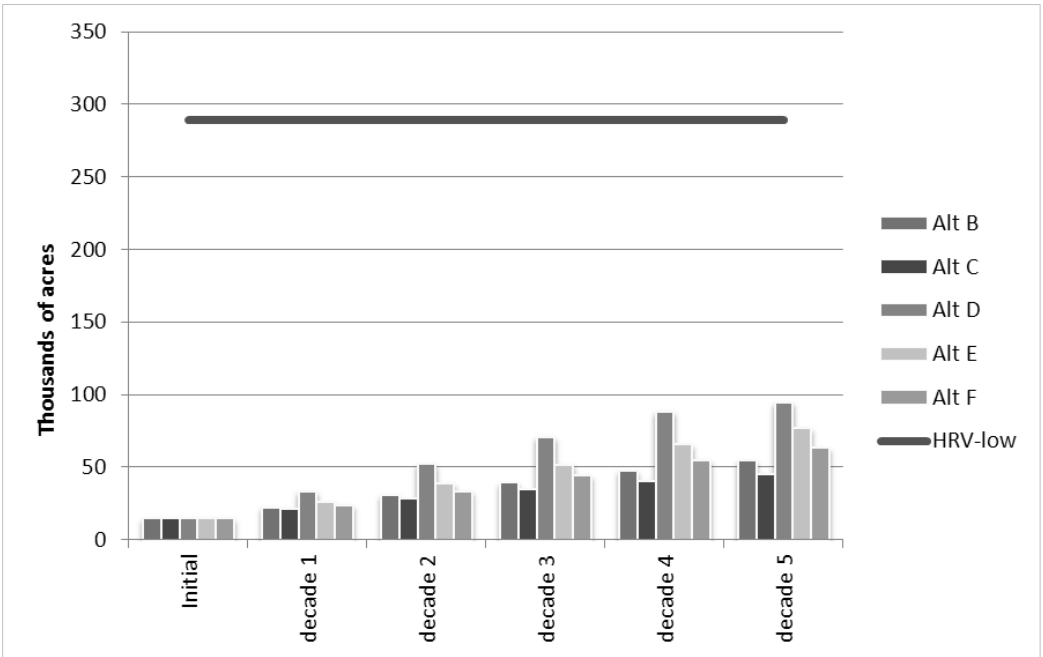

Figure 58. Decadal changes of white-headed woodpecker habitat on the Wallowa-Whitman National Forest compared to what would have been expected historically

White-headed Woodpecker and Snags – Large snags are a part of the habitat for which the white-headed woodpecker has been identified as a surrogate to measure how well the desired conditions of the plan alternatives are being met. Essentially all alternatives, with the exception of alternative D, would have the same standard and guideline (WLD-HAB-12 S-7) to provide protection for all snags 21 inches d.b.h. or larger and would maintain at least 50 percent of the current snags between 12 and 21 inches d.b.h. The desired condition for all alternatives is to have varying levels of snag density and sizes across the landscape. As such, it is not anticipated that levels of snags would vary substantially between alternatives and as shown in table 336, it would appear that snags are within the historical range of variability for roost and nest sites of the white-headed woodpecker.

Table 336. Snag density greater than 20 inches d.b.h. per acre for 30, 50, and 80 percent tolerance levels found at white-headed woodpecker nest and roost sites in the ponderosa pine-Douglas-fir forest, larger trees vegetation condition class, percent of the landscape that historically met these levels, and percent of the landscape currently meeting these levels for the dry forest potential vegetation group based on Mason and Countryman (2010)

Species tolerance levels from DecAID table PP_DF_O.sp-22			Percent of landscape that historically met species tolerance levels (snags per acre)		Percent of landscape that currently meets species tolerance levels (snags per acre)	
30%	50%	80%	< 80% (> 0 to ≤ 2)	> 80% (> 2)	< 80% (> 0 to ≤ 2)	> 80% (> 2)
0.2	1.3	2.8	79%	15%	81%	13%

White-headed Woodpecker Population Trend – Data needed to assess population trends of the white-headed woodpecker are lacking at the national forest, region and range scales. The breeding bird surveys for Oregon show no trend (Sauer et al. 2008). However, the accuracy is considered to be very imprecise (Red) and would not be able to detect a five percent per year change over the long term. Based on the habitat predictions, it is anticipated that populations would at least remain stable for all alternatives. Although habitats could be poorly distributed, dispersal within the planning area was not considered to be of concern for this species (Wales et al. 2011).

Management Indicator Species Common to Alternatives B, C, D, E and F

Mule Deer – Malheur National Forest

Similar to the discussion for Rocky Mountain elk, mule deer (*Odocoileus hemionus*) are a hunted species and do not truly meet the criteria to fulfill the purpose of management indicator species (where population change can be directly attributed to Forest Service management). Because they are important both socially and economically, mule deer were selected as a management indicator species for the new planning effort only for the Malheur National Forest (Gouchner 2010). They were selected to represent security areas/motor vehicle use management and the herbaceous understory of early successional and opened canopy dry forest.

Mule Deer Distribution – Mule deer are extremely adaptable and can be found in all major climatic and vegetation zones of the Western United States except the arctic, tropics and extreme deserts (Boyd and Cooperrider 1986). Mule deer are native to Oregon and typically are found east of the crest of the Cascade Mountain Range. Vernon Bailey (1936) estimated Oregon's mule deer population to be 39,000 to 75,000 animals from 1926 to 1933. Mule deer populations increased through the 1930s and 1940s, peaking during mid-1950s, mid-1960s and in the mid-1970s. Fluctuations in mule deer populations can be attributed to several factors that directly or indirectly affect habitat. Drought conditions reduce forage and cover values, while severe winter weather conditions can result in large losses of deer.

Mule Deer Habitat – Oregon's deer management plan (ODFW 2003a) describes mule deer habitat in eastern Oregon:

> The most important deer habitats in Eastern Oregon are summer habitat (including areas needed for reproductive activities) and winter habitat. Preferred summer habitat provides adequate forage to replace body reserves lost during winter and to maintain normal body functions. Summer habitat also includes areas specifically used for reproductive purposes. These areas must have an adequate amount of succulent vegetation, offering highly nutritional forage. In addition, areas used for reproduction should provide isolation from other deer, security from predators and minimal competition from other ungulates. Summer habitat areas are common throughout Eastern Oregon, and can be found in areas varying from lowland agricultural lands to high elevation mountain areas.
>
> Winter habitat is found predominately in lower elevation areas of Eastern Oregon. These areas usually have minimal amounts of snow cover and provide a combination of geographic location, topography, and vegetation that provides structural protection and forage. Due to the low nutritive values of available forage during the winter, deer are forced to rely on their body reserves acquired during the summer for winter survival.

Deer habitat has changed dramatically during the last 100 years. Overgrazing by livestock during the late 1800s and early 1900s resulted in rangelands that were dominated by shrubs and forb species more favorable for deer, and populations increased (ODFW 2003b). Mule deer numbers in general have decreased during the past decade across the western United States, which is partly explained by mule deer's need for early and mid-successional habitats; habitats that are being lost due to a lack of disturbance either from fire and/or mechanical (timber harvest) treatment. Similar patterns were noted in most western states (Unsworth et al. 1999). Increased fire suppression activities allowed the encroachment of woody vegetation resulting in old decadent shrub plants that have less nutritional value for deer, the loss of desirable shrub and forage species, and the loss of forested areas that were maintained as opened canopy under natural fire regimes and provided for the growth of many important deer browse plants (Hayden et al. 2008).

Nutritional intake is a critical component of deer biology. Mule deer, like elk, are somewhat of a habitat generalist, although deer have a more selective diet, selecting higher quality forage than elk (ODFW 2003b), mostly forbs and shrubs/trees (Bartmann 1983, Findholt et al. 2004). Findholdt et al. (2004) suggested this lack in flexibility could result in increased competition for forage resources with cattle and elk when densities of these animals are high or forage production is low. Because the emphasis currently on National Forest System lands is to manage towards HRV, it was felt that mule deer would respond to the improvement in the understory in the dry forest because of the movement towards more open canopy as well as the increase in early seral stages.

Along with a concern for improving forage conditions for mule deer, is the concern of maintaining adequate security areas (Vavra et al. 2005, Wisdom et al. 2005, Wisdom et al. 2005a). Mule deer reaction to human disturbance is slightly different than elk (Taylor and Knight 2003). Deer are found closer to roads than elk on shared ranges, which may be a result of mule deer avoidance of elk (Johnson et al. 2000, Wisdom et al. 2005, Wisdom et al. 2005a). Human disturbance still results in reducing the quality of habitat for mule deer and therefore they were selected to indicate the effectiveness of motor vehicle use management and secure habitat change. Where road density is high, and security cover is low, deer will move until secure areas are found. Open-road density is often the easiest and most effective attribute to manage since hiding cover criteria may take many years to meet the desired future condition.

As such, the forest plan management question to be answered by selecting mule deer as a management indicator species for the Malheur National Forest is, “Will achieving HRV in the dry forest and meeting the desired conditions for human access on the Forest help the State achieve their population management objectives?”

Effects from Alternatives B, C, D, E, and F to Mule Deer

Figure 59 displays the amount of forest structure (open forest, early successional) within the dry potential vegetation group that is anticipated to provide forage for mule deer. In the first decade, there does not appear to be a large difference between alternatives. The trend appears to be that alternatives B and F are relatively stable; alternatives D and E increase; and alternative C decreases the amount of forage over time.

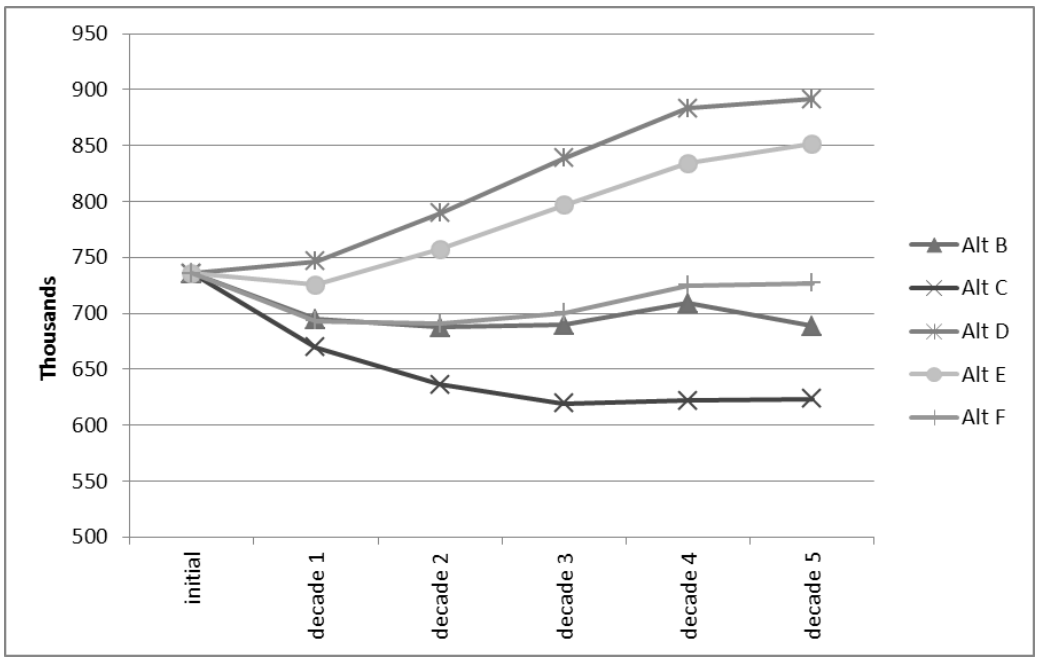

Figure 59. Acres of mule deer forage areas within the Malheur National Forest by alternative for the first five decades

On the other hand, when comparing the amount of area that provides security, a different trend is apparent: alternative C would provide the greatest amount of secure areas, whereas the least amount would be provided by alternative D (figure 60). Finally, hiding cover within the areas to be actively managed is still important (Germaine et al. 2004). None of the alternatives approach what historically has been considered the optimum amount of cover (40 percent) for elk and mule deer habitat (Thomas et al. 1979). Reynolds (1969) indicated that deer need areas of heavy stocking levels (in excess of 160 square feet of basal area in immature stands) to provide escape and security cover. Cover continues to be important in the presence of human disturbance as mule deer, unlike elk, probably hide rather than flee disturbance (Vavra 2009). As with secure areas, alternative C provides the greatest amount of hiding cover over time with alternatives B and F being relatively the same during the first three decades (see figure 61). Alternative D, which provides the greatest increase in forage, provides the least amount of hiding cover. Considering the tradeoffs between all of the alternatives, in all likelihood either alternative B or F would provide the best combination of increased forage while maintaining security areas for mule deer.

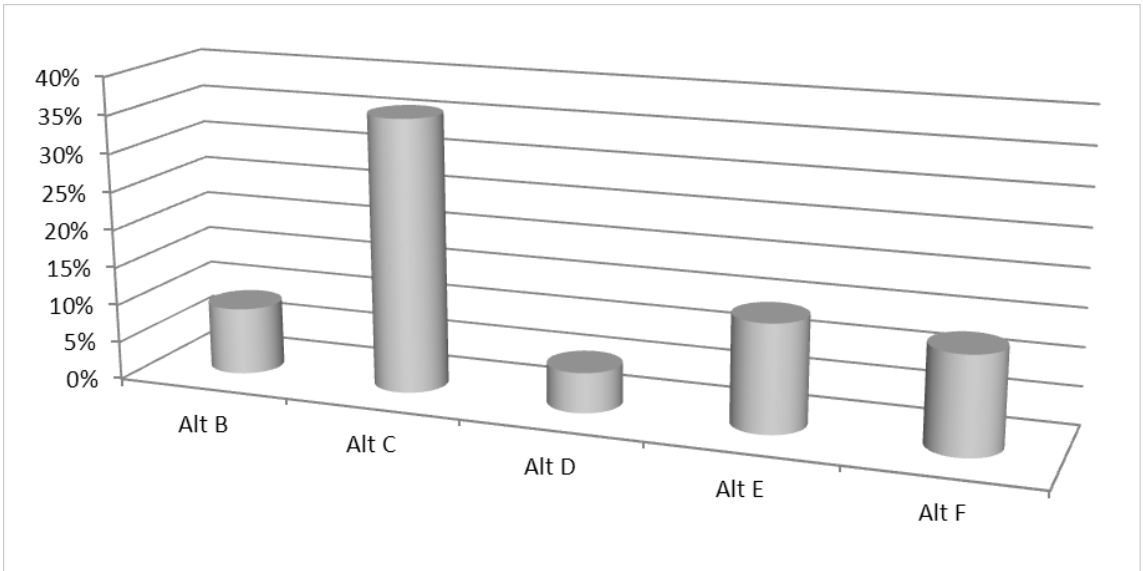

Figure 60. Mule deer security habitat available by alternative for mule deer for the Malheur National Forest

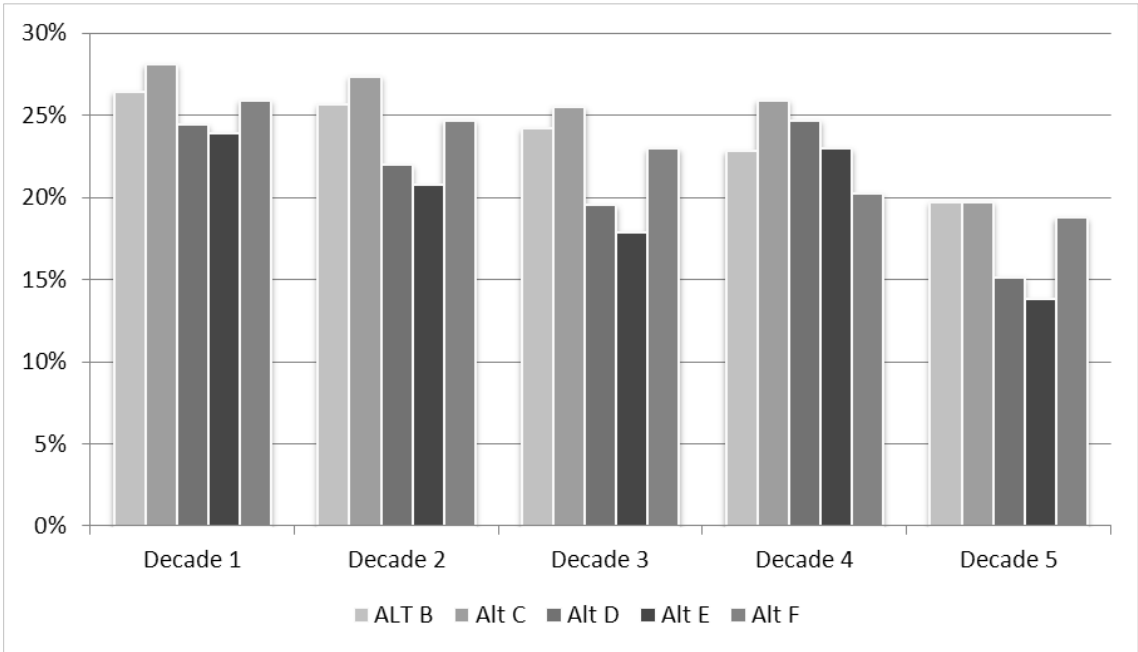

Figure 61. Percent of active landscape in mule deer hiding cover by alternative for five decades within the Malheur National Forest

Mule Deer Population Trends – According to CFR 219.19(a) (6), "Populations trends of the management indicator species will be monitored and relationships to habitat determined. This monitoring will be done with State fish and wildlife agencies, to the extent practicable." The Malheur National Forests would rely on survey data collected by the Oregon Department of Fish and Wildlife (ODFW) for population numbers and trend analysis of all game species.

Vernon Bailey (1936) estimated Oregon's mule deer population to be 39,000 to 75,000 animals from 1926 to 1933. Between 1990 and 2001, populations of mule deer were consistently below

the management objective for Oregon (ODFW 2003b). This continues to be the case for mule deer within the Malheur National Forest as well (figure 62).

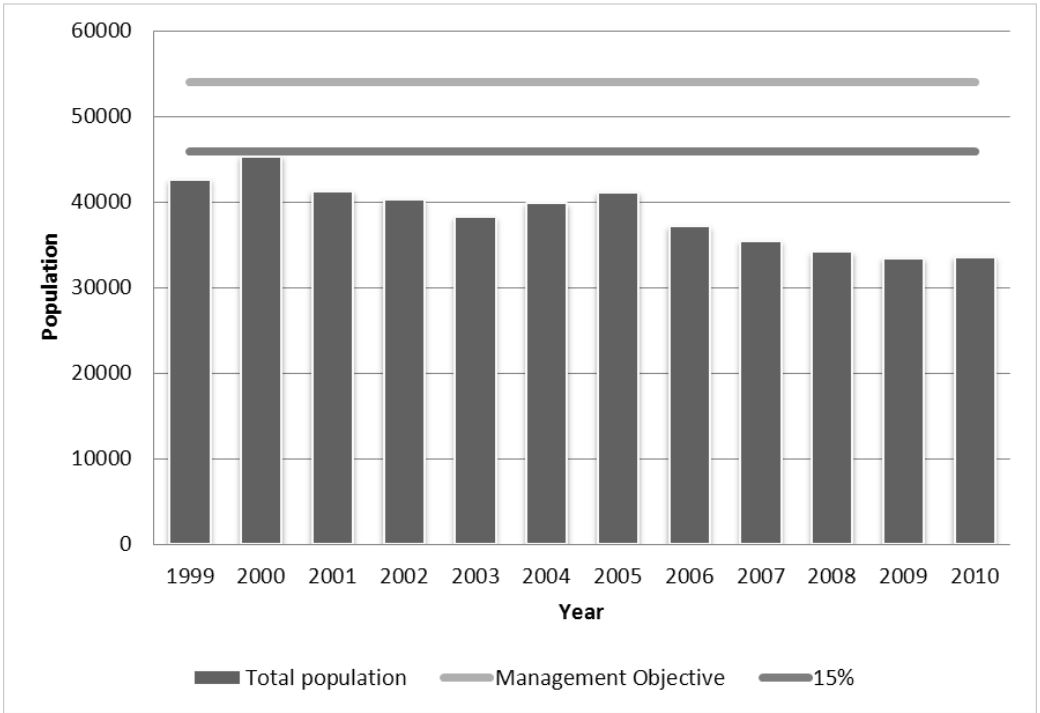

Figure 62. Estimated population of mule deer in comparison to the management objective for those units within the Malheur National Forest between 1999 and 2010

Many mule deer ranges will no longer support historical deer population levels, in part due to reduction of habitat caused by human development and changes in land use (Mule Deer Working Group 2003). Moderate population increases may be attained in some units with careful management; however, a return to the high deer population levels present in the 1950s, 60s and 70s probably will not occur due to changes to habitat and public acceptance (ODFW 2003a).

Fluctuations in mule deer populations can be attributed to many factors including drought, which reduces forage and cover values, and severe winter weather that result in large losses of deer. Both factors can cause poor deer condition and result in lower deer survival. In contrast, years of adequate moisture and mild winters will normally result in increased deer populations. Predation has recently been acknowledged as a contributor to suppressing deer populations (ODFW 2006, Robinson et al. 2002).

Mule deer numbers are held in check by hunting, both sport and depredation. State wildlife departments can change the number of harvest permits allocated, season lengths, and sex to be harvested by game management units, all of which affect populations. Although improvement is anticipated, especially in forage conditions, for all alternatives, the total number of acres that would be treated in the dry potential vegetation group probably wouldn’t be enough to cause a perceptible increase in populations that could be attributed to Forest Service management activities. It is assumed that mule deer populations would remain stable for all alternatives.

Domestic Livestock Grazing in Relation to Management Indicator Species

Forest Service regulations (36 CFR §219.20) related to forest planning and grazing states:

> In forest planning, the suitability and potential capability of National Forest System lands for producing forage for grazing animals and for providing habitat for management indicator species shall be determined as provided in paragraphs (a) and (b) of this section. Lands so identified shall be managed in accordance with direction established in forest plans.
>
> (a) Lands suitable for grazing and browsing shall be identified and their condition and trend shall be determined. The present and potential supply of forage for livestock, wild and free-roaming horses and burros, and the capability of these lands to produce suitable food and cover for selected wildlife species shall be estimated. The use of forage by grazing and browsing animals will be estimated. Lands in less than satisfactory condition shall be identified and appropriate action planned for their restoration.

Consistent with 36 CFR §219.20(a), this analysis will supplement the Rangeland Resources section to identify capable management indicator species habitat on National Forest System lands and where management indicator species source habitat is coincident with open domestic livestock grazing allotments. The Rangeland Resources section identified rangelands that were in less than satisfactory condition. National Forest System lands that exist outside open allotments, while important to management indicator species, are not addressed here as they are not affected by domestic grazing animals. For detailed analysis in this section, the following criteria must be met:

1. Management indicator species source habitat must occur within open domestic grazing allotments
2. Domestic livestock grazing must pose a direct or indirect effect that either (a) is measurably contributing to the less than satisfactory condition of capable management indicator species habitat within an open allotment, and/or (b) measurably threatens the ability to restore capable habitat

The following discussion assesses each management indicator species relative to these criteria: (a) and (b).

Domestic Livestock Grazing in Relation to Pileated Woodpecker – The pileated woodpecker is a management indicator species for the medium/large trees in the cool moist potential vegetation group. While pileated woodpecker habitat does occur within open allotments (criteria 1), livestock grazing is not identified as a major threat to pileated woodpecker habitat. Threats to pileated woodpecker habitat from livestock impacts are believed to be incidental and limited to localized areas where livestock tend to congregate. The majority of pileated habitat typically provides sparse or little livestock forage, an indication that grazing, should it be present, has a low likelihood of posing a risk to development or maintenance of source habitat characteristics, such as large tree development or dense conditions.

Domestic Livestock Grazing in Relation to White-headed Woodpecker – The white-headed woodpecker is a management indicator species for the medium/large trees in the open and mature ponderosa pine and mixed ponderosa pine/Douglas-fir forests in the Blue Mountains. Past timber harvest has had the most significant impact on suitable habitat for white-headed woodpeckers (Wisdom et al. 2000). Large numbers of unregulated livestock in the early to mid-1900s resulted in a loss of fine fuels and created extensive areas of mineral soil that resulted in numerous successful conifer seedlings becoming established (Belsky and Blumenthal 1997, Borman 2005).

Grazing is not identified as a direct risk or threat to white-headed woodpeckers (Garrett et al. 1996, Wales et al. 2011, Wisdom et al. 2000), although it may indirectly influence some of the factors affecting white-headed woodpecker source habitat (Altman 2000). For example, grazing is believed to have some localized effects to the development of younger forests and aspen stands, including incidental trampling of reproducing tree seedlings. It can also result in localized areas of increased soil erosion, and increases the potential for introduction and spread of invasive weeds and other nonnatives. However, livestock grazing does not affect the presence and abundance of large tree structure (living and dead) on the landscape. White-headed woodpecker habitat does occur within open allotments (criteria 1) within the Blue Mountains, but impacts are believed to be incidental and limited to localized areas and not a measurable threat to the restoration of capable management indicator species habitat identified as in less than satisfactory condition

In summary, while management indicator species source habitat for both the pileated and white-headed woodpecker occurs within open allotments, livestock grazing does not measurably contribute to the less than satisfactory condition of management indicator species source habitat within an open allotment, nor would it measurably threaten the ability to restore source habitat. As such, no further analysis of grazing impacts to pileated or white-headed woodpeckers will be done.

Domestic livestock Grazing in Relation to Rocky Mountain Elk – Rocky Mountain elk were chosen as a management indicator species for security areas/cover. While Rocky Mountain elk security habitat does occur within open allotments (criteria 1), livestock grazing is not identified as a major threat to security habitat. Elk are an adaptable species and somewhat of a generalist in their use of habitat and forage (Cooperrider 2002). Regarding their habitat overall, and specifically foraging habitat, many studies have indicated that grazing management can have either positive or negative impacts on their habitat (Wambolt et al. 1997, Halstead et al. 2002, Torstenson et al. 2002, Findholt et al. 2004, Damiran 2006, and Vavra 2009). Management indicator species source habitat does occur within open allotments (criteria 1) and it is believed that livestock grazing across the range of the species within the Blue Mountains may have some effects to the quantity and quality of forage available to elk, although not to security habitat.

Domestic Livestock Grazing in Relation to Mule Deer – Mule deer were selected to represent forage conditions in the dry forest understory and, to a lesser degree, security areas and motor vehicle use management. Mule deer, like elk, are considered a habitat generalist, although deer have a more selective diet and tend to select higher quality forage than elk (ODFW 2003b). At times this less flexible diet, which comprises mostly forbs and shrubs/trees (Bartmann 1983, Findholt et al. 2004), could result in increased competition for forage resources with cattle and elk (Findholt et al. 2004). As with elk, several studies have indicated that grazing management can have either a positive or negative effect on mule deer habitat (Damiran 2006, Findholt et al. 2004, Kie et al. 1991, Loft et al. 1987, Torstenson et al. 2006, Vavra 2009, Willms et al. 1980). Management indicator species source habitat does occur within open allotments (criteria 1), and it is believed that livestock grazing across the range of the species within the Blue Mountains may have some effects to the quantity and quality of forage available to mule deer.

In summary, management indicator species source habitat for both Rocky Mountain elk and mule deer occurs within open allotments and livestock grazing may contribute to less than satisfactory conditions of management indicator species source habitat. Although some differences do exist in their responses to livestock grazing, for the most part deer and elk are very similar. As such, both will be analyzed together, assuming the responses would be the same unless specifically noted.

The dominant forage of cattle, elk, and deer includes shrubs, forbs and grasses (Findholt et al. 2004). The time of year and the order in which species (cattle, elk or deer) graze determines what resource is utilized (Coe et al. 2005). Findholt et al. (2004) concluded the following: 1) cattle will utilize more grasses and sedges than forbs and shrubs in pastures not previously grazed by cattle; 2) elk will utilize more resources and more evenly than deer and cattle; 3) elk responded to a decline in available lichens by increasing their consumption of grasses and sedges, which increased the competition between cattle and elk; and 4) the competition between elk and cattle also increased during the late summer. Skovlin et al. (1968) found that both elk and mule deer used pastures not grazed by cattle more than any of the cattle-grazed pastures, with use declining as cattle stocking rate increased. They found less of an effect by cattle on mule deer than on elk. Coe et al. (2005) found that deer and elk alike selected different resources when cattle were present and may also move out of pastures where cattle had been released.

For Rocky Mountain elk and mule deer, all lands, with the exception of talus slopes, water, and rock, are suitable for grazing and browsing. Although elk and deer will utilize steeper topography, they prefer gentler slopes and therefore suitable forage areas for elk and deer were limited by the same slope restriction as for domestic sheep (60 percent). Figure 63 displays those areas considered as suitable forage areas for deer and elk that are within active domestic livestock grazing allotments. On all three national forests, alternative C would have the fewest acres of overlap between domestic livestock grazing and elk/deer forage areas. On the Malheur and Wallowa-Whitman National Forests, alternative D has the greatest overlap and alternatives A, B, E and F would be similar. On the Umatilla National Forest, alternative B has the greatest overlap and alternatives A, D, E and F are essentially the same.

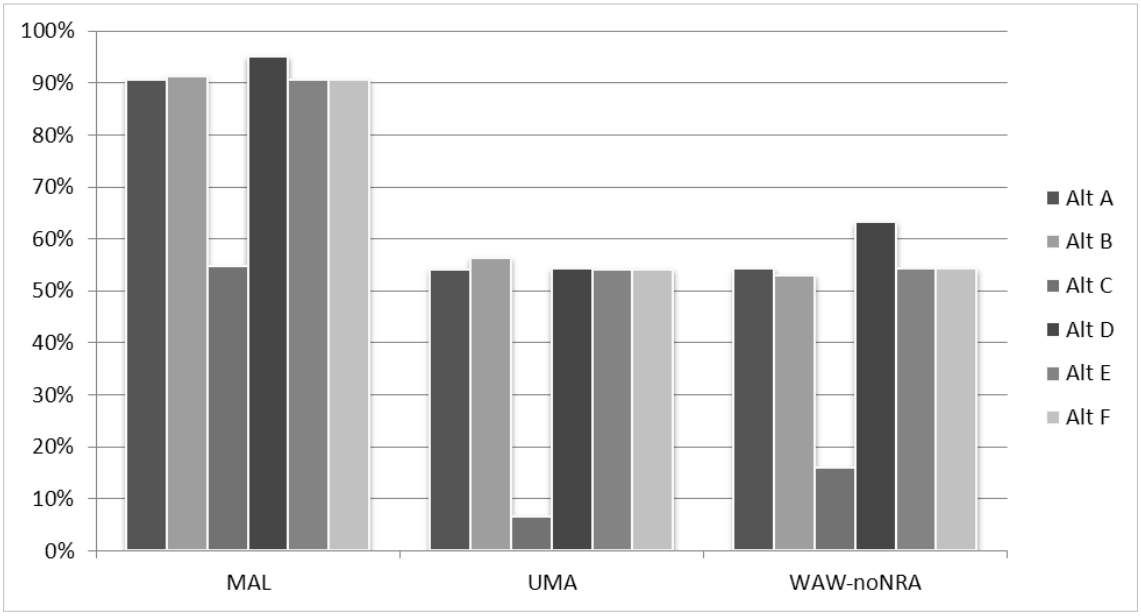

Figure 63. Suitable elk and deer forage areas within identified active domestic livestock grazing areas by alternative and national forest

Not all lands that are suitable as forage areas for elk and deer are subjected to domestic livestock grazing. However, wild ungulate use is not restricted to these areas and therefore must be accounted for on all lands, even those managed for domestic livestock grazing. As with domestic livestock, meadows and grasslands provide the most efficient forage areas for elk (Ager et al.

2003, Collins and Urness 1983, Wickstrom et al. 1984,), especially in early spring, while overall forage is limited on summer range. Also, elk may leave an area being grazed by cattle, but will often return to a pasture after cattle leave (Yeo et al. 1993).

Nutritional status is a key factor in the welfare of individual animals and hence elk herd productivity (Johnson et al. 2005). Therefore, the quantity and quality of forage available for deer and elk populations is an important factor in determining habitat effectiveness (Beck et al. 1997, Roloff 1997). Especially important is the quality of forage available in the fall to store fat reserves for winter and in the spring to replace fat reserves and satisfy gestation requirements (Cook et al. 2004). Damiran (2006) indicated that moderate grazing by livestock and elk has little effect on the subsequent nutrient intake rate of cattle, deer, and elk in mixed-conifer rangelands during the late-summer in northeast Oregon. It is important to keep in mind that it is the plant community and the health of the plants themselves that must be the ultimate measure of use by herbivores (Vavra 1992). As discussed in the livestock grazing section under focal species, utilization levels that do not exceed long term utilization of 40 percent probably do not have negative effects on plant health. As such, it is anticipated that those alternatives with utilization levels of 40 percent or less (table 312) will continue to provide quality forage for elk and deer. Alternative C would be the best at providing for the needs of elk and deer, followed by E and F. As Vavra and Riggs (2010) point out, interactions of ungulates and their environment is very complex, so other aspects such as timing of grazing can also affect the quality and quantity of forage available for deer and elk (Clarke et al. 2000, Westenskow-Wall et al. 1994). Also, on some public lands, developments, such as roads, trails, and campgrounds, and disturbance from recreational and management activities, increasingly influence available forage by causing elk and deer to abandon forage areas due to disturbance (Wisdom et al. 2005, Wisdom et al. 2005a).

According to the range analysis (see “Livestock Grazing and Grazing Land Vegetation” section) an evaluation of monitoring data shows a recovery in terms of native species composition beginning in the mid-1900s and continuing until about the turn of the century. Since 2000, improvement has slowed for reasons that are unclear; however, it may be related to factors such as weather (e.g., precipitation timing and amounts) or the cumulative effects from other impacts such as fire (both exclusion and occurrence), forested vegetation management (including canopy cover, invasion into historical grassland or shrublands, as well as opening of forest canopy in some areas), and could even be somewhat related to climate change.

Some sites may or may not improve with improved grazing management. For example, some upland bunchgrass plant communities have been invaded by cheatgrass and/or invasive species (Quigley and Arbelbide 1997) and since currently there is not a feasible means of eliminating cheatgrass, these sites may have passed the threshold where recovery is achievable. It has also been suggested that early spring or late fall use by wild ungulates, such as elk or deer, are known to impact bunchgrass communities by heavy and improperly timed grazing such that the more palatable, and early growing (e.g., cool-season or C-3) species have been negatively impacted (Briske and Richards 1994).

Riparian areas are also of concern as they not only provide forage areas for both elk and deer, but also a source of hiding cover for deer (Loft et al. 1987). Monitoring data conducted as part of the PACFISH/INFISH Biological Opinion (PIBO) effort (Archer et al. 2009) have indicated that, on a broad scale, there has been a recovery for many of the parameters most closely associated with livestock grazing effects. Analysis of PIBO data for the three national forests also indicates a favorable trend in many of the parameters important to deer and elk; however, this has not occurred to the extent that sites fully meet desired conditions. The rate of recovery may also not

be in the time frame desired. Additionally, it is recognized that localized areas may be lagging behind in recovery, but it is anticipated that they will be dealt with at the project level.

A broad scale assessment of available forage was completed by calculating pounds per acre of forage for each plant association group. The basic data for this was derived from the plant association guides completed for the Blue Mountains (Johnson 1987 and Johnson and Clausnitzer 1992). It should be remembered that these estimates are coarse, and even though a single number was used to calculate potential forage, the reality is that production can be variable and influenced by site specifics, such as the seral stage of vegetation being analyzed or annual variations due to precipitation. A further caveat is that total herbaceous production was estimated, which probably overestimates what would actually be palatable forage.

Table 313 in the Focal Species section under livestock grazing attempted to broadly characterize if adequate forage is being produced to provide for domestic livestock grazing, wild ungulate grazing, and the needs of plant and watershed health. Although it only displays elk, it would appear that based on current numbers of ungulates, in general across the landscape there is more than adequate forage available.

In summary, the available information indicates an excess of forage production that is capable of meeting the current and projected needs for permitted livestock, as well as for large wild ungulate populations, and for providing for the basic needs of the plants, soils, and other rangeland resources. This analysis was conducted at the landscape scale and it is recognized that there may be site-specific conflicts that are believed to be generally small in scope and extent. Project planning will deal with potential conflicts at that scale.

Considering the previous discussion, it would appear that proposed stocking levels for any of the alternatives would leave sufficient residual biomass available for wild ungulates on lands considered suitable foraging areas. However, livestock do not make uniform use of suitable rangeland, but rather graze in a pattern that varies in a gradient from higher use in the more preferred lower slopes and near water, to near zero use in areas with steeper slopes or farther from water. As such, actual utilization across suitable range may vary from the proposed utilization levels to zero percent, but would average perhaps 20 to maybe 40 percent.

Alternative C would have the least impact on suitable habitat for elk and deer because the least amount of suitable foraging habitat coincides with proposed domestic livestock grazing areas. The proposed utilization level is below the threshold where utilization levels may impact the forage base, indicating that few if any site specific areas would be negatively impacted. Although alternatives A, B, D, E, and F have similar amounts of habitat exposed to domestic livestock grazing, E and F would have the least impact, again because proposed utilization levels are not expected to reduce the health of the forage base. Both alternatives A and B are either at or above the level where plant health may be compromised, and although alternative D has more acres subject to domestic livestock grazing, the proposed utilization level is at or below the risk level of plant health reduction.

Cumulative Effects to Management Indicator Species

The clearest concept of a management indicator species would be a species highly associated with a specific habitat type (Niemi et al. 1997) and home ranges small enough to be influenced mostly by management activities on National Forest lands (Hayward et al. 2004, Landres et al. 1988, Owens 2010). Few species, however, are unaffected by events that are not controlled by the

Forest Service. As such, the cumulative effects described below have the potential of influencing populations of those species.

Several of the species analyzed as management indicator species for the various forest plan alternatives include game species managed by state wildlife departments. These departments can change the number of harvest permits allocated, season lengths, and sex to be harvested, which can affect population levels. Cumulative effects not only include harvest regulations of management indicator species, but also changes in harvest regulations for predators of management indicator species. For example, prohibiting the use of dogs to harvest mountain lions in Oregon has led to an increase in mountain lion populations, which may affect some local elk and deer populations (ODFW 2006). Access to other non-federal and federal ownerships during the hunting season can also influence populations. Most game management units contain multiple ownerships, which influences the ability to achieve population objectives.

Some of the species spend a portion of their time outside of the National Forest boundary. For example, elk and deer inhabit areas under private, state, and other federal administrations. Much of the winter habitat, especially for deer, is found on private lands that may be subject to urbanization, conversion to, or a change in agricultural use. Others, like the goshawk and Lewis's woodpecker, are partial migrants (Wisdom et al. 2000) that most likely winter off of the national forest. Still others occupy habitats that occur abundantly on private lands, like the white-headed woodpecker which inhabits ponderosa pine or the northern flicker which inhabits juniper. Vegetation management on other ownerships has not necessarily featured the retention of preferred habitat attributes for these species (large trees and snags) in the past, and may not in the future. Wisdom et al. (2000) estimated a 62 percent reduction in source habitat for the white-headed woodpecker from historical conditions in the Columbia River Basin and a reduction of 79 percent in the Blue Mountains.

Other species like the northern (American) three-toed woodpecker and pileated woodpecker have much of their preferred habitat on lands administered by the Forest Service. Wisdom et al. (2000) estimated a 21 percent decrease in source habitat basin-wide for the pileated woodpecker, but found more than a 100 percent increase in source habitat in the Blue Mountains Ecological Recovery Unit from historical to current times, indicating that few cumulative effects would be anticipated from lands under private, state, or other federal administration within the Blue Mountains.

Affected Environment – Resident and Migratory Birds

It is estimated that the planning area supports over 265 species of birds (Altman 2000, Thomas et al. 1979), including those that utilize stopover habitats during their annual migration or that only breed occasionally within the planning area. Of these, 120 species are considered land breeding birds, many of which are Neotropical migrants that breed during the summer within or near the national forests of the Blue Mountains (Altman 2000). Generally, these species winter south of the United States border. Most bird species are still common; however, some populations are declining. Neotropical migratory bird species are of particular concern within the planning area due to the international issues associated with their conservation. The planning area contributes most heavily to species that utilize spruce-fir, lodgepole pine, mixed conifer, and ponderosa pine habitats. However, habitats such as riparian areas and wetlands ecosystems that make up smaller portions of the landbase are also of conservation concern due to these areas' critical importance to bird species.

The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. While some courts have held that the MBTA does not apply to Federal agencies, in July 2000, the United States Court of Appeals for the District of Columbia Circuit ruled that the prohibitions of the MBTA do apply to Federal agencies, and that a Federal agency's taking and killing of migratory birds without a permit violated the MBTA.

On January 10, 2001, President Clinton signed Executive Order 13186 placing emphasis on conservation of migratory birds. The Executive Order (EO) directs agencies to take certain actions to further comply with the migratory bird conventions, the MBTA, the Bald and Golden Eagle Protection Act (BGEPA), and other pertinent statutes. The MBTA, signed in 1918 and amended in 1936, 1974, and 1989, implements the United States' commitment to four international conventions (with Canada, Mexico, Japan, and Russia) for the protection of migratory birds. EO 13186 requires Federal agencies to develop memorandums of understanding (MOU) with the U.S. Fish and Wildlife Service (USFWS) to promote the conservation of migratory bird populations. The MOU between the Forest Service and USFWS was signed by the Chief of the Forest Service in December 2008.

The MOU directs the agency to address the conservation of migratory bird habitat and populations when developing, amending, or revising management plans for national forests and grasslands, consistent with NFMA, the Endangered Species Act (ESA), and other authorities. When developing the list of species to be considered in the planning process, the Forest Service must:

- Consult the current USFWS Birds of Conservation Concern list, state lists, and comprehensive planning efforts for migratory birds
- Evaluate and consider management objectives and recommendations from conservation planning efforts for migratory birds
- Acknowledge special designations that may apply to all or part of the planning area, such as Globally Important Bird Areas in the United States
- Acknowledge such designations in the appropriate plan documents

Additionally, within the NEPA process, the Forest Service must evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Determining whether or not any particular bird species detected in a free-flying and unrestrained condition in the United States or its territories is protected by the MBTA depends on answering two simple questions (Trapp 2005 (updated 2009)):

3. Is it native to the United States or its territories?
4. Does it belong to a family, group, or species covered by one or more of the four migratory bird conventions to which the United States is a party?

All species of birds that occur within the planning area are protected by the MBTA except the following species that are (1) native and (2) belong to families not covered by any of the conventions implemented by the MBTA:

Family Phasianidae

Bonasa umbellus, Ruffed Grouse+ (cont. U.S.)
Centrocercus urophasianus, Greater Sage-grouse+ (w. U.S.)
Dendragapus obscurus, Dusky Grouse+ (w. U.S.)
Dendragapus fuliginosus, Sooty Grouse+ (w. U.S.)
Falcipennis canadensis, Spruce Grouse (n. U.S.)
Lagopus leucurus, White-tailed Ptarmigan+ (n. U.S.)
Meleagrus gallopavo, Wild Turkey+ (cont. U.S.)

Family Odontophoridae

Callipepla californica, California Quail+ (CA, NV, OR)
Colinus virginianus, Northern Bobwhite+ (cont. U.S.)
Oreortyx pictus, Mountain Quail+ (w. U.S.)

The Birds of Conservation Concern list (USFWS 2008) and the priority species and habitats identified in the Conservation strategy for the Northern Rockies of eastern Oregon and Washington (Altman 2000) help frame the conservation needs of birds within the planning area. The Birds of Conservation Concern list highlights species of particular interest within large geographic areas of the United States, referred to as Bird Conservation Regions (BCRs), while the Landbird Conservation Plans provide information for more localized bird conservation priorities. The majority of the land administered by the Blue Mountains national forests occurs within the Northern Rocky Mountains (U.S. portion only) Bird Conservation Region (BCR 10), which encompasses portions of Oregon, Washington, Idaho, New Mexico, Colorado, Montana, and Wyoming. The Birds of Conservation Concern list for BCR 10 contains 22 species (table 337), some of which do not occur or would be considered accidental within the planning area. The landbird conservation strategy for the Oregon and Washington portion of BCR 10 (Altman 2000) supplemented the National Partners in Flight (PIF) approach of identifying species most in need of conservation action by placing a greater emphasis on ecosystem function.

Table 337. USFWS birds of conservation concern by bird conservation region, respective focal species from regional bird conservation plans and how they were addressed by the current DEIS

Species	USFWS Bird Conservation Region	Representative Focal Species from Altman 2000 and Altman and Holmes 2000	Treatment of Species in Blue Mountains National Forests
Bald eagle	9 and 10	None mentioned	Identified as a focal species in R6 Assessment and is assessed in detail in Wales et al. 2011 and the Biological Assessment as a sensitive species
Swainson's hawk	10	None mentioned	Identified as a possible focal species in R6 Assessment but not chosen for the Blues. A member of the grassland group of the woodland/grass/shrub family in the R6 Assessment which is represented by the northern harrier as the focal species. The northern harrier is assessed in detail in Wales et al. 2011.

Species	USFWS Bird Conservation Region	Representative Focal Species from Altman 2000 and Altman and Holmes 2000	Treatment of Species in Blue Mountains National Forests
Ferruginous hawk	9 and10	None mentioned	Identified as a member of the woodland/grass/shrub group of the woodland/grass/shrub family in R6 Assessment which is represented by both the golden eagle and lark sparrow as the focal species. Both focal species are assessed in detail in Wales et al. 2011.
American peregrine falcon	9 and 10	None mentioned	Identified as a focal species in R6 Assessment for the habitat generalist group of the human disturbance family in R6 Assessment and is assessed in detail in Wales et al. 2011 and the Biological Assessment as a sensitive species
Upland sandpiper	10	Focal species for mesic and dry conditions of montane meadows	Identified as a focal species in R6 Assessment for the upland grassland group of the upland grassland family in R6 Assessment and is assessed in detail in Wales et al. 2011 and the Biological Assessment as a sensitive species
Long-billed curlew	9 and 10	Upland sandpiper Vesper sparrow for Steppe-Shrublands	Identified as a member of the grass/shrub group of the woodland/grass/shrub family in the R6 Assessment which is represented by the bighorn sheep as the focal species in the Blue Mountains with a detailed analysis in Chapter 3 of the DEIS.
Yellow-billed cuckoo	9 and 10	None mentioned	Identified as a member of the shrubby/deciduous group of the riparian family in the R6 Assessment which is represented by the MacGillivray's warbler as the focal species in the Blue Mountains assessed in detail in Wales et al. 2011.
Flammulated owl	9 and 10	Focal species for old forest with grassy openings and dense thickets in dry forest habitats	Identified as a member of the dry forest group of the large/medium tree family in the R6 Assessment which is represented by the white-headed woodpecker as the focal species in the Blue Mountains assessed in detail in Wales et al. 2011, Chapter 3 of the DEIS and the Biological Assessment as a sensitive species.
Black swift	9 and 10	None mentioned	Identified as a member of the conifer riparian group of the riparian family in the R6 Assessment which is represented by the inland tailed frog as the focal species in the Blue Mountains assessed in detail in Wales et al. 2011. The black swift is addressed in detail in the Biological Assessment as a sensitive species.

Species	USFWS Bird Conservation Region	Representative Focal Species from Altman 2000 and Altman and Holmes 2000	Treatment of Species in Blue Mountains National Forests
Calliope hummingbird	9 and 10	Veery (dense understory riparian habitats)	Identified as a member of the all forest communities group of the open forest family in the R6 Assessment which is represented by the western bluebird, fringed myotis and fox sparrow as the focal species in the Blue Mountains assessed in detail in Wales et al. 2011. The western bluebird and the fox sparrow are also addressed in detail in chapter 3 of the DIES and the fringed myotis is addressed in detail in the Biological Assessment as a sensitive species.
Lewis's woodpecker	9 and 10	Focal species for burned forests and riparian woodland with large snags	Identified as a focal species in R6 Assessment for the post fire habitat group of the open forest family and is assessed in detail in Wales et al. 2011 and the Biological Evaluation as a sensitive species
Williamson's sapsucker	9 and 10	White-headed woodpecker Vauk's swift (large snags) Red-naped sapsucker (Aspen)	Identified as a member of the all forest communities group of the medium/large tree family in the R6 Assessment which is represented by the Cassin's finch as the focal species in the Blue Mountains assessed in detail in Wales et al. 2011 and in chapter 3 of the DIES.
White-headed woodpecker	9 and 10	Focal species for large patches of old forest with large trees and snags in dry forest habitats	Identified as a focal species for the dry forest group of the large/medium tree family in the R6 assessed in detail in Wales et al. 2011, Chapter 3 of the DEIS and the Biological Assessment as a sensitive species.
Olive-sided flycatcher	10	Focal species for edge and openings created by fire in mesic mixed conifer (late successional) habitats	Identified as a member of the post fire habitat group of the open forest family in the R6 Assessment, which is represented by Lewis's woodpecker and black- backed woodpecker. Both of these species are assessed in detail in Wales et al. 2011 and Chapter 3 of the DIES. Additionally the Lewis's woodpecker is addressed in the Biological Evaluation as a sensitive species
Willow flycatcher	9 and 10	Focal species for shrub density in riparian habitats	Identified as a member of the shrubby/deciduous group of the riparian family in the R6 Assessment which is represented by the Macgillivray's warbler as the focal species in the Blue Mountains assessed in detail in Wales et al. 2011.
Loggerhead shrike	9 and 10	Focal species for Steppe-Shrubland habitats and interspersion tall shrubs-openings	Identified as a focal species in R6 Assessment for the woodland/shrub group of the woodland/grass/shrub family in R6 Assessment and is assessed in detail in Wales et al. 2011.

Species	USFWS Bird Conservation Region	Representative Focal Species from Altman 2000 and Altman and Holmes 2000	Treatment of Species in Blue Mountains National Forests
Sage thrasher	9 and 10	Focal species for Sagebrush habitats and sagebrush height	Identified as a focal species in R6 Assessment for the shrub group of the woodland/grass/shrub family in R6 Assessment and is assessed in detail in Wales et al. 2011
Brewer's sparrow	9 and 10	Vesper sparrow (10) Focal species (9) for Sagebrush habitats and sagebrush cover	Identified as a member of the shrub group in the woodland/grass/shrub family in R6 Assessment which is represented by the sage thrasher as the focal species. The sage thrasher is assessed in detail in Wales et al. 2011.
Sage sparrow	9 and 10	Focal species for Sagebrush habitats and large contiguous patches	Identified as a member of the shrub group in the woodland/grass/shrub family in R6 Assessment which is represented by the sage thrasher as the focal species. The sage thrasher is assessed in detail in Wales et al. 2011.
McCowan's longspur	10	None mentioned	Does not occur in Oregon
Black rosy-finch	9 and 10	Gray-crowned rosy-finch for alpine habitats	Identified as a member of the Alpine group in the alpine/boreal family in R6 Assessment which is represented by the gray-crowned rosy-finch as the focal species. The gray-crowned rosy-finch is assessed in detail in Wales et al. 2011. Additionally the black rosy-finch is addressed in detail in the Biological Evaluation as a sensitive species.
Cassin's finch	10	Flammulated owl Chipping sparrow for open understory with regenerating pines in the dry forest habitat Olive-sided flycatcher	Identified as the focal species for the all forest communities group of the medium/large tree family in the R6 Assessment and is assessed in detail in Wales et al. 2011 and in chapter 3 of the DIES.
Greater sage-grouse (not covered by MBTA)	9	Focal species for Sagebrush habitats and large areas - diverse understory	Identified as a member of the shrub group in the woodland/grass/shrub family in R6 Assessment which is represented by the sage thrasher as the focal species. The sage thrasher is assessed in detail in Wales et al. 2011 and the greater sage-grouse is assessed in detail in both chapter 3 of the DEIS and in the Biological Evaluation as a sensitive species.
Eared grebe	9	None mentioned	Identified as the focal species for the marsh/open water group of the wetland family in the R6 Assessment and is assessed in detail in Wales et al. 2011
Golden eagle	9	Burrowing Owl	Identified as a focal species for the woodland/grass/shrub group of the woodland/grass/shrub family in R6 Assessment which is assessed in detail in Wales et al. 2011.

Species	USFWS Bird Conservation Region	Representative Focal Species from Altman 2000 and Altman and Holmes 2000	Treatment of Species in Blue Mountains National Forests
Yellow rail	9		Does not occur in the Blue Mountains of Oregon
Snowy plover	9		Does not occur in the Blue Mountains of Oregon
Marbled godwit	9		Does not occur in the Blue Mountains of Oregon
Pinyon jay	9		Does not occur in the Blue Mountains of Oregon
Virginia's warbler	9		Does not occur in the Blue Mountains of Oregon
Green-tailed towhee	9	None mentioned	Identified as a member for the woodland/shrub group of the woodland/grass/shrub family in R6 Assessment represented by the loggerhead shrike as the focal species. The loggerhead shrike is assessed in detail in Wales et al. 2011. And the green-tailed towhee is assessed in detail in the Biological Evaluation as a sensitive species for Washington.
Black-chinned sparrow	9		Does not occur in the Blue Mountains of Oregon
Tricolored blackbird	9		Identified as member of the marsh group of the wetland family in the R6 Assessment, represented by the marsh wren as the focal species. The marsh wren is assessed in detail in Wales et al. 2011. The tricolored blackbird is not found on Forest Service lands within the planning area.

The conservation strategy for the Northern Rocky Mountains in Oregon and Washington does not include shrub-steppe, juniper-steppe, and lowland riparian habitats found in eastern Oregon and Washington. These habitats are normally found in the Great Basin BCR (9) which represents less than one percent of the planning area. These areas are covered in another PIF plan entitled Conservation Strategy for Landbirds in the Columbia Plateau of eastern Oregon and Washington (Altman and Holmes 2000). Altman (2000) indicated that 31 breeding bird survey routes were at least partially located within the Blue Mountains of Oregon and Washington. These surveys provide some information regarding status of bird species within the planning area.

An important bird area (IBA) is a site that is of outstanding importance to bird conservation. The IBA designation is recognized internationally, and thousands of IBAs have been designated across Europe, Asia and North America. The National Audubon Society oversees the North American IBA program and Portland Audubon oversees the IBA program in Oregon. Only one IBA has been identified within the three national forest areas of the Blue Mountains: the Wallowa Mountains within the Wallowa-Whitman National Forest. This IBA comprises the entire range of spruce grouse in Oregon, is the only area with regular confirmed breeding of the pine grosbeak in Oregon, and comprises the entire breeding range of an Oregon endemic taxon, the Wallowa rosy finch (subspecies of the gray-crowned rosy finch). There are no legal requirements for particular management of IBAs. The hope is simply that the owners and managers will continue to manage

the site for its avian values and that recognition as an IBA may generate support for management or maintenance of the site.

Altman (2000) also identified more than 25 bird conservation areas (BCAs) in the Northern Rocky Mountains Strategy for the Blue Mountains, many of which occur on National Forest System lands. BCAs are intended to provide a focus for agencies, nongovernmental organizations, or companies or private individuals to prioritize where conservation actions should occur. They represent what was thought to be the best geographic options for maintaining or enhancing healthy populations of landbirds and prevent further declines of species. Similar to IBAs, there are no legal requirements for particular management of BCAs, but it is recommended that management and evaluation of BCAs should emphasize healthy, native vegetation within the historical range of variation for each habitat type (Altman 2000).

Environmental Consequences – Resident and Migratory Birds

Impacts to migratory and resident bird habitats are expected to be similar across all of the alternatives and all national forests as a result of management activities, mostly because all alternatives have similar desired conditions. Each alternative is expected to be guided by HRV for available habitats within the planning area. Depending upon the species group, influences on migratory and resident birds may be expected to vary in intensity and over time between alternatives. For example, alternative D has the most aggressive treatment program, whereas alternative C has the least aggressive, although both are guided by moving towards HRV. As indicated in table 336, effects to both resident and migratory birds are addressed for other categories. For example, the three species mentioned for the Wallowa Mountains IBA (gray-crowned rosy-finch, pine-grosbeak, spruce grouse) were either addressed in detail under sensitive species or were represented by a focal species (see table 298) that was addressed in detail (Wales et al. 2011). The focal species assessment essentially addressed the broad composite of habitats within the Blue Mountains and, in a landscape sense, confirmed that implementation of the various forest plan components would be expected to sustain populations within the planning area for each of the alternatives. Because all alternatives for each national forest include direction to improve structure, composition, and pattern of vegetation to move closer to HRV, and both national and local Birds of Conservation Concern lists were used to select some of the focal species, the intent of the MBTA has been met at the plan level. Because forest plans do not actually authorize site-specific activity, the MBTA taking regulation must be complied with during project NEPA analysis.

There is little anticipated change to the existing IBA from any of the alternatives. Currently, the majority of the Wallowa Mountains IBA is within the Eagle Cap Wilderness Area, which precludes any active management other than domestic livestock grazing. All alternatives, including continuing with current management (alt A), do not propose grazing within this IBA. Alternative C includes a proposal for a substantial increase in area that would be recommended for inclusion into wilderness immediately adjacent to the Eagle Cap Wilderness Area and would increase the area where active management would not occur. This, however, is not always a good thing as the risk for catastrophic events may increase.

Cumulative Effects to Resident and Migratory Birds

Many of the cumulative effects for bird species have been discussed under the individual species in other sections of this document. Suffice it to say that habitat degradation on nonpublic lands on both summer and wintering areas continue to be of concern

Affected Environment – Hunted Species

Within the planning area, big game and other hunted wildlife species are of particular interest due to their economic and cultural importance to tribal, state, and local communities. Executive Order 13443, Facilitation of Hunting Heritage and Wildlife Conservation (Bush 2007), directs appropriate Federal agencies to facilitate the enhancement of hunting opportunities and the management of game species and their habitat. The primary big game species that are hunted within the planning area are Rocky Mountain elk and mule deer. To a lesser degree, black bear, bighorn sheep, mountain goats, and mountain lion are also hunted as big game species. Other game species include blue grouse, wild turkey, mourning dove, band-tailed pigeon, ring-necked pheasant, cottontail (mountain and desert species), and various species of waterfowl.

According to Mockrin et al. (2012) from 1991 to 2006, the percentage of the U.S. population that reported engaging in any kind of hunting has declined steadily from 7.5 percent of the total population to 5.5 percent. The 2011 National survey of Fishing, Hunting, and Wildlife-Associated Recreation in Oregon indicated that the total number of hunters within the state declined between 2006 and 2011, although it was not statistically significant.

The planning area provides both summer and winter range, supporting the population objectives for deer and elk as established by ODFW and WDFW. Most of the summer range occurs on National Forest System lands that make up the planning area. Most winter range occurs at lower elevations of mixed ownership, mostly on private land (ODFW 2009), but also includes National Forest System lands, and BLM and state administered lands.

Population growth and associated activities, land use conversions, and lack of fire frequency in fire-dependent ecosystems have led to changes in big game winter range quality and availability. Winter range includes much of the low elevation areas found within the planning area and adjacent lands under other ownership. Availability of effective winter range is considered to be a limiting factor to big game populations within eastern Oregon (ODFW 2009). As early as 1995, it was recognized that, excluding security concerns, elk may benefit from the ecosystem management prescription applied to ponderosa pine dominated winter ranges in Montana (Baty et al. 1995). The 2003 elk management plan for Oregon (ODFW 2003a) recognized that forest management on public lands in Oregon has changed and emphasizes ecosystem restoration, which may not be the optimum condition for elk habitat management. At the 2003 western states deer and elk workshop, Woolever (2004) provided the following insight into the changing role of the Forest Service:

> The Forest Service manages a limited land base with many demands including a legal responsibility to provide for biodiversity and viability of species. Our current focus is to manage with ecosystems in mind and with special regard for the range of historic variation within those systems. We will continue to manage for elk and deer, although not exclusively. Our local communities depend on these species and there is a large, politically effective constituency for them. The challenge will be redeeming conservation responsibility for all species while meeting political, social and economic demands for the land they occupy. There is little doubt public values and attitudes about wildlife will continue to evolve with the continuing demographic changes in America. However, our legislative history and current polls clearly demonstrate wild places and wild things are intensely important to us as a society. It is imperative that we work cohesively and cooperatively to resolve resource conflicts and perpetuate healthy, functioning systems that benefit all wildlife including deer and elk

Portions of 19 ODFW wildlife management units (WMUs) are within the three Blue Mountains national forests. These WMUs are combined into four provinces or zones: Wallowa, Wenaha-

Snake, Umatilla-Whitman, and Ochoco-Malheur. A portion of the Blue Mountains extends into Washington and is covered by eight elk management units, six of which include some National Forest System lands. There is an interchange of elk between Washington and Oregon, which complicates the management of some herds (WDFW 2009).

The importance of the quality and quantity of forage for both species going into and coming out of winter has been acknowledged in the literature and big game winter range on public lands is important due to the loss of this habitat on private lands. The Rocky Mountain Elk Foundation (RMEF) initiated the Measure and Prioritize Elk Habitat Project (M.A.P. Habitat™) in the late 90s. The project was a cooperative effort using GIS technology and information from state, tribal, Federal, corporate, and independent biologists and elk experts to map suitable elk habitat in North America. Elk winter and summer range, parturition, migration and other important habitat areas were drawn using expert opinion of wildlife biologists on a 1:250,000 scale map, state by state across land ownership and jurisdictions in the United States and was copyrighted in 1999. The intent was to provide a GIS tool to state and Federal biologists to address habitat conservation from the big-picture, mid-scale perspective. Within this mapping effort, winter range was identified. Habitat for Oregon was mapped prior to 1997 (Wertz 1997 (18 December)). In a letter to regional foresters (Thompson 2003), the Forest Service Washington office indicated that “it is anticipated that project records for forest planning efforts would reflect forest-level consideration of the elk M.A.P. Habitat™ data. If the M.A.P. Habitat™ data is inaccurate or insufficient for planning or project use on your units, we need to work closely with the RMEF to update the data layers to ensure we are both using the same and most current information in our GIS work.”

The action alternatives do not draw a hard line around winter range as found in the no-action alternative. It was felt that wintering habitat is based on habitat attributes found in an area and these attributes can change due to fires, active management, predator presence (Pierce et al. 2004), and snow depth (Poole and Mowat 2005).Figure 63 demonstrates the difference in winter range mapping done in 1990; the extensive mapping effort conducted by RMEF in 1997; and the 2009 ODFW mapping effort, illustrating the problems associated with hard lines. As illustrated in figure 63, RMEF mapped over 60 percent more acres within the Umatilla National Forest as winter range than what was identified by the 1990 forest plan. Within the Wallowa-Whitman National Forest, the amount of winter habitat identified by both mapping efforts is almost the same, but there is less than a 50 percent overlap between the two mapping efforts. This means that more than half the acres identified for the 1990 forest plan are in different locations than those identified in 1997. A similar pattern is seen with the 2009 mapping effort, which shows an increase on all three forests over the 1997 mapping effort. The following discussion will use the 2009 winter range map to compare alternatives.

Environmental Consequences – Hunted Species

The current management emphasis on public lands for restoration based on HRV does not seek to optimize any one species of wildlife, but rather to provide those conditions under which the breadth of wildlife species occurred (Landres et al. 1999). What exactly this means in reference to populations of hunted species is difficult to assess. For example, some hunted species such as wild turkey, pheasants, and chukars are not native species and may or may not respond in a positive manner to returning to HRV.

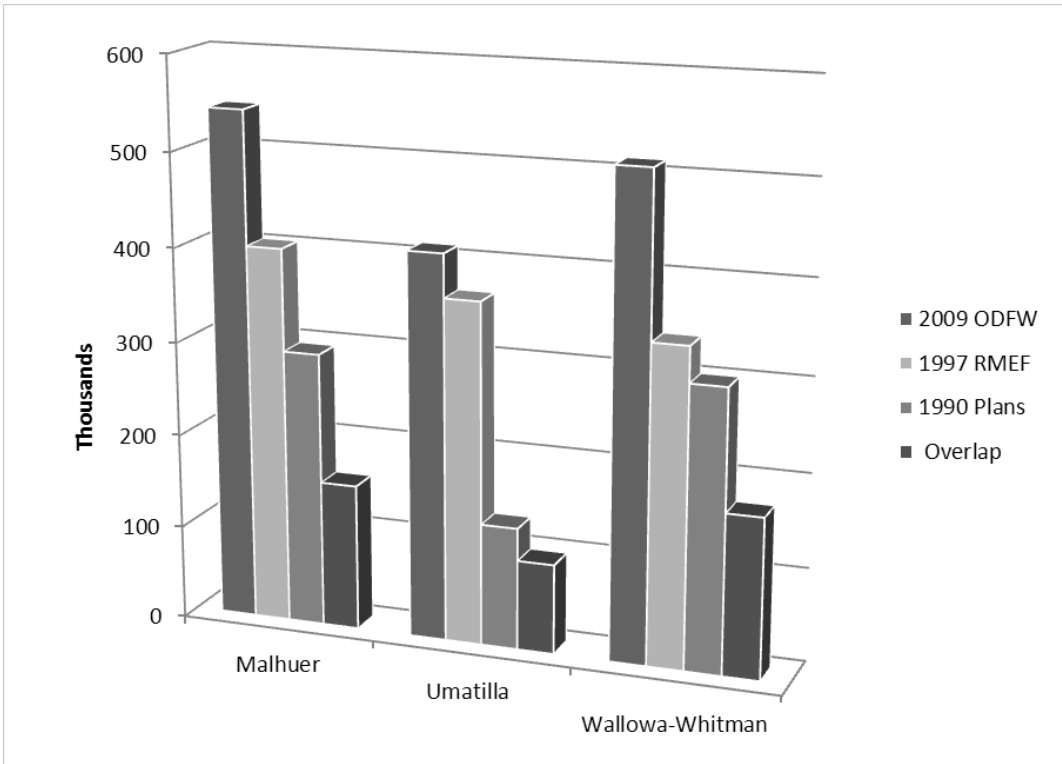

Table 338. Comparison of areas identified as Rocky Mountain elk winter range in 1990, 1997 and 2009 by national forest

Three of the most important big game species have been addressed in some detail as either focal species or management indicator species (bighorn sheep, Rocky Mountain elk, and mule deer). Hunting opportunities for bighorn sheep are below what occurred historically as populations are far below what is thought to have occurred in the early 1800s (ODFW 2003, Singer et al. 2000a). Mule deer populations are substantially lower than what occurred in the mid-1900s but they still exceed the early published estimates (ODFW 2003b). Elk were considered to be plentiful in the Blue Mountains in the early 1800s and current populations probably exceed those levels (ODFW 2003a). Baty et al. (1995) concluded that in the absence of human disturbance, both elk and deer would benefit from ponderosa pine restoration. As demonstrated in the management indicator species analysis for both deer and elk, habitat conditions for both species remains relatively stable, with slight increases in forage: alternative D creates the most and alternative C creates the least. Because proposed management for any alternative is to move towards HRV, as is the current management emphasis (Eastside Screens), it is anticipated that availability of these two species for harvest by both tribal members and the general public would also remain relatively stable as shown in figure 47 through figure 50, and figure 62.

Disturbance to big game from open motor vehicle routes was discussed in some detail previously, mostly in reference to nonwinter periods. Disturbance on winter ranges will not only come from open motor vehicle route density, but also cross-country use by snowmobiles. To comply with the new travel management rule, motor vehicle cross country travel will be extremely limited, except for over-the-snow vehicles (OSVs). The use of OSVs has increased greatly from the early 80s and it is anticipated to continue increasing. Assuming increased snowmobile use, animals on big game winter range could be increasingly stressed by motor vehicle use during the time of year they are most vulnerable to depletion of their energy reserves.

Although over-the-snow travel will not be restricted in MA 4A, the percentages in figure 64 can be deceiving as the total area that may be open to snowmobiles is further limited by steep topography, dense timber stands, and, in some cases, snow. Much of the winter range within the Umatilla and Wallowa-Whitman National Forests is below 4,000 feet, which in all likelihood will not normally have the snow conditions sought by OSV recreationists. This would not be the case for the Malheur National Forest and alternative C, which would make less than half (41 percent) of big game winter range generally unsuitable for snowmobile uses, does the most to reduce the risk of disturbance, whereas the other four alternatives are basically the same. For all alternatives, there are likely to be terrain and vegetation conditions that can restrict snowmobiles. Vegetation limitations can be substantially changed, however, by massive events, such as wildfire. Large fires can open terrain previously considered inaccessible to snowmobiles. Alternative C presents the least possibility of adverse winter effects on wildlife by having less than 50 percent of the national forest's winter ranges open to motor vehicle use (see figure 64). For the Malheur National Forest, all alternatives are essentially the same and for the Umatilla and the Wallowa-Whitman National Forests, D, E, and F are basically the same.

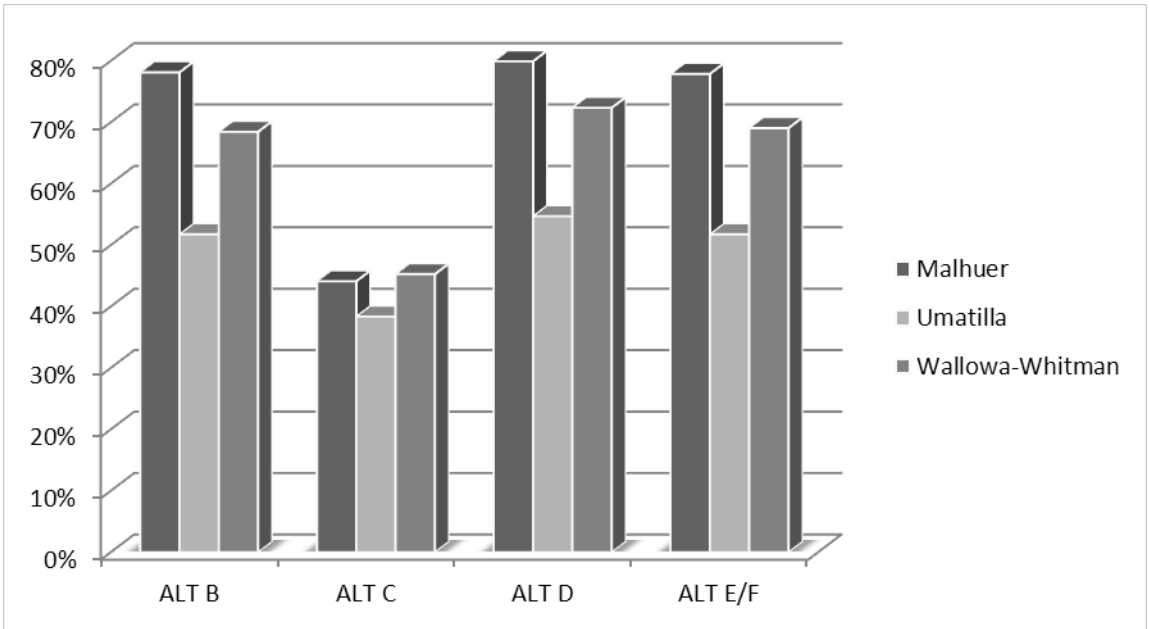

Figure 64. Big game winter range within MA 4A for each national forest by alternative (motor vehicle travel is restricted the least in MA 4A)

Although grazing was addressed in general for elk and mule deer under management indicator species, the following is a short discussion focused strictly on winter range. The issue surrounding winter range would be does sufficient residual biomass exist after summer use to provide for the needs of wintering big game and still provide protection of the health of rangeland plants. Much discussion has occurred overtime whether domestic livestock grazing can be managed to improve forage quality for wild ungulates (Anderson and Scherzinger 1975, Clark et al. 1998, Clark et al. 1998a, Vavra and Sheehy 1996, Wambolt et al. 1997,Westenskow-Wall et al. 1994). Westenskow-Wall et al. (1994) pointed out that "spring conditioning" of bluebunch wheat grass range resulted in a 33 to 47 percent reduction in available forage in November and fall conditioning of forage resulted in an 81 to 95 percent reduction. They also point out that improvement in digestibility is dependent upon regrowth and Hedrick et al. (1969) only

documented regrowth after fall cattle grazing in 2 out of 5 years on crested wheatgrass in eastern Oregon. Table 339 displays how much (percent) winter range for each national forest is within areas identified for active grazing for each alternative. The key to the question of whether domestic livestock grazing improves winter forage for big game centers around whether it is actually being intensively managed to provide these benefits (Holechek et al. 1982, Vavra 2005) and this is not the case currently. As such, it would appear that, except for alternative C, there is little difference between alternatives for the Malheur National Forest. Generally alternative C would provide the greatest benefit for big game winter range for all national forests. The order between alternatives changes between forests with alternative D having the highest risk to big game winter range within the Malheur and Wallowa-Whitman National Forests, whereas alternative B has the highest risk within the Umatilla National Forest.

Table 339. Percent of big game winter range within active grazing areas for each national forest by alternative

National Forest	Alt. B	Alt. C	Alt. D	Alts. E and F
MAL	93	59	95	94
UMA	54	8	50	49
WAW	75	36	80	75

Cumulative Effects to Hunted Species

Forest Service management activities can change habitat for all wildlife species, especially big game, and can bring about localized changes in big game populations and herd composition. Substantial changes in habitat and related herd sizes, however, can be affected by factors outside the control of the Forest Service. Examples are major wild fires or insect and disease outbreaks; and although these disturbances were projected for the life of the plan based on the historic average, the amount or location cannot be accurately predicted. Many of the cumulative effects for the big game species discussed have been previously disclosed in other sections of this document.

Subtle but longer term impacts to big game winter range can occur from the development of lands adjacent to the National Forest. Many key winter ranges are in private land ownership and subject to pressures to subdivide for residential development. Much of the undeveloped private ranchlands are a valuable component in maintaining wildlife connectivity. It is not clear if there is a “break point” at which grazing management practices may cause permittees to withdraw or change the focus of their operation such that they would sell their base ranches. The pressure for development of this land into smaller and smaller parcels will continue to reduce the quality and availability of big game winter habitat.

As noted in the recreation section, many aspects of the hunting experience are within the control of the state fish and wildlife management agencies such as bag limits, difficulty or cost of obtaining tags and types of weapons to mention a few.

Affected Environment – Wildlife Habitat Connectivity

Habitats for individual wildlife species normally occur as a mosaic across the landscape. How well a species thrives within this mosaic is closely tied to being able to move across landscapes to find food and other resources, migrate between seasonal habitats, find mates, and shift to new habitats in response to environmental changes. Such movement is dependent on habitat patches

being of sufficient size to provide for the life needs of an individual and that other patches occur in a network that allows individuals to successfully move between them. This resource patchiness occurs when a habitat is divided into usable areas that are separated from one another by unusable areas. Within this matrix (habitat and nonhabitat), patches may be connected by corridors (Forman and Godron 1981). Although disagreement exists regarding the utility of corridors, landscape connectivity, which is the degree to which the landscape facilitates or impedes movement among resource patches (Taylor et al. 1993), is important. The recent memorandum of understanding regarding Wildlife Corridors and Crucial Habitats (USDI et al. 2009) signed by the USDA, other Federal agencies, and 19 western states, reinforces the importance of landscape connectivity. This spatial connection of habitats means that either the patches are sufficiently close together so that movement can occur among patches or that there is some corridor along which the organisms can move (Fahrig and Merriam 1985).

In landscape ecology, patches are spatial units at the landscape scale. Patch size can affect species habitat, resource availability, competition, and recolonization. The ability to successfully move between habitats is essential for the long-term survival of many wildlife species, from large, migratory species such as elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*), to smaller animals like white-tailed jackrabbits (*Lepus townsendii*), Greater Sage-Grouse (*Centrocercus urophasianus*), and western toads (*Anaxyrus boreas*). Spatial scale is especially important when dealing with patches because an area large enough to be a patch to one species may be a barrier or be insignificant to another species. For example, a plowed field might be a hunting ground for an owl, a barrier to a deer mouse, and of no consequence to a coyote or deer. Another important aspect of patch size is that larger patches tend to have more linkages than smaller ones (Cantwell and Forman 1993).

Connectivity usually involves corridors and networks that describe how patches are connected in the landscape. A spatial connection means either that the patches are sufficiently close that movement can occur among them, or that there is some corridor along which the organisms can move (Fahrig and Merriam 1985). Many different kinds of corridors can be found in the landscape and they can vary from wide to narrow, meandering to straight, and with high to low connectivity (Forman 1995). Corridor characteristics, such as width, connectivity, curvilinearity, pinch points, etc., control the important conduit and barrier functions of a corridor (Forman and Godron 1981). Riparian zones often function as natural corridors and migration routes for some species, providing a connection between source habitats (Machtans et al. 1996).

Connectivity of habitat patches is dependent upon the species and its ability to disperse. For example, because the pileated woodpecker flies, it would appear that few things would present a barrier to its movements. Bull (1987) documented dispersal of 3.4 kilometers for juveniles based on 8 individuals; however, searches outside of the study area were not conducted. It is probable that at least some of the 20-plus potential survivors of the 87 nestlings banded (using the survival rate given by Bull [2001]) dispersed outside of the study area or more than 16 kilometers. Using Bowman (2003), Samson (2005) calculated a dispersal distance for the pileated of more than 240 kilometers, making most habitats within a national forest available. It is difficult to identify movement patterns across the landscape for large ungulates or forest carnivores without telemetry data showing precise movement patterns. However, in the broad sense, it is possible to assess a landscape and identify areas that could be important travel ways for some species. For example Singleton (Singleton 2002, Singleton et al. 2002) conducted large scale analysis to identify potential travel corridors between large secures areas (wilderness) for forest carnivores in Washington and Oregon.

Connectivity within forested environments is not only a spatial consideration, but also temporal. In some cases, the movement needs of wildlife can be served with different land cover types than those needed to sustain resident wildlife populations (Washington Wildlife Habitat Connectivity Working Group (WHCWG) 2010). For example, a large clear-cut may pose a movement barrier for American marten immediately post-harvest; however, over time, as it begins to regenerate, although unsuitable habitat, it may have sufficient canopy cover to allow travel between suitable habitat patches. Wales et al. (2011) estimated that the probability for ease of movement through the landscape (high dispersal) within the planning area for American marten was less than 22 percent historically (see table 340). Dispersal or connectivity of habitats was considered an issue for this species, but as demonstrated, a highly permeable landscape probably did not occur historically. A slight decrease from the historical condition to the current condition, with a slight reduction in high and slight increase in the low dispersal probability, has occurred.

Table 340. Percent current and historical dispersal likelihood for the American marten by class for each national forest (Wales et al. 2011)

Time Period	National Forest	Dispersal Classes and Likelihood		
		Low	Moderate	High
Current	MAL	25	70	5
	UMA	24	52	23
	WAW	40	44	16
Historical	MAL	18	71	11
	UMA	22	48	31
	WAW	37	38	25

Maintaining linkages and connectivity may not always be beneficial. Simberloff and Cox (1987), Simberloff et al. (1992), and Hess (1994) argued that corridors might enhance the spread of disease, catastrophic disturbances, such as wildfires, or the spread of exotic species into the areas connected by corridors. Corridors might also lure animals into areas, including the corridors themselves, where they experience higher mortality [for a review see Hobbs (1992)]. Samson (2005) notes:

> …increases in intermediate-aged forests and connectivity threaten key remaining elements of biodiversity, such as areas of old growth, as these areas no longer persist in fire-protected refugia but are embedded in a well-connected matrix of intermediate-aged forest that permits the rapid spread of fire and insect outbreaks with a spatial-temporal pattern unlike the historic landscape.

Washington recently completed a statewide connectivity analysis (Washington Wildlife Habitat Connectivity Working Group [WHCWG] 2010) which incorporated a large portion of the Blue Mountains in Oregon and Idaho as well. The products produced were derived from two modeling approaches: 1) A focal species approach which produced linkage networks for 16 representative species, and 2) a landscape integrity approach which produced networks of lands exhibiting high degrees of landscape integrity and relatively intact natural areas with low levels of human modification. Linkage network was defined as a system of habitats and areas important for connecting them. Composite linkage networks for groups of focal species resulted in three “connectivity guilds”- 1) generalist, 2) montane, and 3) shrubsteppe. The networks for the generalist and montane species guilds are generally broadly connected, with the interruptions fitting the traditional view of “fracture zones”, i.e., linear features that pose significant barriers to

animal movement. WHCWG (2010) also found broad consistency between the linkage patterns identified by the focal species and the landscape integrity approaches. The landscape integrity approach mirrors the approach used in the California Essential Habitat Connectivity Project (Spencer et al. 2010) in that it is not tailored to specific species or habitats. It is indifferent to vegetation type—apart from degree of departure from natural conditions—and is intended to provide a coarse filter for species and processes that are sensitive to human disturbance.

Figure 65 illustrates that forested areas of the Blue Mountains are reasonably well connected for most of the focal species used within the generalist category (western toad, mule deer, elk, bighorn sheep, western gray squirrel), and no use areas are a result of human development such as agricultural lands and highways. As mentioned above, this was the case for the montane guild as well. It should also be noted that even though five species are indicated for the generalist group and the maximum for the Blue Mountains is four, the fifth focal species (western gray squirrel) modeled for Washington does not occur in the Blue Mountains. Therefore, a linkage network for four species in the Blue Mountains would be the maximum that could occur.

Environmental Consequences – Wildlife Habitat Connectivity

The Washington analysis identified four overarching types of threats/barriers and their potential effects on species' movements:

1) **Land clearing/vegetation removal**, which limits connectivity through

- Alienation due to lack of security cover
- Change to inhospitable environment (e.g., desiccating conditions for amphibians)
- Alienation due to lack of forage or prey
- Increases in competing species, predators, invasive exotics

2) **Buildings and infrastructure**, which limit connectivity through

- Barriers to movement created by fences, walls, buildings, asphalt, canals, etc.
- Alienation due to noise, lighting, lack of forage or prey
- Increases in competing species, predators, invasive exotics
- Making important habitat areas inaccessible (e.g., streams diverted into culverts)

3) **Roads and traffic**, which limit connectivity through

- Creation of inhospitable conditions (e.g., desiccating conditions for amphibians)
- Creation of physical barriers (e.g., Jersey or Texas barriers, right-of-way fences)
- "Fatal attraction" (e.g., attraction of snakes to warm road surface)
- Increased mortalities due to collisions
- Behavioral alienation (i.e., avoidance of roads or high traffic volumes)

4) **Presence of people or domestic animals**, which limit connectivity through

- Legal harvest and poaching
- Harassment and disturbance
- Disease transmission (e.g., domestic sheep to bighorn sheep [*Ovis canadensis*])
- Intolerance (e.g., conflict resolution removals)

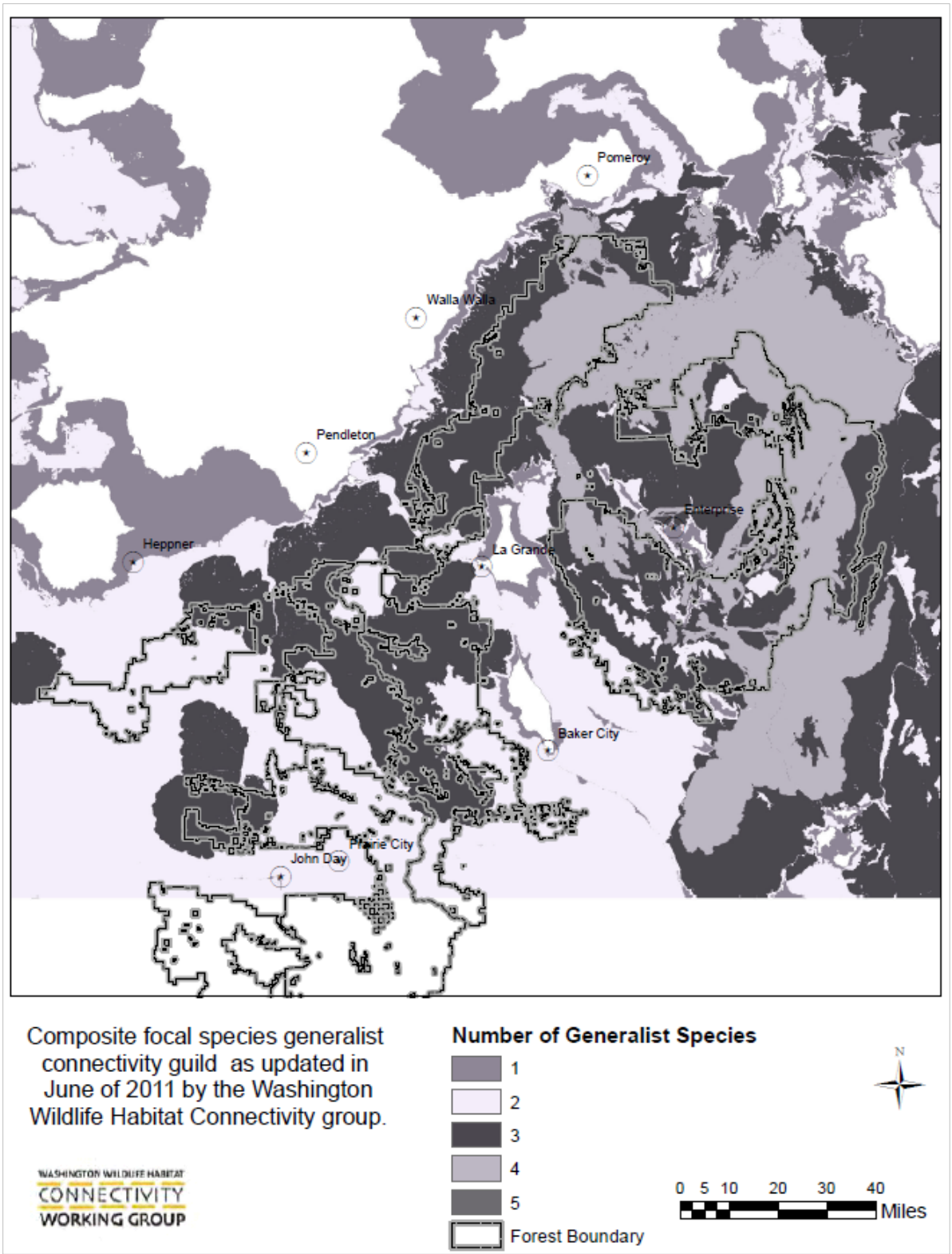

Figure 65. Composite focal species and landscape integrity map for generalist connectivity guild; Includes species that can inhabit a variety of habitats such as mule deer and western toads[10]

[10] developed from data available at http://waconnected.org/statewide-analysis

Many of these threats are not anticipated to occur on National Forest System lands, but could and do occur adjacent to them and will be discussed as cumulative effects. In general, the two greatest potential barriers on the National Forest are roads and presence of people. As mentioned, alteration of vegetation can cause short-term disruptions in travel ways used by a species such as American martens, but in general do not result in long term isolation of habitat patches. This is evidenced by the landscape integrity (areas that have low levels of human modification and are in a relatively natural condition) modeling that Washington conducted (Washington Wildlife Habitat Connectivity Working Group (WHCWG) 2010). Their assessment of the marten also showed that habitat in the Blue Mountains is largely surrounded by impermeable conditions; both natural (low-elevation forests, grasslands, and shrublands) and human created features (highways, dams, towns, and railways), suggesting this population will remain isolated from all others. They further found that habitats in the Blue Mountains of southeastern Washington and northeastern Oregon showed some linkages, but are largely isolated from each other.

All alternatives, including alternative A (no action), provide some degree of secure areas and connectivity (see figure 36 on page 248). Both the Wallowa-Whitman and the Umatilla National Forests have more than 30 percent of National Forest System lands in areas with minimal human disturbance in all alternatives except alternative A. The Malheur National Forest only accomplishes this for alternative C.

Short-term disruption of connectivity between habitat patches for some species can occur due to vegetation treatments. As displayed in table 341, a relatively small portion of the landscape is projected to be treated during the life of the plan. The greatest potential for disruption of wildlife movement patterns occurs for alternatives D and E because of the level of mechanical vegetation treatments. Alternative C would be the less disruptive, but in all cases a very low percentage of the landscape is being treated for all alternatives. Alternatives A and C include safeguards addressing connectivity (WLD-HAB-4 and Eastside Screens amendment), which, combined with desired conditions, would provide the greatest connectivity between habitat patches.

Connected landscapes are especially important for wide-ranging species, such as carnivores (Beier 1993), and for migratory species, such as large herbivores and migratory birds (Bennett [1998, 2003]). They can be critical for maintaining genetically healthy populations, because immigration helps small populations avoid inbreeding (Hanski and Gilpin 1997). As demonstrated by the above analysis, connectedness of habitats is a complex issue. Taking into consideration all of the variables presented above, alternative C appears to provide the greatest opportunity to maintain or improve connectedness of habitats. The establishment of MA 3C provides corridors connecting large secure wildlife areas within which habitat linkages can be designed. Establishing such corridors allows for the design of ecological connections (habitat linkages) that may take a variety of forms, not just simple linear connecting patches of habitat.

The no-action alternative (A) would probably be the second best at providing for connectivity. Although more treatment would occur for this alternative within the Wallowa-Whitman National Forest in the dry forest compared to alternatives E and F, the standards and guidelines from the Eastside Screens amendment are somewhat more restrictive than the standards and guidelines for alternatives E and F. Alternative B would follow alternatives E and F, and alternative D would do the least for providing connected habitat.

Table 341. Percent of potential vegetation group being treated and treatment type during the first decade for each alternative for each national forest

Vegetation Type	Type of Treatment	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
MAL							
Cold forest	Precommercial thinning	0.3%	0.5%	0.6%	1.0%	0.6%	0.6%
	Commercial	0.5%	1.2%	0.9%	6.1%	3.4%	2.4%
	Totals	**0.8%**	**1.7%**	**1.5%**	**7.1%**	**4.0%**	**3.1%**
Cool/moist forest	Precommercial thinning	0.0%	0.1%	0.1%	0.1%	0.1%	0.0%
	Commercial	0.4%	1.3%	0.8%	5.9%	2.5%	1.5%
	Totals	**0.5%**	**1.4%**	**0.9%**	**6.0%**	**2.6%**	**1.5%**
Dry forest	Precommercial thinning	0.9%	1.0%	0.9%	1.0%	0.7%	0.7%
	Commercial	1.6%	2.9%	1.4%	8.2%	5.1%	3.4%
	Totals	**2.5%**	**3.9%**	**2.3%**	**9.2%**	**5.8%**	**4.1%**
UMA							
Cold forest	Precommercial thinning	0.7%	0.9%	0.8%	1.2%	0.9%	0.9%
	Commercial	0.2%	0.7%	0.4%	4.1%	1.3%	0.9%
	Totals	**0.9%**	**1.6%**	**1.2%**	**5.3%**	**2.2%**	**1.9%**
Cool/Moist forest	Precommercial thinning	0.7%	0.7%	0.5%	0.6%	0.6%	0.6%
	Commercial	1.2%	2.0%	1.0%	7.3%	4.6%	2.6%
	Totals	1.9%	2.7%	1.5%	8.0%	5.1%	3.2%
Dry forest	Precommercial thinning	1.8%	2.0%	1.4%	2.0%	1.8%	1.8%
	Commercial	1.2%	3.1%	1.3%	8.8%	6.2%	3.9%
	Totals	**2.9%**	**5.1%**	**2.6%**	**10.7%**	**8.0%**	**5.7%**
WAW							
Cold forest	Precommercial thinning	0.4%	0.3%	0.2%	0.4%	0.3%	0.2%
	Commercial	1.0%	0.7%	0.4%	3.5%	1.6%	1.0%
	Totals	**1.4%**	**0.9%**	**0.6%**	**3.9%**	**1.9%**	**1.2%**
Cool/moist forest	Precommercial thinning	0.7%	0.6%	0.5%	0.8%	0.6%	0.5%
	Commercial	1.2%	1.2%	0.7%	5.8%	3.1%	2.1%
	Totals	**1.9%**	**1.8%**	**1.2%**	**6.5%**	**3.7%**	**2.6%**
Dry forest	Precommercial thinning	5.0%	2.5%	1.4%	2.4%	1.7%	1.6%
	Commercial	2.0%	2.0%	1.1%	6.8%	3.9%	2.8%
	Totals	**7.1%**	**4.4%**	**2.5%**	**9.2%**	**5.7%**	**4.4%**

Riparian zones function as natural corridors and migration routes for some species, providing a connection between source habitats (Machtans et al. 1996). Each of the alternatives establishes some degree of special designation for areas to be managed as riparian areas. The intent of these areas was the recovery of the riparian zone, but at the same time, this recovery can lead to providing travel corridors for terrestrial wildlife between source habitat patches. Alternative A, as amended by PACFISH/INFISH, has riparian management designations that vary in width from 300 feet to 50 feet depending upon the stream. Alternatives B, E, and F have riparian widths that vary from 300 feet to 100 feet. Alternative C has a riparian width of 300 feet for all situations, whereas alternative D varies from 100 feet to 50 feet. As illustrated in figure 66, alternative C provides the greatest opportunity for riparian areas to act as connectors between habitat patches

on all three national forests, whereas alternative D actually provides less connectivity than what is provided by the 1990 forest plans as amended.

In addition to these considerations, climate change may force new patterns of wildlife movements in response to changing environmental conditions and shifting habitats (Heller and Zavaleta 2009).

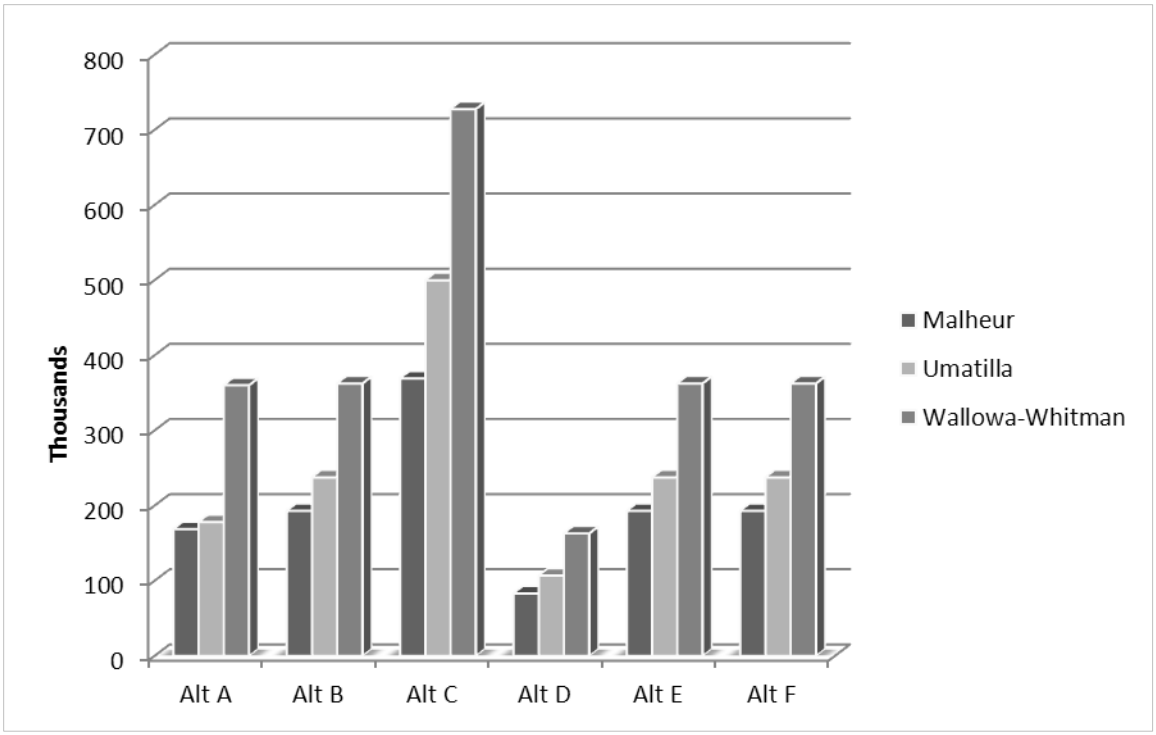

Figure 66. Riparian management areas that could provide travelways and habitat connection for wildlife within each national forest by alternative

Cumulative Effects to Wildlife Habitat Connectivity

Some of the cumulative effects suggested above have already been discussed in other sections of this document (e.g., the potential of spreading disease to bighorn sheep from privately grazed lands). Additionally, the continued sub-division of larger parcels to smaller parcels continues to be occurring on land adjacent to and/or between portions of public lands which restricts wildlife movements due to increases in fencing and other infrastructure. The continued improvement of county, state and federal roads increases the barrier effect to wildlife, isolating some habitat patches from others for certain species.

Cumulative Effects to Terrestrial Wildlife Species (Basinwide Scale)

In general, the analysis area for cumulative effects is all those lands within the Blue Mountain Ecoregion, including BLM, State and private lands as well as those lands within the Columbia Plateau Ecoregion. However, cumulative effects will vary depending on the individual needs and habitat of individual species, and impacts from resource use outside forest boundaries. Cumulative effects to wildlife are also based on the cumulative effects described for vegetation, watersheds, and aquatic resources in their respective sections in this chapter.

The lack of younger seral conditions was identified as a concern from a diversity of habitat standpoint. Management directed at striving for the historic range of variability would provide improved habitat for many species. Because private forest lands have been managed more intensively, it is highly likely that some of these early seral conditions are being provided on those lands. As demonstrated in the effects analysis, the proposed level of activity under any alternative will not be enough to bring the dry forest within HRV over the next several decades. The departure is so large that our goal can only be to produce an upward trend, and although the younger seral stages may occur on lands outside of the forest, it is extremely unlikely that the old forest structure, which is also highly departed, will be produced outside of national forest lands.

Regional risk trends for some species date from the westward expansion and settlement. For example, the greater sage grouse has seen its habitat shrink largely due to habitat losses that have occurred outside of National Forest lands. The bulk of habitat currently occurs on BLM lands. Little habitat occurs on the forest, with all known breeding sites and the vast majority of nesting habitat occurring outside the forest. As such, long-term viability of this species in Oregon is fundamentally beyond the scope of the National Forest management to affect.

Fire suppression on neighboring Federal, State and private lands are routinely coordinated. Given the likelihood of increasing populations in surrounding communities, fire management is expected to be increasingly influenced by public concerns about threats to investments, air quality, and aesthetics. The extent of this influence will be driven by public perceptions and will be variable and not quantifiable. There is the distinct possibility that wildland fire use for resource management on the forest could be trumped by adverse public perceptions to fires allowed to burn under a wildland prescription.

Growing demand for motorized recreation, snowmobiling in particular, includes all ownerships adjacent to the forest. “User built” trails are made by OHV users, expanding their play areas. Conflicts, such as trespass into areas closed to motorized use, are likely to arise as snowmobile and OHV ownership increases. Increased use of National Forests is also expected to facilitate expansion of noxious weeds and other undesirable or nonnative vegetation species. Urban expansion, both locally and regionally, reduces the ability of non-federal land to function as biological reserves and provide wildlife habitat connectivity at broad scales.

Wildlife species do not recognize political or administrative boundaries. Effective wildlife management involves local, regional, state and Federal agencies; public land users; industry; and private landowners. Oregon and Washington completed statewide conservation strategies in 2006 and 2005, respectively. These documents, developed in collaboration with the diverse groups mentioned above, provide the baseline information on the status, distribution, risks and management considerations for species and habitats of greatest concerns for the two states. In addition to these assessments, findings in local subbasin assessments, Partners in Flight products, state fish and wildlife products, and The Interior Columbia Basin Ecosystem Management Project (ICBEMP) have been reviewed for baseline information and additive actions that affect the landscape scale efforts of conservation and restoration.

ICBEMP conducted a large scale viability assessment within the Columbia basin in the late 1990s. Although datasets, analysis area (all lands vs. national forest system lands) and methodology differ slightly, the results (see table 342) are instructive. In some cases, like the white-headed woodpecker, there is strong agreement between the results from this analysis and that of ICBEMP. In other cases, such as the black-backed woodpecker, the trend would be considered increasing rather than decreasing, at least on the national forests.

Table 342. The relative change in habitat and trend category for the Blue Mountains Ecological Reporting Unit from ICBEMP (Wisdom et al. 2000)

Species	Season	Group	Change	Trend
Boreal owl	Year round	7	-3.25	Stable
Northern goshawk	Summer	5	-29.33	Decreasing
Northern goshawk	Winter	25	-24.71	Decreasing
American marten	Year round	5	> 100	Strongly increasing
Pileated woodpecker	Year round	6	> 100	Strongly increasing
White-headed woodpecker	Year round	1	-79.26	Strongly decreasing
Western bluebird	Year round	29	-64.24	Decreasing
Black-backed woodpecker	Year round	9	-30.96	Decreasing
Lewis's woodpecker	Year round	2	-72.17	Strongly decreasing
Wolverine	Year round	15	> 100	Strongly increasing
Lark sparrow	Year round	31	-46.28	Decreasing
Ash-throated flycatcher	Year round	30	> 100	Strongly increasing
Sage thrasher	Year round	33	-28.28	Decreasing
Gray-crowned rosy finch	Year round	38	0	Stable
Fringed myotis	Year round	26	14.12	Stable
Pallid bat	Year round	28	-41.98	Decreasing
Loggerhead shrike	Year round	35	-9.64	Stable
Rocky Mountain bighorn sheep	Summer	22	-47.61	Decreasing
Rocky Mountain bighorn sheep	Winter	22	-53.6	Decreasing
Townsend's big-eared bat	Year round	27	10.42	Stable

Many of the species that are addressed within this document have home ranges or territories that would be expected to extend beyond the boundaries of National Forest System lands. For some species, such as neo-tropical migratory birds, impacts from far-distant areas may have much greater effects than forest management activities. An example is the severe mortality in Swainson’s hawks from pesticide poisoning on wintering areas in Argentina (Goldstein et al. 1999). The upland sandpiper is considered a long-distant migrant, spending the breeding season in the United States, but wintering in South America. Other species such as mule deer may summer on National Forest System lands, but winter in valley bottoms and agricultural lands. As such, species are potentially exposed to local area effects, such as the continued alteration of riparian habitats on lands of other ownership, which may disrupt connectivity between habitats for species such as American martens. At the same time, local governments have been encouraging riparian habitat improvement projects on private lands that will actually be a beneficial cumulative effect. Other habitats that occur mostly on other ownerships, such as the sagebrush-steppe, will probably continue to be lost to invasive species like cheatgrass as management practices on private land, and the continued transportation corridors and resulting connectivity with un-invaded habitats, allow the spread of invasive species.

Wildlife and Climate Change

Earth is undergoing a period of rapid climate change that is enhanced by atmospheric carbon enrichment from human activity during the past 100 years. All organisms depend on their habitats for food, water, shelter, and opportunities to breed and raise young. Climate changes can affect

organisms and their habitats in many ways. In fact, climate change likely impacts all life on Earth, from individual organisms to populations, species, communities, and ecosystems. It may alter behavior, population size, species distributions, plant and animal communities, and ecosystem function and stability. How strongly different species will be affected differs, depending on differences in their ecology and life history. Species with small population sizes, restricted ranges, specialized habitat requirements and limited ability to move to different habitat will be most at risk. Similarly, different habitats and ecosystems will be impacted differently, with those in coastal, high-latitude, and high-altitude regions most vulnerable.

According to Hayes (2011), the accelerating change in climate poses the single biggest threat to wildlife species in the United States. Climate change likely will lead to the loss of native species from extensive areas and result in increasingly scarce and fragmented populations in many others. Further changes within ecosystems will be triggered as invasive species, both plant and animal, fill voids that are left as native species are lost. Associated changes in the food web will cascade and further destabilize ecosystems. Climate change effects will vary by ecosystem, and, although there have been many articles published on potential climate change effects on wildlife; a large degree of uncertainty still exists.

Terrestrial Species (Ruggiero et al. 2008)

Wildlife species, such as the wolverine (*Gulo gulo*), snowshoe hare (Lepus americanus), and short-tailed weasel (*Mustela erminea*), have adapted to snowy environments. The snowshoe hare, for example, is well adapted to deep snow based on its large snowshoe-like feet. A warming climate will put this species at a disadvantage, and, importantly, this species is a food source for many predators. Specific tight relationships between predators and their prey (e.g., American marten and red squirrel (*Tamiasciurus hudsonicus*)) may break apart as each species responds differently to climate changes. Native species may be further stressed by the proliferation of invasive species that thrive in warmer conditions.

Climate projections for late century (after 2050) suggest a high probability for the loss of alpine and sub-alpine ecosystems. These cold-adapted ecosystems, such as whitebark pine forests and alpine meadows, will become smaller and will eventually disappear as they are pushed up the mountains. Populations of fauna associated with these ecosystems will become increasingly fragmented and prone to extinction. Habitat isolation and restricted species movement will become prevalent. For example, breeding populations of gray-crowned rosy finches may become isolated on lingering high-elevation, boreal islands, threatening the long-term viability of the species.

Increases in disturbance owing to fire, and insects and disease will accelerate the infiltration of weeds. This is of particular concern in the Blue Mountains, where fire frequency and severity are expected to increase as the climate warms. The loss of native ecosystems to weeds affects many species of terrestrial fauna. Many animal species could be extirpated from the Blue Mountains as changes in vegetation patterns ripple through the ecosystems.

Amphibians and Reptiles (Synthesized from Lind 2008)

For amphibians and reptiles, responses to climate change will be influenced by the following primary factors: (1) expected changes and variability in local environmental and habitat conditions, (2) the phenology (timing) of life-requisite activities, (3) interactions with emerging pathogens and invasive species, and (4) interactions with other environmental stressors (e.g., chemicals). For example, in Oregon, frogs are breeding earlier in the spring and the incidence of infectious diseases among them is increasing (Oregon Climate Change Research Institute

(OCCRI) 2010). Changes in wet periods, snowpack, and flooding frequency will determine reproductive success rates and survival to metamorphosis (OCCRI 2010). Over the long term, the frequency and duration of extreme temperature and precipitation events will likely influence the persistence of local populations, dispersal capabilities and consequently the structure of metapopulations on the landscape. Synergisms among a variety of environmental stressors adversely affect native amphibians and reptiles and climatic changes are likely to exacerbate these effects.

Although amphibians and reptiles are typically grouped together in assessments such as this one, it should be noted that these two groups represent a great variety of species that are adapted to diverse ecosystems and environments throughout the world. In general, particular ecological communities are expected to move upward in both elevation and latitude (Walther et al. 2002). As with other species, montane and higher-latitude populations of amphibians and reptiles are most at risk (Root et al. 2003). Amphibians have recently been experiencing global population declines (Stuart et al. 2004) and similar signs of decline may be emerging for reptiles (Gibbon et al. 2000).

Amphibian and reptile populations are sensitive to and respond strongly to changes and variability in air and water temperature, precipitation, and the hydroperiod (length of time and seasonality of water presence) of their environments (Carey and Alexander 2003). Many amphibians require aquatic habitats for egg laying and larval development, and moist environments for post metamorphic life stages. As temperatures warm and the availability of aquatic habitats become more variable, amphibians are likely to experience lower rates of survival. Species associated with ephemeral waters, such as shallow ponds and intermittent streams, may be particularly vulnerable to altered precipitation patterns. Some reptile species exhibit temperature-dependent sex determination during egg incubation that could be influenced by changes and variability in global climates (Gibbon et al. 2000, Hawkes et al. 2007). Increases in frequency or intensity of wildfires could create changes that may directly affect animals during the wildfire event or degrade habitat conditions necessary for their survival post wildfire.

Amphibians typically have relatively small home ranges and low dispersal rates, although there are some exceptions. Reptiles are somewhat more mobile and have a greater ability to withstand the expected dryer and warmer conditions. However, in areas where key habitats and species ranges have already been altered and fragmented by human use and development, the physical pathways to connect animals with suitable habitats (e.g., upwards in latitude or elevation) may not exist. Although some near-term benefits of climate warming may be seen for some reptile species owing to increases in preferred temperatures and activity periods (ChamaillÉ-Jammes et al. 2006), over the long term, expected variability and temperature extremes will likely not be beneficial to these taxa.

For amphibians and reptiles, the timing of key ecological events is influenced by environmental conditions, such as air and water temperature and precipitation patterns. Lawler et al. (2009) found amphibian ranges were thus more vulnerable to changes in precipitation than were those of birds or mammals. The timing of reproduction (breeding/egg laying), metamorphosis, dispersal, and migration may shift in response to higher temperatures and changes in rainfall (Beebee 1995). If such shifts in amphibian and reptile activities occur inconsistently with other ecological events (e.g., emergence of their insect prey), growth and survival rates would be affected.

Recent research on amphibian declines has documented the role of emerging pathogens and in some cases epidemic outbreaks of particular infections and diseases (Daszak et al. 2003). Changes in climatic regimes are likely to increase pathogen virulence and amphibian and reptile susceptibility to pathogens. Similarly, warm water invasive species (e.g., bullfrogs and some

fishes in the western United States) are a concern to native species and may expand their ranges given warming trends, particularly earlier warming in the spring (Bury and Whelan 1984).

Birds

In North America, the northern limits of many bird species are strongly associated with various climatic variables (e.g., winter temperature). Both the ranges and the abundances of birds shift on an annual basis in concert with temperature. Studies have shown that a significant number of migrating birds are arriving up to three weeks earlier now than they did in 1960. Apparently, many bird species can and do respond to changing climatic conditions. Because their ranges are limited by vegetation, these birds probably will not be able to shift their ranges with the changing climate, at least not until the vegetation itself shifts. Consequently, natural communities of birds may change dramatically as changes in climate and vegetation favor some species and harm others. It is difficult to predict how these changes will influence community structure or function.

The pattern in Oregon is consistent with this assessment. Ranges of some birds are moving north and increasing in elevation. The other major change is the probable shift to an earlier breeding season as the temperatures become warmer earlier in the spring. Birds associated with higher elevation wetlands dependent on snowpack may be adversely affected (North American Bird Conservation Initiative (NABCI) 2010). Some forest birds already of concern may be affected by summer drying. Birds in the transition zone to the Great Basin, along the southern edge of the Blue Mountains, will be particularly vulnerable to summer drying (Olson and Burnett 2009).

Bird populations will be affected by a set of cumulative effects, including changes in ranges and migratory patterns. Earlier spring warming will affect breeding, as will changes in abundance of insects. Insects are particularly affected by climate dynamics, since their development is closely tied to temperature. For example, an increase in temperature of 2 degrees Celsius will change the availability of insects as a food source by more than 18 days (OCCRI 2010). Birds migrating may thus be adversely affected by asynchrony; they could arrive at a time when the level of insects they feed their young has declined, passed, or not yet occurred. Jones and Cresswell (2009) state:

> The phenology mismatch hypothesis predicts that migrant birds, which experience a greater rate of warming in their breeding grounds compared to their wintering grounds, are more likely to be in decline, because their migration will occur later and they may then miss the early stages of the breeding season. Population trends will also be negatively correlated with distance, because the chances of phenology mismatch increase with number of staging sites.

Because of this complicated set of trends, it is difficult to predict specific outcomes with confidence. Nevertheless, management actions to foster relatively intact and functioning ecosystems will be the best strategy to mitigate these effects.

Plant Species Diversity and Threatened, Endangered, and Sensitive Plants

Threatened, endangered, and proposed plant species are designated under the Endangered Species Act by the U.S. Fish and Wildlife Service (USFWS). One threatened species, Spalding's catchfly (*Silene spaldingii*), is present within the forest plan revision area. A second threatened plant, MacFarlane's four o'clock (*Mirabilis macfarlanei*) is not present, but suitable habitat for the species may exist within the plan area.

Threatened and Endangered Plants

Affected Environment – Spalding's Catchfly

Spalding's catchfly is an herbaceous perennial in the pink family (Caryophyllaceae). Seasonal stems emerge in the spring from the root crown, sending usually one, but sometimes multiple shoots 8 to 24 inches in height. Each stem has typically 4 to 7 pairs of leaves and 3 to 20 flowers on reproductive shoots. Stems, leaves, and the floral calyx are covered with dense sticky hairs that catch insects. The species is noted for its very long taproot that can exceed 1 meter (39 inches). Spalding's catchfly begins blooming in mid to late July. Blooming continues through August and sometimes into September. Fruits mature from August until September. Seeds are small (2 mm), wrinkled, and winged and are dispersed by wind from a dehiscent capsule (USFWS 2007).

Spalding's catchfly is endemic to the Palouse region of southeastern Washington and adjacent Oregon and Idaho, and is disjunct in northwestern Montana and British Columbia, Canada. Spalding's catchfly is found predominantly in the Pacific Northwest bunchgrass grasslands and sagebrush-steppe and occasionally in open-canopy pine stands. Occupied habitat is in five physiographic regions: (1) the Palouse Grasslands in west-central Idaho and southeastern Washington, (2) the Channeled Scablands in east-central Washington, (3) the Blue Mountains Basins in northeastern Oregon, (4) the Canyon Grasslands along major river systems in Idaho, Oregon, and Washington, and (5) the Intermontane Valleys of northwestern Montana and British Columbia, Canada. Spalding's catchfly was listed as a threatened species under the Endangered Species Act October 10, 2001.

As of 2007, there are 99 known populations of Spalding's catchfly across its range, with two-thirds of these (66 populations) composed of fewer than 100 plants. There are an additional 23 populations with at least 100 or more plants. The 10 largest populations are each made up of more than 500 plants. Approximately 78 percent of the total known Spalding's catchfly plants are within the 10 largest populations (USFWS 2007). The plan area includes occupied habitat in the Blue Mountains Basins (Wallowa-Whitman National Forest) and the Canyon Grasslands (Umatilla National Forest) physiographic regions.

The recovery plan for Spalding's catchfly (recovery plan) outlines a strategy to protect and maintain reproducing, self-sustaining populations in each of the five physiographic regions where it resides to ensure the long-term persistence of the species (USFWS 2007). Within each of these regions the USFWS identifies key conservation areas to focus conservation efforts on the larger populations that support at least 500 plants. Until the USFWS completes a comprehensive population viability analysis, the recovery plan assumes 500 individuals to be the minimum viable population size. A key conservation area possesses the following qualities:

- Is composed of intact habitat (not fragmented), preferably 40 acres or greater
- Native plants comprise at least 80 percent of the canopy cover of the vegetation
- Adjacent habitat is sufficient to support pollinating insects
- Habitat is of the quality and quantity necessary to support at least 500 reproducing individuals of Spalding's catchfly

According to the recovery plan, key conservation areas should be surrounded by 300 acres of habitat that is intact or could be restored to support Spalding's catchfly.

In the Blue Mountains Basins physiographic region, the recovery plan identifies four Spalding's catchfly key conservation areas. One key conservation area, Crow Creek, is almost entirely within the Wallowa-Whitman National Forest. The Crow Creek population is estimated to hold approximately 2,400 plants and is the third largest Spalding's catchfly population range-wide (USFWS 2007). A second key conservation area, Clear Lake Ridge, occupies National Forest System lands, BLM, and private lands. Most Spalding's catchfly patches at Clear Lake Ridge are on private lands, but more than half the plants (520 of 850) grow at one site within the Wallowa-Whitman National Forest. An additional 330 plants occupy several small patches that are predominantly on private land. Only a small portion of one patch overlaps BLM administered land. The two additional key conservation areas in the Blue Mountains physiographic region are on private lands. In the Blue Mountains physiographic region, National Forest System lands that make up the plan area contribute two of the four Spalding's catchfly key conservation areas (Crow Creek, Clear Lake Ridge). As the third largest population range-wide, the Crow Creek key conservation area plays a leading role in the conservation of Spalding's catchfly.

The recovery plan identifies five Spalding's catchfly key conservation areas in the Canyon Grasslands physiographic region. One key conservation area, the Blue Mountains Foothills is within the Umatilla National Forest and has an estimated population of approximately 1,070 plants. Another key conservation area is located on Nez Perce Precious Lands immediately adjacent to the Wallowa-Whitman National Forest. Spalding's catchfly populations also occur in the adjacent Hells Canyon National Recreation Area (HCNRA) but are outside the forest plan revision area. Spalding's catchfly sites in the HCRNA have not been identified as key conservation areas because they contain fewer than 500 plants. In the Canyon Grasslands physiographic region National Forest System lands contribute one of five Spalding's catchfly key conservation areas.

Spalding's Catchfly Occurrence within the Umatilla National Forest

Spalding's catchfly is the only federally listed plant species occurring within the Umatilla National Forest. No other listed plant species are suspected to occur within this national forest.

Spalding's catchfly occurs in an area within the Umatilla National Forest Peola and MacKee range allotments. Both allotments have been surveyed for the presence of sensitive species, including specific surveys for Spalding's catchfly in 1997 and 2000 (Wood 2006; see table 343). The Sourdough area where Spalding's catchfly occurs includes at least portions of four open ridges on the south side of Lick Creek (Cabin, Sheep, Sourdough, and Bracken ridges) and their intervening draws that support plant communities typical of the Canyon Grasslands (USFWS 2005, Johnson and Simon 1987, Tisdale 1986).

The condition of grasslands in the vicinity inhabited by Spalding's catchfly is described as variable: the northerly slopes and ridge tops are reported in good to excellent condition (USDA

Forest Service 2006), whereas the southerly slopes have been invaded by exotic plants, including state-listed noxious weeds, such as *Centaurea solstitialis*.

National Forest System lands that support Spalding's catchfly within the Umatilla National Forest are currently allocated to MA C3 big game winter range. Under this management allocation all management actions are suitable, but with some modifications of timber resources. Permitted grazing utilization standards for upland grasslands in big game winter range are 55 percent for pastures in satisfactory condition and zero to 35 percent for pastures in unsatisfactory condition [although the pastures of the Peola Allotment that are occupied by Spalding's catchfly are in a resource protection status (i.e., not grazed, to assist in the conservation of the species) (USDA Forest Service 2006)]. One road passes through the area following Sourdough Gulch. Three patches of Spalding's catchfly are about 100 to 130 meters southeast of the road and between 100 and 200 feet higher.

Table 343. Site locations of Spalding's catchfly in the Sourdough Area

State Element of Occurrence Number	Umatilla National Forest Site Number	Date Discovered	Number of Plants Reported	Allotment	Pasture
49	1007	September, 2011	200	Peola	Cottonwood
49*	20	August 16, 1995	45	Peola	Lower Sourdough
49	21	August 5, 1997	130	Peola	Lower Sourdough
49	831	August 15, 2000	150	Peola	Lower Sourdough
49	14	August 6, 1997	490	Peola	Upper Sourdough
49	15	August 6, 1997	83	Peola	Upper Sourdough
49	61	August 6, 1997	113	Peola and MacKee	Upper Sourdough
49	832	August 16, 2000	10	Peola	Upper Sourdough
49	57	August 16, 1995	6	MacKee	NA
58	76 and 77	July 28, 1997	21	Peola	Lower Sourdough
88**	State land: Smoothing Iron Ridge	September 2008	greater than 5,000	NA	NA

* EOR Numbers 50 and 56 were combined into EOR 49 in 2006 (per G. Glenne, USFWS).

** EOR 88 is within Washington Department of Fish and Wildlife land that is currently grazed. This population was discovered in 2008 with 713 plants. In 2009, additional inventory resulted in a count of 5,977 plants.

Spalding's Catchfly Occurrence within the Wallowa-Whitman National Forest

The recovery plan identifies four Spalding's catchfly key conservation areas in the Blue Mountains Basins physiographic region. One key conservation area, Crow Creek, is located almost entirely within the Wallowa-Whitman National Forest. The Crow Creek population is estimated at approximately 2,400 plants and is the third largest Spalding's catchfly population range-wide (USFWS 2007). A second key conservation area, Clear Lake Ridge, occupies National Forest System, BLM, and private lands. Most patches of Spalding's catchfly at Clear Lake Ridge are on private land, but more than half the plants (520 of 850) grow at one site within the Wallowa-Whitman National Forest. An additional 330 plants occupy several small patches that are predominantly on private land. Only a small portion of one patch overlaps with BLM administered land. The two additional key conservation areas in the Blue Mountains Basins physiographic region are on private lands. In the Blue Mountains Basins physiographic region,

National Forest System lands that make up the plan area contribute two of the four Spalding's catchfly key conservation areas (Crow Creek, Clear Lake Ridge). As the third largest population range-wide, the Crow Creek key conservation area plays a leading role in the conservation of Spalding's catchfly.

Both the Crow Creek and Clear Lake Ridge vicinities are currently allocated to MA 4A General Forest Timber/Range. The maximum livestock utilization rate for upland grasses and forbs (for pastures rated in satisfactory condition) is 55 percent.

Rare plant species occurrence information is recorded by state Heritage Programs in a numbered record called an element occurrence record (EOR) displayed in table 344. Each EOR may include one or more sites (often called subpopulations), which are defined as distinct patches of the plant on the landscape. The Forest Service tracks each site on National Forest System lands with its own spatial database (geographic information system (GIS)) number. Table 344 displays the population at Crow Creek. Population sizes were obtained via visual estimates.

A systematic approach to measure population sizes began in 2008 in partnership with The Nature Conservancy. Using statistically valid methods, The Nature Conservancy measured the area, frequency, and density of Spalding's catchfly at Crow Creek and Clear Lake Ridge. Density and area measurements were then used to estimate population size. Three years of results have been summarized (Jansen and Taylor 2010). The Nature Conservancy statistical population estimates exceed the values reported by Forest Service visual estimates and approximately double both the Crow Creek and Clear Lake Ridge populations.

Table 344. Spalding's catchfly population estimates at Crow Creek and Clear Lake Ridge

State Element of Occurrence Number	WAW GIS Number	Number of Plants Reported	Combined Population Estimate	TNC Population Estimate
Crow Creek				
EOR 016	1266, 1267 East	99-203	Crow Creek East 266-1,006	Crow Creek East 1,665-7,363 (2008) 520-2,284 (2009) 558-2,368 (2010)
EOR 014	0519, 1337, 1338, 0518/new sites in 2004, 0600-0608 East	126-295/414		
EOR 013	0516, 0517 East	41-94		
EOR 017	1268, 1269 West	58-79	Crow Creek West 822-2,259	Crow Creek West 2,306-7,242 (2008) 2,834-7,740 (2009) 854-3,586 (2010)
EOR 019	1280 West	14-20		
EOR 020	1275-1279 West	659-1,860		
EOR 018 (PVT)	1265 West	91-300		
Clear Lake Ridge				
Unassigned	061602	520	750-1,970	NA
Clear Lake Ridge TNC	NA	230-1,450 (837)		230-1,450 (2009)

Spalding's Catchfly Modeled Suitable Habitat (Wallowa-Whitman National Forest)

Suitable habitat for Spalding's catchfly within the Wallowa-Whitman National Forest has been identified using a model (Murray 2001). Physical and biological attributes from known

Spalding's catchfly sites, including vegetation type, elevation, slope, and aspect, were weighted and used to identify and map areas that have the potential to support the species. Habitats were assigned categories of probability: moderate, high, or very high. The purpose of the model is to identify areas to prioritize field inventories for Spalding's catchfly, not definitively identify suitable habitat, whether occupied or not. Nearly all known Spalding's catchfly sites are in high or very high modeled habitat, but three occurrences discovered in 2010 were found in areas not predicted by the model. Although the model does a good job of predicting potential habitat for focusing inventories, it is not perfect. Within the Wallowa-Whitman National Forest, the model identifies 9,637 acres of high potential habitat and 13,615 acres of very high potential habitat.

Threats to Spalding's Catchfly

Across its range, the main threats facing Spalding's catchfly are habitat loss due to development, habitat degradation associated with adverse grazing and trampling by domestic livestock and wildlife, and invasions of aggressive, nonnative plants (USFWS 2007). In addition, a loss of genetic fitness is a problem for small, fragmented populations where genetic exchange is limited. Other impacts include changes in fire frequency and seasonality, off-road vehicle use, and herbicide spraying and drift.

The main threats to Spalding's catchfly on National Forest System lands are invasions by aggressive, nonnative plants, adverse livestock grazing management, and changes in fire frequency and seasonality. The Spalding's catchfly population within the Clear Lake Ridge key conservation area is infested with sulfur cinquefoil (*Potentilla recta*). North Africa grass (*Ventenata dubia*) is present at the Crow Creek key conservation area. Annual exotic bromes (*Bromus tectorum, B. japonicus, B. secalinus*) are present at most Spalding's catchfly sites. Livestock grazing is currently being managed to reduce impacts at the Crow Creek area through avoidance or deferred pasture rotation (USFWS 2005). The Blue Mountains Foothills key conservation area (Umatilla National Forest) is not being grazed (resource protection status). Yellow-star thistle (*Centaurea solstitialis*), an aggressive invasive plant, does threaten the Spalding's catchfly in this area. Off road vehicle use is impacting Spalding's catchfly in the Blue Mountains Foothill key conservation area within the Umatilla National Forest, contributing to nonnative plant spread and degradation of habitat. In 2010, a fence was discovered severed with fresh vehicle tracks within 50 feet of Spalding's catchfly.

Within the Wallowa-Whitman National Forest, Spalding's catchfly populations appear stable or increasing where multiple years (15 to 20 years) of inventory has been done (USDA Forest Service 2008). Populations range from 20 to more than 500 plants. The populations on National Forest System lands in Oregon are within grazing allotments. The Mud Duck allotment is presently closed. The FEIS and record of decision (ROD) for the Joseph Creek Rangeland Analysis and associated biological assessment and biological opinion (USFWS 2005) for Spalding's catchfly in the Swamp Creek and Crow Creek Allotments were completed in 2005. Direction from the ROD continues grazing within the Crow Creek and Swamp Creek allotments where Spalding's catchfly occurs; however, an adaptive approach to grazing management was implemented with specific protections for sensitive areas. Management direction is designed to improve range condition through monitoring, reduction of trailing through the pastures, and rotation so that spring grazing is rested. Conservation measures for Spalding's catchfly include spring drought protections and rest every third year, restrictions on herding through the Doe Gulch pasture, and restricting use to spring and fall, mostly outside the active growing season. Current management direction allows the Dorrance pasture to be used during June, but not in every year. The goal of effectiveness monitoring is to ensure that the conservation measures are working as designed.

Two populations of Spalding's catchfly within the Swamp Creek allotment are within one-quarter mile of a diffuse knapweed site (about 10 acres) along Crow Creek. The population that spans both private and public land, on the terminal moraine at the north end of Wallowa Lake, is grazed and has a diffuse knapweed problem. In one Crow Creek population, both Kentucky bluegrass and *Ventenata* (an exotic annual grass) have been documented. Other annual grasses, yellow starthistle, and sulfur cinquefoil occur within one-quarter to one-half mile of populations on the Wallowa plateau (USDA Forest Service 2005).

Environmental Consequences – Spalding's Catchfly

Effects from Livestock Grazing

Livestock grazing can directly impact Spalding's catchfly by herbivory and trampling and indirectly impact Spalding's catchfly via soil compaction, soil erosion, the introduction of nonnative plants, and loss of pollinator habitat. Grazing of Spalding's catchfly has been observed and is considered a threat to the species (Kagan 1989, Hill and Gray 2004, Taylor 2007). Direct herbivory removes flowers or seeds, thereby limiting reproduction. Herbivory of leaves inhibits a plant's ability to manufacture carbohydrates necessary for seasonal growth and storage in the perennial taproot. Trampling can easily break off entire plants at the ground level and damage the root crowns from which stems emerge. Root crown damage is more frequently associated with early season grazing (Hill and Gray 2004). Late summer grazing or heavy grazing is especially detrimental to Spalding's catchfly (Hill and Gray 2004). Sufficient research has not been completed to discern what levels of grazing may allow the Spalding's catchfly to persist (USDI 2007).

Indirect effects can impact the habitat of Spalding's catchfly. Although grassland ecosystems of the arid, intermountain west experienced little grazing pressure from large, hoofed animals during the last 10,000 years (Mack and Thompson 1982, Lyman and Wolverton 2002) they cannot tolerate the levels of grazing exerted by domestic livestock in the 1800s and early 20th century. Both *Pseudoreigneria spicata* and *Festuca idahoensis* are poorly adapted to herbivory by comparison to other grass species, having little compensatory growth, such as tiller production (Caldwell et al. 1981). Disturbances, most frequently linked to adverse livestock grazing and trampling, have dramatically altered western arid ecosystems in a progression from native perennial bunchgrass communities to invasive nonnative annual grasslands that are then susceptible to more invasive perennial plant invasions (DiTomaso 2000).

Of greater concern is the impact livestock grazing may have on the pollinator community in Spalding's catchfly habitat. Described as the first large-scale manipulative study of the effect of grazing intensity on native bee communities in a North American grassland, Kimoto (2010) found that increases in grazing intensity showed a linear decline in bee diversity, abundance, and richness, especially with bumblebees (*Bombus* spp.), which have been identified as the most significant pollinator (*B. fervidus*) of Spalding's catchfly in a range-wide study (Lesica and Heidel 1996). In the absence of open pollination, Spalding's catchfly experienced an 85 percent reduction in fecundity and a loss of fitness, due to inbreeding depression, resulting in an estimated total reduction in fitness of 99 percent (Lesica 1993). Therefore, management practices that significantly reduce pollinators, especially bumblebees, could have a significant impact on the recruitment of new plants into a Spalding's catchfly population. Even though Spalding's catchfly is long lived, without seedling recruitment populations would decline over time. Forage utilizations approaching 50 percent showed very little to zero bumblebee abundance (Kimoto 2010). Therefore, grazing utilization of 50 percent within Spalding's catchfly populations and surrounding habitat would not likely contribute toward maintaining bumblebee populations,

thereby limiting Spalding's catchfly reproduction. Kimoto (2010) found that even moderate grazing (22 to 40 percent utilization) led to bumblebee declines.

Effects Common to all Alternatives

Within the Wallowa-Whitman National Forest, known Spalding's catchfly populations, including potential habitat as modeled by Murray (2001), are within lands suitable for livestock grazing. Direct and indirect effects could occur to populations of the species. As projects are planned or revised (or ongoing actions brought into compliance with the forest plan upon its implementation), livestock grazing actions would need to comply with standards PL-TES-1 and PL-TES-2 that restrict the timing of livestock grazing in occupied habitat to outside the growing season for Spalding's catchfly for pastures in satisfactory condition (low departure from the upland grassland desired condition). For pastures in unsatisfactory condition (moderate or greater departure from the desired condition) grazing is to be avoided in occupied habitat. These standards would ensure that Spalding's catchfly would not be grazed or trampled and that occupied habitat in moderate or greater departure from the upland grassland desired condition would recover to phase A or B faster than if grazed.

For alternatives B, D, E, and F, nearly all the known sites within the Umatilla National Forest are within a proposed botanical area, where livestock grazing would not be suitable. Two patches, with approximately 200 plants (about 3 percent of the Spalding's catchfly plants within the Umatilla National Forest) are north of the proposed botanical area. These two patches would be in MA 4A General Forest for all alternatives. For alternative C, all known Spalding's catchfly sites within the Umatilla National Forest would be allocated to a wilderness study area, where livestock grazing would be suitable. For alternative A, known Spalding's catchfly plants would be within the current C3A allocation, which is also suitable for livestock grazing. Therefore, livestock grazing would not affect the majority of the known population of Spalding's catchfly within the Umatilla National Forest. For all alternatives, about 3 percent of the population could be affected by grazing. These patches and other Spalding's catchfly populations that may be discovered during the life of the plan would be managed according to standards PL-TES-1 and PL-TES-2 as described for the Wallowa-Whitman National Forest.

Effects from Invasive Plants

Exotic, invasive plant species threaten the viability of Spalding's catchfly. Invasive plants compete with Spalding's catchfly for water, nutrients, and light. Of greatest concern is the effect of invasive plants on seedling establishment, a vulnerable state for perennial plants. Not only are invasive species able to outgrow seedlings of Spalding's catchfly, they often leave behind increased leaf litter, inhibiting the germination of other plants. In one study in Washington, high levels of exotic plants (*Bromus secalinus*, *Hypericum perforatum*, and *Ventenata dubia*) were associated with less vigorous occurrences of Spalding's catchfly (Caplow 2002). Invasive plants also provide competition for pollinators, affecting fecundity and individual fitness in Spalding's catchfly (Lesica and Heidel 1996). Insects may switch from Spalding's catchfly to an invasive plant if it is more abundant or provides more pollen or nectar (Richards 1997). Lesica and Heidel (1996) found lower visitation rates for Spalding's catchfly in sites infested with *Hypericum perforatum* (St. John's wort).

With the increased level of activity expected for alternative D, the risk of increased invasive plant spread would be more likely compared to the other alternatives. See the Non-native Invasive Plants section for a discussion of these effects from invasive species.

Forest plan objective 1.5, "Reduce current infestations of invasive plant species," would contribute to the conservation of Spalding's catchfly by reducing or eliminating invasive species in and around occupied habitat. Invasive plant treatment actions designed to reduce or eliminate infestations may affect Spalding's catchfly. The main concern here is the use of herbicides to treat invasive plants, which, if applied indiscriminately, may cause mortality or damage to Spalding's catchfly. The forest plan would address this concern by incorporating standards from the 2005 Record of Decision for the Preventing and Managing Invasive Plants FEIS. The 2005 plan standard (number 20) directs invasive plant treatments to be designed to minimize or eliminate adverse effects to species or habitats proposed or listed under the Endangered Species Act.

Effects from Prescribed Fire

Although the actual effects of prescribed fire is unknown, Spalding's catchfly is presumed to have evolved with and adapted to the historical fire regime in intermountain western North America (Lesica 1999), where fire has been a common occurrence in grasslands (Barrett and Arno 1982). Historical fire frequency in the Idaho fescue grasslands of the Blue Mountains is not well understood, but it is believed fires were frequent, with return intervals of less than 35 years (Johnson and Swanson 2005). Late summer fires are more damaging to Idaho fescue, but pre-burn cover of fescue returns usually within five years (Johnson and Swanson 2005). In the Idaho fescue grasslands of northeastern Oregon and southeastern Washington, fire is not believed necessary to promote seedling establishment of Spalding's catchfly as it apparently is in the western Montana grasslands dominated by rough fescue (Lesica 1999). Drier conditions in northeastern Oregon and southeastern Washington also limit the ability of trees and shrubs to encroach onto grasslands. Therefore, prescribed fire may not be needed to maintain grasslands in northeastern Oregon and southeastern Washington. If prescribed fires are needed to improve habitat for *S. spaldingii*, they would be carried out during the early spring or fall, when fires are more easily controlled. Fires carried out in the fall would probably have less impact to *S. spaldingii* than fires carried out during spring. During spring, it is possible seedlings could be killed. Dormant plants would probably not be affected, and older plants emerging from root crowns may suffer only minor damage. Perennial individuals damaged by spring fire are expected to send up additional shoots from axillary buds. Forest plan guideline PL-TES-7 would require sensitive plants to be buffered (minimum 100 feet) from slash piles to protect plants from the extreme temperatures that develop underneath or next to them. The overall effect of prescribed fire would benefit *S. spaldingii*, though some individual plants may be adversely affected in the short-term. [If the overall effect of an action is beneficial to the listed species, but also is likely to cause some adverse effects, the action is likely to adversely affect the listed species (USFWS and NMFS 1998)].

Effects from Climate Change

The effects of climate change are speculative, but it has the potential to affect rare plants, including Spalding's catchfly. Researchers speculate that a warming climate will alter precipitation patterns, with some regions becoming drier and others wetter. Within the Pacific Northwest, a recent model predicts warmer and wetter winters in 80 years. Being stationary, plants must migrate through dispersal, colonization and recruitment strategies, a relatively slow process compared to mobile organisms. Some researchers believe that plant species will not be able to migrate at a pace dictated by a warming climate, which would isolate and eventually doom some species, unless new adaptations arise to cope with a changing environment. Even though activities would be designed to maintain or improve Spalding's catchfly habitat or numbers, these actions may cause short term adverse effects. Restorative actions, such as

prescribed fire or collecting *S. spaldingii* seed for long term storage, could cause short-term adverse effects, even though the overall effect of these actions would be beneficial.

Determination for Spalding's Catchfly

A complete biological assessment is being prepared, but the anticipated determination is that forest plan goals, objectives, standards and guidelines, and areas identified for suitable activities that may be conducted within the Wallowa-Whitman National Forest and (to a lesser extent) the Umatilla National Forest for any of the alternatives, may affect, and would be likely to adversely affect Spalding's catchfly. Though many management actions, such as nonnative invasive species abatement or prescribed fire, would assist in the recovery of Spalding's catchfly, these actions may have short-term effects that could impact individuals or their habitat, while promoting the recovery of the species in the long term.

Affected Environment – Macfarlane's Four O'clock

MacFarlane's four o'clock (*Mirabilis macfarlanei*) is a rare plant narrowly endemic to a small range (46 by 29 km) in northeastern Oregon and adjacent west-central Idaho. MacFarlane's four o'clock was listed endangered under the Endangered Species Act in 1979. As more populations were discovered, the status was downgraded to threatened (61 FR 10693-10697). Populations have not been discovered within the plan area but are in the adjacent Hells Canyon National Recreation Area. The nearest population is approximately 25 miles to the southeast in the Imnaha River canyon. Suitable habitat for the species exists within the plan area below 3,000 feet in the Joseph Creek canyon, Wallowa Ranger District, Wallowa-Whitman National Forest.

MacFarlane's four-o'clock is a perennial forb in the Nyctaginaceae or four-o'clock family. New shoots emerge in the early spring from tuberous rootstock with flowers blooming from late May to early June. Each flower produces only one barrel-shaped achene: a single seeded fruit about 6mm long. Seeds typically disperse via gravity from late June through July, and plants generally senesce shortly thereafter. Seedling establishment is apparently infrequent; most reproduction is accomplished asexually via tuberous roots that continue to grow in several directions and send up new stems.

Environment Consequences – Macfarlane's Four O'clock

MacFarlane's four-o'clock grows predominantly in blue-bunch wheatgrass grasslands below 3,000 feet in the canyon grasslands ecological type described by Tisdale (1986). Suitable habitat for Macfarlane's four o'clock within the Wallowa-Whitman National Forest has been identified using a model (Murray 2001). Physical and biological attributes from known Macfarlane's four o'clock sites, including vegetation type, elevation, slope and aspect, were weighted and used to map areas that have the potential to support the species. Habitats were assigned categories of probability: moderate, high, or very high. The purpose of the model is to identify areas to prioritize field inventories for Macfarlane's four o'clock; it does not definitively identify suitable habitat, whether occupied or not. Eleven of 12 Macfarlane's four o'clock occurrences known to occur in the Hells Canyon National Recreation Area are in very high potential (8 occurrences) or high (3 occurrences) potential habitat. One site falls in an area not predicted by the model. Similar to the Spalding's catchfly habitat model (discussed previously), the Macfarlane's four o'clock model does a good job of predicting potential habitat for focusing inventories, but is not perfect.

Within the plan area portion of the Wallowa-Whitman National Forest, the model identifies 1,258 acres of high potential habitat. The model does not identify any very high or moderate potential habitat within the plan area. A survey completed in 2004 in MacFarlane's four o'clock potential

habitat in the Joseph Creek canyon (USDA Forest Service 2005e) did not detect new occurrences. This survey was conducted in the likely best available habitat within the plan area and near the known range of the four o'clock. Additional surveys conducted in 2007, 2008, 2009, and 2010 of MacFarlane's four o'clock very high and high potential habitat within the Snake River canyon did not detect new occurrences. Based on the negative survey findings in the plan area and in the Snake River canyon, it is unlikely that MacFarlane's four o'clock occurs within the plan area.

Determination for Macfarlane's Four O'clock

Given the negative survey results in the best quality suitable habitat within the plan area and the long distance of this habitat from the known range of the species, *Mirabilis macfarlanei* is presumed not present in the plan area. Therefore, any alternative would result in no effect to *Mirabilis macfarlanei*.

Sensitive Plants

Forest plan components will be evaluated for each alternative by their predicted ability to meet the direction set forth in Sections 219.26 and 219.27 of the 1982 planning rule and in their ability to achieve the desired condition for federally listed plants and plants included on the Regional Forester's Sensitive Species List.

Proposed forest plan goals, desired conditions, and standards and guidelines common to all action alternatives are found in appendix A.

Alternative A, the no-action alternative, is the continuation of the 1990 forest plans for the Malheur, Umatilla, Wallowa-Whitman, and Ochoco National Forests (the portion of the Ochoco National Forest administered by the Malheur National Forest's Emigrant Creek Ranger District). They include management direction to provide a diversity of habitat sufficient to maintain viable populations of plant and animal species.

Affected Environments – Sensitive Plants

Sensitive plants are designated by the regional forester. To facilitate analysis, sensitive species have been grouped into 14 habitats. These groups are discussed further in environmental consequences.

Habitat Groups for Sensitive Plant Species

- Alpine fellfields and subalpine parkland
- Aspen, cottonwood
- Conifer forest
- Sagebrush shrubland
- Grassland
- Basalt lithosol
- Talus, cliffs, and rock outcrops
- Aquatic
- Fens/bogs
- Seep/spring
- Riparian
- Intermittent stream
- Moist meadow
- Wet meadow

Each habitat group is represented throughout the plan area and can be found within all three national forests.

Affected Environment – Alpine Fellfields and Subalpine Parkland

Alpine areas are lands above the timberline. Within the plan area, these are found on the highest peaks of the Wallowa Mountains, Elkhorn Mountains, Greenhorn Mountains, and Strawberry Mountain. Fellfields are among the dominant vegetation community in alpine areas. Fellfields are characterized by stony soils that support sparse vegetation. Subalpine parklands are treeless plant communities at or immediately below the timberline. Subalpine parkland is more widespread than alpine areas in the Blue Mountains. Parkland can be found throughout the Wallowa and Elkhorn Mountains; it becomes less a feature of the landscape to the south and west as elevations and precipitations decline; though they are a feature in the Greenhorn Mountains and the Strawberry Mountains. The plant communities in parkland may be similar to fellfield, but the meadows that dominate parkland are usually more lush than fellfields.

Nearly all species listed for alpine fellfields and subalpine parkland are confined to designated wilderness areas. The few exceptions are discussed further:

Lomatium greenmanii: One population, the largest known, is located on the summit plain of Mount Howard, just north of the Eagle Cap Wilderness Area in the Wallowa Mountains. Two other populations are found within the Eagle Cap Wilderness Area. The current land allocation is backcountry.

Lomatium erythrocarpum: All known sites of this narrow endemic are in the Elkhorn Mountains. The current land allocation is backcountry.

Table 345. Alpine fellfields and subalpine parkland habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Bupleurum americanum	Subalpine fellfields. Talus slopes, rocky soils, dry meadows, ridgetops. Can be in a mosaic of open areas, and scrubby coniferous forest. Generally north to northwest aspect. Coarse gravel; granodiorite and basaltic lithosols.			D
Carex nardina	Exposed arctic and subalpine tundra, usually calcareous, cliffs, rocky slopes, ridges, and summits 50-3,300 meters. Population is in the dark sedimentary rocks of Hurwal formation. Habitat well distributed. Plant not well distributed across habitat.			D
Carex pelocarpa	Alpine slopes, ridge crests, rocky lakeshores 2,700-3,700 meters. Ours are on fellfield in lower sedimentary series, scattered in alpine depression, and on streambanks. Not clear if always on calcareous soils.			D
Carex pyrenaica ssp. *micropoda*	Moist meadows, stream banks, seeps, snowbeds, and areas irrigated by meltwater 10-4,000 meters. Boulder talus.		D	D
Carex vernacula	Moist alpine tundra, moist forest openings just below treeline. High elevation only, 2,000-3,800 meters.	S	D	D
Castilleja fraterna	Open, exposed, bare rock and talus in sub-alpine tundra. Damp sub-alpine meadows and streambanks. Restricted to calcareous substrates; both sedimentary soils and Martin-Bridge limestone outcrops. Wallowa Mountains endemic.			D

Scientific Name	Habitat Description	MAL	UMA	WAW
Castilleja rubida	Talus, alpine fellfields. Wallowa Mountains endemic. Open, exposed bare rock on calcareous substrates. Hurwal sedimentary soils and Martin-Bridge limestone outcrops. Alpine tundra habitat w/low grasses, sedges, and forbs. All aspects and slopes.			D
Cymopterus nivalis	Open rocky places. Moderate to high elevations.	D	S	S
Kobresia myosuroides	Tundra, grassland, heaths, bare rocky, dry to wet ground; zero-3,500 meters (18). Moist meadows, seeps, riparian areas. Often above timberline; high elevations only in Blue Mountains.			D
Kobresia simpliciuscula	Fens, marshes, mesic to wet tundra, gravels, rocky slopes, usually on calcareous substrates; zero-3,500 meters. Moist meadows, seeps, riparian areas. Streamsides, bogs, pond edges. Moderate to high elevations in Wallowa Mountains.			D
Lomatium erythrocarpum	Ridges, fine argillite talus, open slopes. Mostly on steep slopes, with very little vegetation. Alpine knotweed (Polygonum phytolaccaefolium) is often associated. Most populations are south or east facing. High elevation in southern Elkhorn Mountains only.			D
Lomatium greenmanii	Subalpine grasslands on sedimentary rocks at basalt interface. Ridges, fine basalt-derived talus, open slopes. High Wallowa Mountains endemic. Soils are thin and fine textured.			D
Phlox hendersonii	Alpine fellfields, open gravely slopes and ridges. Glacial moraines.	S		D
Saxifraga adscendens ssp. *oregonensis*	Rock crevices, glacial moraines, alpine meadows, along streams. Damp cliffs where soil has accumulated. High elevations only. Recent sites in Wallowa Mountains are in limestone, reported also on quartzite and gneiss in Idaho.	S		D
Townsendia alpigena var. *alpigena*	Meadows, granite and limestone ridges; 2,000-3,100 meters. Rocky, dry areas, high elevations only.			D
Townsendia parryi	Meadows, grassy slopes, gravelly benches, talus; 1,500-3,000 meters. Rocky, dry areas, high elevations only here.			D

D: documented within the national forest, S: suspected to occur within the national forest.

Environmental Consequences – Alpine Fellfields and Subalpine Parkland

Indirect Effects

Wilderness area management retains the 1990 forest plan direction in all alternatives except for two instances in alternative C. For alternative C, two guidelines from 1990 management direction that are retained in alternatives B, D, E, and F become standards. One guideline would, as a standard, require new proposals for outfitter and guide special use permits, or recreation event permits, be approved only when the special use or event is consistent with wilderness area desired conditions and a need is identified by a needs assessment and capacity analysis. The second guideline, as a standard under alternative C, would prohibit camping and campfires within 200 feet of lakes, streams or other camps. This second standard, under alternative C would bring

slightly better protection to sensitive species with habitat near water bodies within alpine areas and subalpine parkland. Otherwise, the 1990 management direction for congressionally designated wilderness areas, retained for alternatives B, D, E, and F, would more than meet the desired condition for sensitive species within alpine areas and subalpine parkland. In congressionally designated wilderness areas timber production, timber harvest, motor vehicle use, road construction, mechanical fuel treatment, and energy development are unsuitable uses, under all action alternatives. In effect, congressionally designated wilderness areas serve as reserves for rare plant species, as well as for many other natural resources. While it is possible that individuals of rare species inhabiting alpine environments in wilderness areas may be affected by authorized activities, these impacts are expected to be minor, and not result in a loss of population viability within the plan area. New trail construction would have to comply with standard PL-TES-10, directing that new trail construction to avoid threatened, endangered, or sensitive plant locations.

For the populations of *Lomatium greenmanii* outside wilderness areas, the alternatives vary in land management allocations and suitability of uses. In the alternatives B, E, and F, the allocation is MA 3B Backcountry (limited motor vehicle use). Under alternative D the proposed allocation is MA 4A General Forest. Alternative C would include this area as MA 3A Backcountry (nonmotorized use). The suitable uses vary from only grazing (alternative C) to all uses for alternative D. Given the subalpine habitat of the species and its current range restricted to one peak outside wilderness areas, impacts from recreation uses would be the only likely activity to impact the species. Impacts from new trail construction would be addressed for alternatives B, E, and F with guideline PL-TES-10, which directs new trail construction to avoid the occupied habitat of sensitive plant species.

In the case of *Lomatium erythrocarpum*, alternatives B and D would retain 1990 management direction of limited motor vehicle use in a backcountry area (MA 3B) within the area of the plant's habitat. Alternative E would designate this area as nonmotorized backcountry area (MA 3A), while alternative C would include the area containing the species' habitat within a preliminary administratively recommended wilderness area (MA 1B). Each of these management allocations restricts management to a lesser or greater degree and, with the possible exception of motor vehicle trail use under alternatives A, B, and D, none of the designated suitable uses under any alternative poses a threat to the species. Existing hiking trails already provide access to the area occupied by *Lomatium erythrocarpum*. Any new trail construction would be directed by guideline PL-TES-10 to avoid the occupied habitat of *Lomatium erythrocarpum*.

Affected Environment – Conifer Forest

The conifer forest habitat group includes all types of forest, from dry ponderosa pine forest to the relatively wet subalpine fir and mountain hemlock. Sensitive species that inhabit conifer forest are listed in table 346.

Environmental Consequences – Conifer Forest

Indirect Effects

Timber harvest, livestock grazing, and prescribed fire are the principal threats to sensitive plants that inhabit the conifer forest group. The forest plan would respond to these threats with guidelines for alternatives B, E, and F that would require sensitive plants to be buffered (minimum 100 feet) from timber harvest and associated activities (PL-TES-6) and piling and burning of slash (PL-TES-7), and it would limit the maximum utilization of key forage species (grasses) to 30 percent (PL-TES-4). Although some individual plants may be impacted by subsequent project actions, these guidelines would be expected to maintain the populations of

species in the conifer habitat group. The action alternatives do not vary in the biological evaluation finding: may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Table 346. Conifer forest habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Allium campanulatum	Dry PIPO forest, margins of PIPO stands adjacent sagebrush openings; mountain big sagebrush above treeline.		D-WA	
Botrychium paradoxum	In snowfields, secondary growth of pastures; 1,500-300 meters (18). Moist meadows, riparian zones, moist roadsides. Montane to subalpine grasslands or forb dominated meadows. In openings and on edges of cold coniferous forests.	S	D	D
Botrychium ascendens	Moist meadows, riparian zones, moist roadsides, openings in cold forests. Often in calcareous soils, but not always. Lower montane, mesic coniferous forest and grassy fields.	D	S	D
Botrychium pedunculosum	Brushy secondary-growth habitats along streams and roadsides; 300-100 m (18). Moist meadows, riparian zones, moist roadsides. Sometimes in openings or on edges of cold coniferous forest	S	D	D
Carex cordillerana	Naturally disturbed rocky slopes with organic layer and leaf litter in mesic mixed forests, or disturbed, open grassy slopes; 500-2,400 meters. Moist, shady woods; warm-moist plant associations. Found in aspen being taken over by Douglas-fir in Washington.	D	D	D
Collomia mazama	In southern Oregon Cascades, C. mazama inhabits high elevation (4,800-6,300 feet) forest-meadow ecotones in the red fir/mountain hemlock and lodgepole pine forest zones and occasionally along riparian areas.	D		
Cypripedium fasciculatum	Coniferous forest - moist coniferous forest usually at lower third of slope or riparian conifer forest bottomland.		D	S

D: documented within the national forest, S: suspected to occur within the national forest.

Affected Environment – Aspen and Cottonwood

Species that occur in aspen (*Tortula mucronifolia*) and cottonwood (*Carex cordillerana*) communities are listed in the following table.

Table 347. Aspen and cottonwood habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Carex cordillerana	Naturally disturbed rocky slopes with organic layer and leaf litter in mesic mixed forests, or disturbed, open grassy slopes; 500-2,400 meters. Moist, shady woods; warm-moist plant associations. Found in aspen being taken over by Douglas-fir in Washington.	D	D	D
Tortula mucronifolia	Forms a soil crust.	S	S	S

D: documented within the national forest, S: suspected to occur within the national forest.

Aspen and cottonwood communities are classified within the warm riparian forest potential vegetation group (Countryman 2010). Patch sizes in these communities are usually less than 40 acres in size. Some stands within the Wallowa-Whitman National Forest are between 40 and 100 acres. The fire frequency interval has not been established for the warm riparian forest potential vegetation group, although recent research indicates that the return interval in riparian areas is very similar to the adjacent uplands (Olsen 2000). ICBEMP findings documented in the Status for the Interior Columbia Basin Summary of Scientific Findings (USDA Forest Service 1996) and Quigley et al. (1997) show that fire exclusion has resulted in declines in aspen communities within the Interior Columbia Basin. *Carex cordillerana* is believed to have declined in distribution and abundance through decades of fire suppression, resulting in increased growth of competing understory plants, such as snowberry, that compete for light, water, and nutrients (Carex Working Group 2008). Livestock grazing is believed to have impacted this palatable plant (Wilson et al. 2008).

Environmental Consequences – Aspen and Cottonwood

Indirect Effects

The forest plan objective for this special habitat (1.13) for all three national forests in the plan area is to increase the distribution of aspen and cottonwood as well as increase the young, or sprout, age class of these communities. Increasing the distribution of aspen and cottonwood would benefit other species dependent on the habitat provided by these hardwood tree species, including *Carex cordillerana* and *Tortula mucronifolia*. Increasing the amount of young age classes of aspen and cottonwood within existing groves would help in the longer term maintenance of these habitats, which would also benefit dependent species. This may be accomplished by thinning competing coniferous trees, which have the potential to impact both *Carex cordillerana* and *Tortula mucronifolia*; however, this prescription would benefit the species in the long term. Additional mitigation measures could be applied at the site-specific project level. Prescribed fire is expected to benefit *Carex cordillerana* in the long term.

Plan objectives to move stands in the dry and moist potential vegetation groups toward condition classes 1 and 2 would improve habitat condition for this habitat group, particularly for aspen, which is often found in smaller patches within a larger matrix of dry or moist forest or moist upland shrubland. Alternatives D and E would provide the greatest benefit with projections to treat the most acres (215,000 and 220,000 acres respectively). Alternative C projects to treat the least acres (155,000 acres), while projections for alternatives A and F are in the middle (170,000 and 190,000 acres). Tree thinning and fuels reductions used to carry out these objectives would comply with guidelines PL-TES-6 and PL-TES-7, which would require sensitive plants to be buffered (minimum 100 feet) from timber harvest and the piling and burning of slash. A thinning prescription in this habitat group would benefit the species by increasing solar radiation. Prescribed fire used to reduce fuel loads would benefit the species by helping to reduce competing vegetation. Some individual plants may be impacted by subsequent project actions, but these guidelines are expected to maintain populations of sensitive plants. The action alternatives do not vary in the biological evaluation finding: may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Affected Environment – Sagebrush Shrubland

Sagebrush shrublands are sagebrush communities with at least 5 percent crown cover of sagebrush (*Artemisia tridentata* or *A. arbuscula*). Stiff sagebrush, *Artemisia rigida*, communities are included under the habitat group lithosol. Species that depend on sagebrush communities are

listed in the table below. Both high elevation (cold shrubland potential vegetation group) and lower elevation big sagebrush (moist shrubland potential vegetation group) and low sagebrush (dry shrubland potential vegetation group) communities are included. Both the cold and moist shrubland potential vegetation groups include mountain big sagebrush, *A. tridentata* var. *vaseyana*; however, the understory changes from western needlegrass or elk sedge present in the cold shrubland potential vegetation group to Idaho fescue in the moist shrubland potential vegetation group. *Artemisia arbuscula*-Idaho fescue communities also comprise the moist shrubland potential vegetation group.

In an evaluation of current vegetation survey (CVS) plot data, 38 percent of the sampled plots in the moist upland shrubland potential vegetation group within the Malheur National Forest were in phase A or B (good or fair condition), 45 percent were in phase C (poor condition but can recover via succession to phase A or B) and 17 percent were in phase D (altered, unable to recover to natural condition of phase A or B) (Countryman 2010, Johnson and Swanson 2005). Within the Umatilla National Forest, 37.5 percent of the sampled plots in the moist upland shrubland potential vegetation group were in phase A or B, 12.5 percent were in phase C, and 50 percent were in phase D. Within the Wallowa-Whitman National Forest, 20 percent of the sampled plots in the moist upland shrubland were in phase A or B, 15 percent were in phase C, and 55 percent were in phase D. In the dry upland shrubland potential vegetation group, 28 percent of the sampled plots were in phase A or B within the Malheur National Forest, 23 percent were in phase C, and 49 percent were in phase D. Within the Umatilla National Forest, 86 percent of the sampled plots were in phase A or B, 14 percent were in phase C, and zero percent were in phase D. Within the Wallowa-Whitman National Forest, 8 percent of the sampled plots were in phase A or B, 23 percent were in phase C, and 69 percent were in phase D. No data were available for the cold upland shrubland potential vegetation groups.

Table 348. Sagebrush shrubland habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Astragalus tegetarioides	Sagebrush flats on volcanic ash or basaltic substrates, adjacent and sometimes encroaching on ponderosa pine forest, cracks of welded tuff outcrops. Moist shrubland potential vegetation group.	D		
Camissonia pygmaea	Unstable soils or gravel in steep talus, dry washes, banks, and roadcuts. Open, bare ground. Moist or Dry Shrubland potential vegetation group.	S	S	S
Castilleja flava var. *rustica*	Talus, open dry hillsides, often with mtn. big sage. Wet, subalpine prairies, limestone cliffs, dry basalt soil, granite cliffs. Mixed conifer forest and open mtn. sage steppe. Cold shrubland potential vegetation group.	S	D	D

D: documented within the national forest, S: suspected to occur within the national forest.

Astragalus tegetariodes only occurs within the Malheur National Forest in the mountain big sage sagebrush habitat of the moist upland shrubland potential vegetation group. The state or phase condition of the shrublands within the smaller range occupied by *Astragalus tegetarioides* is not known, but the overall condition of the moist upland shrubland is modest with 38 percent in good condition and 45 percent in fair condition (phase C). Phase C is a state that is capable of recovery to phase B. The genus *Astragalus* has a propensity for disturbance regimes, so it is possible the species could be adequately maintained in phase C shrublands. Site observations indicate the species has increased its cover in disturbed areas left to recover, such as double track, jeep trail

roads or the margins along unimproved roads. Timber harvest and associated activities when conducted adjacent to occupied shrublands, livestock grazing, and prescribed fire are the management activities that might impact *A. tegetariodes*. Effects to this plant would be the same as described for *Carex cordillerana*.

Camissonia pygmaea is suspected to occur but has not yet been discovered on National Forest System lands. Its habitat is suspected to occur in the warm or dry shrubland potential vegetation group. *Castilleja flava var. rustica* occurs in one isolated population in the Elkhorn Mountains within the Wallowa-Whitman National Forest and four populations within the Umatilla National Forest. Its habitat would be included the cold upland shrubland potential vegetation group.

Environmental Consequences – Sagebrush Shrubland

Indirect Effects

These three species may benefit from forest plan objective 1.7 proposed for alternatives E and F that would improve rangeland vegetation in phases C and D to phase A or B.

For *A. tegetarioides,* the range of this plant within the Malheur National Forest for both the no action and the action alternatives would be allocated to MA 4A General Forest where all uses would be considered generally suitable. Plan objectives to move stands in the dry and moist potential vegetation groups toward condition classes 1 and 2 would improve *A. tegetariodes* habitat that is immediately adjacent to timbered stands. Effects would be similar to those described for *Carex cordillerana*. Thinning pine stands encroached upon by *A. tegetariodes* would be beneficial as a result of modest soil (surface) disturbance and increased solar radiation. Objectives to improve rangeland would assist in moving this habitat type toward the desired conditions of adequate quality, distribution, and abundance.

The maintenance of *Camissonia pygmaea* (if discovered in the plan area) and *Castilleja flava* var. *rustica,* would rely on plan guidelines PL-TES-4, -5, -6, -7, -8, -9, -10, -11, and -12. These guidelines would require site specific projects to provide avoidance buffers and would require that grazing management practices be designed to reduce impacts on occupied habitat. Although some individual plants may be impacted, the guidelines are expected to maintain populations of sensitive plants. The action alternatives do not vary in the biological evaluation finding: may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Affected Environment – Grasslands

Grasslands are composed of upland herbaceous vegetation dominated by grasses. Meadows and grass or grass-like dominated riparian areas are separate habitat groups. Sensitive species listed in table 349 occupy grassland habitats.

The sensitive species listed in table 350 occur in grasslands within the Umatilla and Wallowa-Whitman National Forests. These species occupy moist upland herbland and dry upland herbland potential vegetation groups as described in the vegetation section. In an evaluation of CVS plot data, 50 percent of the sampled plots in the moist upland herbland potential vegetation group within the Umatilla National Forest and 67 percent within the Wallowa-Whitman National Forest were in good or fair condition (phase A or B). In the dry upland herbland potential vegetation group, 42 percent of the sampled plots within the Umatilla National Forest and 46 percent within the Wallowa-Whitman National Forest were in good or fair condition (phase A or B) (Countryman 2010). The desired condition for herblands is that 70 to 90 percent of their area be in phase A or B.

Table 349. Grasslands habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Allium campanulatum	Rocky ridges of grasslands.		D	
Allium diction	Rocky ridges of grasslands.		D	
Astragalus arthurii	Bunchgrass communities, mostly low elevation Idaho fescue-prairie junegrass sites; sumac and bluebunch wheatgrass, Idaho fescue- bluebunch wheatgrass/balsamroot; bluebunch-poa secunda.		D	D
Astragalus cusickii var. *cusickii*	Dry, grassy or rocky slopes; in loose, finely textured soils derived from basalt, on basalt cliffs and talus; w/bluebunch wheatgrass and Idaho fescue.		D	D
Calochortus macrocarpus var. *maculosus*	Dry plains, rocky slopes, sagebrush scrub, pine forests, usually in volcanic soil; 300-2,700 meters. Dry grasslands, ridgetops. In rocky, basaltic derived soils, on hillsides, rock outcrops and cliff bands. In grasslands on steep slopes.		D	D
Delphinium bicolor	Low larkspur is found on sites ranging from open woods and grasslands. Low larkspur is found on sites ranging from open woods and grasslands to subalpine scree.		D	D
Lomatium rollinsii	Canyon grasslands; slopes: very steep to relatively gentle; soils: gravelly and rocky to deeper loamy conditions. Associated species include Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Agropyron spicatum*), and Sandberg's bluegrass (*Poa sandbergii*).		D	D
Pyrrocoma scaberula	FEID-AGSP-KOMA; Snowberry (*Symphoricarpos albus*), and native roses (*Rosa woodsii* and *R. nutkana*) are the most common shrub associates, but serviceberry (*Amelanchier alnifolia*), Oregon grape (*Mahonia repens*) and others can also co-occur.		S	D

D: documented within the national forest, S: suspected to occur within the national forest.

Table 350. Upland vegetation percent maximum utilization standards and guidelines for management systems that incorporate deferment, rest, and rotation

Departure from Desired Condition	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Low departure	50-60	55	30	50	40	40
Moderate or greater departure	50	35	30	45	35	35

*Moderate is 41 to 50 percent utilization (Holechek 2006).

Improper heavy grazing, unnaturally high fire frequency, and invasion by exotic plants are the biggest threats to the sensitive species occupying grassland habitat. Higher fire frequencies are to be expected in phases C and D grasslands, which have a higher proportion of nonnative invasive species at the expense of native bunchgrasses. Therefore, actions to promote the development of phase A or B herblands best address the threats from invasive plants and high fire frequencies.

Environmental Consequences – Grasslands

Indirect Effects

The alternatives include objectives to increase the proportion of phase A or B herblands, which would benefit sensitive plants that inhabit grasslands. Where alternatives vary is in utilization standards for upland vegetation and permitted AUMs. Upland vegetation maximum utilization standards and guidelines are displayed in table 350 for management systems that incorporate deferment, rest, and rotation, which comprise the vast majority of grazing allotments in the Blue Mountains national forests.

Holechek (2006) reviewed grazing studies that compared controlled intensity, timing, and frequency with grazing exclusion and concluded that grazing is sustainable and could be beneficial compared to complete exclusion when grazing intensities do not exceed 40 percent utilization. Miller et al. (1994) found that communities capable of returning to good ecological condition could occur either under grazing exclusion or at light to moderate grazing intensity. Miller did not quantify utilization at either light or moderate grazing levels, but Holechek (2006) defines these levels quantitatively and qualitatively: non-use to light grazing ranges from zero to 30 percent utilization and moderate grazing from 41 to 50 percent utilization. Holechek further defined utilization from 31 and 40 percent as conservative and heavy grazing at utilization levels exceeding 50 percent. The discussion of indirect effects summarizes the findings of effects to grazing land phases. A more complete discussion of indirect effects to rangeland vegetation with respect to utilization levels and state or phase outcomes is in the Livestock Grazing and Rangeland Vegetation section.

Effects Common to All Action Alternatives

The plan objectives to reduce current infestations of invasive plant species would assist in increasing the amount of phases A and B herblands and consequently would benefit sensitive species.

Effects from Alternative A (no action)

The relative amount of rangeland in phases A through D is expected to remain similar to the existing condition. No improvements from phase C are expected. Sensitive plant species inhabiting grasslands would have the fewest acres of suitable habitat in phase A or B. The desired condition of a minimum 70 percent of grasslands in phase A or B would not be met.

Effects from Alternative B

Areas moderately or greatly departed from the desired condition would be grazed at lower intensity, not to exceed 35 percent utilization, to allow improvement of rangeland condition and movement toward the desired condition. These kinds of improvements in condition should benefit sensitive species inhabiting upland grasslands. For areas with low departure from the desired condition, grazing at 55 percent maximum utilization, a level considered heavy by Holechek (2006), could lead to a decline in phases A and B communities. The utilization level would likely move these communities further from the desired condition, although it has been reported that the observed actual past use in upland rangelands has not exceeded 40 percent, even though the 1990 forest plans (alternative A) permitted use of up to 60 percent (see the Livestock Grazing and Rangeland Vegetation section). If utilization levels exceed 50 percent on large expanses of grasslands, declines in suitable habitat for grassland dependent sensitive species would be expected. Forest plan guideline PL-TES-4 would limit forage on key species in occupied habitat to 30 percent or less. This level is expected to maintain sensitive plants in grasslands.

Effects from Alternative C

Alternative C would provide the greatest opportunity to achieve the desired condition for sensitive plants in grasslands. There would be a beneficial affect achieved through a combination of significant reductions in AUMs (by 75 to 80 percent) and in the acres designated suitable for grazing (by about 65 percent). As a result of the reductions, sensitive species impacted by grazing, even at levels that would sustain their populations, would benefit. Compared to the other alternatives, the desired condition, that the natural range of habitats of plant species is of adequate quality, distribution, and abundance to contribute to maintaining native and desired nonnative species diversity, would be more easily achieved for alternative C.

Effects from Alternative D

The combined cattle AUMs for the Malheur and Wallowa-Whitman National Forests would increase from 212,000 to 259,000 (22 percent) for alternative D. For the Umatilla National Forest, cattle AUMs would increase from 40,000 to 52,000 (30 percent). These increases combined with grazing at moderate intensities (defined by Holechek (2006) as 41 to 50 percent) is less likely to provide suitable conditions for sensitive plants dependent upon grassland habitat than alternatives B, C, E, and F. At utilization levels of 45 and 50 percent for alternative D, desired conditions for grasslands may not be achieved. For the dry or moist upland herblands, the existing condition of 50 percent or less in phase A or B would need to increase to 70 to 90 percent in phase A or B. At best, existing conditions might be maintained and would likely impact sensitive species dependent upon grassland habitat. Because past utilization in rangelands under the 1990 forest plans has not exceeded 40 percent, even when levels up to 60 percent were permitted, the effects expected for the maximum authorized utilization may not occur. This is less likely an outcome compared to alternative B given the percent increases in AUMs for alternative D, particularly for the Wallowa-Whitman National Forest (44 percent increase in AUMs) and the Umatilla National Forest (21 percent increase in AUMs). Sensitive plant habitat is not expected to be maintained for alternative D, and desired conditions for sensitive plants are not expected to be achieved. For alternative D, individual plants or their habitat may be impacted with a consequence that the action may contribute to a trend towards Federal listing or cause a loss of viability to the population or species in the grasslands habitat group.

Effects from Alternatives E and F

Alternatives E and F would reduce upland allowable utilization to 40 and 35 percent while keeping cattle AUMs constant and decreasing sheep AUMs. These changes from the existing condition would improve the condition of grasslands. The addition of guideline PL-TES-4 that would limit utilization to not more than 30 percent on key species in occupied habitat would further contribute to maintaining sensitive plant species that inhabit grasslands. Alternatives E and F would achieve desired conditions for sensitive plants at a faster rate than alternatives A and B, but not as quickly as alternative C.

Biological Evaluation Finding for Alternatives A, B, C, E, and F

Although some individual plants may be impacted, the guidelines are expected to maintain populations of sensitive plants. The action alternatives do not vary in the biological evaluation finding: may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Affected Environment – Basalt Lithosol

Lithosols are habitats with very shallow soils with little zonation on poorly weathered basalt or andesitic bedrock. While the soils can be saturated following spring snow melt, they dry quickly

and are exposed to full sun for the entire growing season. Plants adapted to this harsh environment usually bloom and fruit earlier in the growing season. Basalt lithosols can be found in the dry upland shrubland potential vegetation group or dry upland herbland potential vegetation group. Basalt lithosols may also be found as small inclusions within a larger matrix of grassland and shrublands. The common plant associations within the dry upland shrubland and dry upland herbland potential vegetation groupings are stiff sagebrush or low sagebrush/Sandberg's bluegrass, bluebunch wheatgrass/Sandberg's bluegrass or Sandberg's bluegrass/one-spike oatgrass. Countryman and Swanson (2008) found that conditions had improved in the dry shrubland potential vegetation group from 30 years earlier, but that this improvement has slowed. The dry herbland potential vegetation group has experienced invasion by nonnative plants resulting in conversion of some lands to exotic herblands (Hann et al. 1997).

Within the Wallowa-Whitman National Forest, 7 percent of the sampled plots in the dry shrubland potential vegetation group were in phase A or B, 23 percent were in phase C, and 69 percent were in phase D (altered from the natural potential with little or no ability to recovery naturally). Within the Umatilla National Forest, 86 percent of the sampled plots in the dry upland shrubland potential vegetation group were in phase A or B with no lands in phase D. In the dry upland herbland potential vegetation group, 46 percent of the sampled plots within the Wallowa-Whitman National Forest were in phase A or B, 32 percent in phase C, and 22 percent in phase D. Within the Umatilla National Forest, 42 percent of the sampled plots were in phase A or B, 35.5 percent in phase C, and 2.5 percent in phase D (Countryman 2010). Within the Malheur National Forest, 28 percent of sampled plots in the dry shrubland potential vegetation group were in phase A or B, 23 percent in phase C, and 49 percent in phase D. In the dry upland herbland potential vegetation group, 21 percent of sampled plots were in phase A or B, 43 percent in phase C, and 36 percent in phase D. Active restoration would be required to return phase D to phase A or B, although given this habitat type's low productivity successful transition from phase D to phase A or B may not be possible.

Heavy grazing, spring grazing when soils are moist, and invasion by exotic plants are the main threats to basalt lithosol habitats. Given the low productivity and discontinuous fuels in this habitat group, effects from fire are not considered to be a major threat.

Plants inhabiting basalt lithosols are listed in table 351.

Environmental Consequences – Basalt Lithosol

Indirect Effects

Spring grazing could impact the species occupying lithosol habitats. During spring the soils are wet and susceptible to compaction from livestock. Guideline PL-TES-4, limiting utilization to not more than 30 percent on key species would help reduce impacts to sensitive plants inhabiting basalt lithosols. Given the low productivity on the site, 30 percent utilization would equate to a comparatively short period. Corresponding trampling associated with grazing is expected to be light. Additional mitigation measures could be developed at the site-specific project level, if further protection from trampling were needed. Guideline PL-TES-5, excluding water developments and salting within one-quarter mile of sensitive plant locations, would help reduce concentrations of livestock near occupied habitat. Reduced use and trampling by livestock would help abate invasion by nonnative plants, especially exotic annual grasses, such as cheatgrass and North Africa grass. Although some individual plants may be impacted, the guidelines are expected to maintain populations of sensitive plants. The action alternatives do not vary in the

biological evaluation finding: may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Table 351. Basalt lithosol habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Achnatherum wallowaensis	Basalt scablands and lithosols; shallow rocky soils, sometimes w/stiff sage, strict buckwheat, and ponderosa pine surrounding.	S	S	D
Achnatherum hendersonii	Basalt scablands and lithosols; shallow rocky soils, sometimes w/stiff sage, strict buckwheat; often surrounded by ponderosa pine.	S	S	S
Astragalus diaphanus	Barren hillsides, dry washes, and opening in juniper-ponderosa pine forests. Thin, gravely soils overlying basalt or on sandbars and sandy streambanks.	S	D	
Erigeron disparipilus	Gravelly and rocky slopes, ridges, sagebrush, grassland. Basalt scablands, lithosols, dry ridges in ne Oregon. Often with stiff sage.		D	D
Erigeron engelmannii var. *davisii*	Bare, rocky ridges and slopes, basalt outcrops, sparsely vegetated woodland openings or edges; usually with grasses 1,200-1,800 meters.			D
Lomatium ravenii	Scablands, lithosols. Openings in mixed or ponderosa pine forests. Flats, slopes, or ridges. Often with stiff sage, in openings in juniper or pine woodlands. Moderate elevations.	D	S	S

D: documented within the national forest, S: suspected to occur within the national forest.

Affected Environment – Talus, Cliffs, and Rock Outcrops

Talus is accumulated boulders and cobbles at the base of cliffs or on steep slopes. Because these habitats are largely composed of bedrock or accumulations of rock, they are assumed to be in good condition with a stable trend. The nature of this habitat group means it is resistant to management activities or has been avoided with most management activities, with the exception of road construction and rock quarries. Species that occupy talus, cliffs and rock outcrops are listed in table 352.

Environmental Consequences – Talus, Cliffs, and Rock Outcrops

Indirect Effects

Talus, cliffs, and rock outcrops are expected to be impacted to a relatively small degree. Outside wilderness areas, this habitat type is likely to be the least affected by forest and rangeland management activities. This is because talus, cliffs, and rock outcrops support scant vegetation that does not support or attract grazing livestock or possess sufficient fuel to carry a prescribed fire. Road construction and rock quarries are apt to be the only management activities with potential to affect these sites. Impacts associated with road construction activities would be addressed with guideline PL-TES-9, which directs that new road construction avoid sensitive plants with a minimum 25-foot buffer. Impacts associated with rock quarries would be addressed with guideline PL-TES-11, which requires mining operations to avoid sensitive plants to the greatest extent possible. Although some individual plants may be impacted, the guidelines are expected to maintain populations of sensitive plants. The action alternatives do not vary in the biological evaluation finding: may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Table 352. Talus, cliffs, and rock outcrops habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Anastrophyllum minutum	Grows on peaty soil at relatively high elevations (greater than 5,500 feet). In the *Tsuga mertensiana* zone, the colonies of *Anastrophyllum minutum* are typically associated with other bryophytes in tight mats on ledges or at the base of cliffs. Wallowa County.			D
Anthelia julacea	On rock surfaces, wet rock surfaces, and dry soil. In arctic-alpine areas of northern North America. Wallowa County.			D
Arabis hastatula	Basalt outcrops, cliffs, and scree. Rocky outcrops and mountain ridges.			D
Asplenium trichomanes-ramosum	Wet, shady, limestone cliffs. Grows in moss and crevices. Basic rocks in talus slopes. Zero-4,000 meters.			D
Barbilophozia lycopodioides	Organic soil to rock, less often on tree bark. Not necessarily on mineral soil. Reported by Hong (1976), Anthony Lakes area, Baker County. Damp outcrops at higher elevations.	S	S	D
Bolandra oregana	Moist rocky seeps, springs, waterfalls. Grows from wet crevices and moss.		D	
Cheilanthes feei	Rocky outcrops, usually calcareous.	S	S	D
Cryptogramma stelleri	Sheltered calcareous cliff crevices and rock ledges, typically in coniferous or boreal forest; 0-3,000 meters. On wet cliffs, and ledges, along streams, under waterfalls. Limestone substrate. Shady sites. Usually north-facing aspects.			D
Encalypta brevipes	Soil on ledges and in crevices on cliffs, reported from both igneous and siliceous substrates.	S	S	S
Geum rossii var. turbinatum	Granitic cliffs and ledges, in cirque basins. Talus slopes, rocky ridge tops, and rocky soil. Basalt, granite, or loose granodiorite substrate. Sub-alpine high elevation sites.			D
Hackelia diffusa var. diffusa	Shaded areas, cliffs, *talus, wooded flats and slopes.* Occurs with *Symphoricarpos albus, Philadelphus lewisii, Osmorhiza occidentalis, Acer glabrum, Fritillaria pudica, and Erysimum occidentale*. Elevation of populations in Washington is around 1,000 feet.		D	
Lophozia gillmanii	Peaty soil on cliff ledges; strict calciphile. Above 6,500 feet.	S	D	D
Luina serpentina	Open, rocky sites with poor soil development. Usually on steep slopes, above small tributaries. Aldrich Mountains.	D		
Pellaea bridgesii	Rocky slopes and cliffs, on granitic substrate; 1,200-3,600 meters. Talus slopes, scree, rocky outcrops; often on argillite in Blue Mountains. Southerly aspects.	S	D	D
Phlox multiflora ssp. depressa	Basalt cliffs, rocky outcrops, rocky openings in dry forest. Wooded rocky areas as well as in openings in the forest. Loose substrate rather than exposed hard rocks.		S	D
Suksdorfia violacea	In moss on wet cliffs, cracks of moist talus slopes, on basalt. Habitat sometimes is only wet in the spring.		S	S

D: documented within the national forest, S: suspected to occur within the national forest.

Affected Environment – Aquatic and Riparian Dependent Species Habitats

Species dependent on aquatic and riparian habitats (aquatic areas, fens and bogs, seeps and springs, riparian areas, intermittent streams, moist meadows, and wet meadows) are listed in table 353 to table 359. Because the forest plan manages these habitats under direction for Riparian Management Areas (RMAs), the effects to species dependent upon these habitats will be addressed together following the tables.

Affected Environment – Aquatic Habitats

Aquatic habitat supports plants that are free-floating or rooted at the bottom of ponds, lakes, streams and rivers. Species that depend on aquatic habitats are displayed in the following table.

Table 353. Aquatic habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Elatine brachysperma	Plants submerged to terrestrial on muddy shores and shallow pools.	S	D	S
Potamogeton diversifolius	Shallow ponds; edges of reservoirs and small catchment ponds, and shallow, slow running creeks.	S	S	S
Rotala ramosior	Moist sites, drying edges of ponds, springs and streams.	S	S	S
Utricularia minor	Ponds, lakes, slow-moving streams.	S	D	S
Utricularia ochroleuca	Loose, floating vegetation mat or openings in dense vegetation mats.		S	

D: documented within the national forest, S: suspected to occur within the national forest.

Affected Environment – Peatlands

Peatlands are a type of wetland that accumulates partially decayed plant matter (peat) (Mitsch and Gosselink 2007, USDA Forest Service 2011). Peat is partially decayed plant material that accumulates under saturated conditions where there is little oxygen to facilitate decomposition (USDA Forest Service 2011). Two major types of peatlands are fen and bog. Fen, the main type of peatland in the Blue Mountains, is fed by groundwater or mineral-rich surface water, has neutral to alkaline pH, and supports relatively rich marsh-like vegetation. Fen is distinguished from marsh, which is a wetland on mineral soil (USDA Forest Service 1998). A bog receives water entirely from precipitation, accumulating sufficient peat to raise the surface layer above the influence of the water table (USDA Forest Service 1998), and are very acidic in pH. Bogs form under a climate where precipitation exceeds evapotranspiration, a condition not present in the Blue Mountains. Bogs are thus not expected to be found in the Blue Mountains, except possibly as hummocky microsites within fens.

Peatlands can be found on each national forest in the plan area, but are unique habitats, not common in the Blue Mountains. This is due, in part, to a climate that does not favor their extensive development. Peatlands form stable plant communities that are self-perpetuating in the absence of disturbance. The combination of habitat rarity, stability, and extreme conditions in peatlands engenders a distinctive flora with high concentrations of rare species (USDA Forest Service 1998). Species that depend on peatland habitat are displayed in the following table.

Table 354. Peatlands habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Botrychium crenulatum	Local in marshy or springy areas, 1,200-2,500 meters. Moist meadows, riparian zones, moist roadsides, openings in cold forests. Often in calcareous soils, but not necessarily.	D	D	D
Carex diandra	Bogs and fens; floating peat mats, lakeshores, springs, and seeps.	S	S	S
Carex gynocrates	Wet, peaty ground, usually in openings in coniferous swamps and conifer-hardwood stands, less often in poor fens, boggy swales, and alder thickets, also subalpine meadows, tundra, outwash gravel and seepage areas, usually calcareous substrate zero-3,100 meters.			D
Carex lasiocarpa var. americana	Sedge meadows, fens, bogs, lakeshores, stream banks, usually in very wet sites and sometimes forming floating mats. Dominant of boreal wetlands, often forming huge stands zero-1,300 meters.	S	S	S
Epilobium oreganum	Fens and bogs; affinity for serpentine soils, but not strictly so.		S	
Gentiana prostrata	Alpine bogs and meadows at high elevations.			S
Harpanthus flotovianus	Bogs and fens. According to Hong (1993), it "occurs on moist humus, soil covered rocks and decaying wood in forests, and is frequently associated with *Cephalozia bicuspidata* and *Scapania undulate*.	S	D	D
Helodium blandowii	Bogs, fens, wet meadows, and stream sides. Shady sites to full sun.	D	D	S
Meesia uliginosa	Fens.	D	S	S
Platanthera obtusata	Mesic to wet coniferous forest, forested fens, sphagnum bogs, streambanks, tundra, moist roadsides; zero-3,500 meters. Sometimes found growing on top of rotting logs. Often with Engelmann spruce, or sub-alpine fir.			D
Pseudocalliergon trifarium	Forming lawns or inconspicuously intermixed with other bryophytes in medium to rich montane fens where it grows submerged to emergent in pools or on saturated ground, usually in full sunlight.			S
Splachnum ampullaceum	Forming green sods on old dung of herbivores, or on soil enriched by dung, in peat lands or other wetlands.	S	S	S
Tomentypnum nitens	Forming loose or dense sods or intermixed with other bryophytes in medium to rich montane fens where it favors slightly elevated sites, such as logs, stumps, or hummocks, formed by *Vaccinium uliginosum* and *Betula glandulosa*.	D	S	S

D: documented within the national forest, S: suspected to occur within the national forest.

Affected Environment – Seeps and Springs

Springs are points where groundwater emerges and flows. Groundwater also feeds seeps, but seeps do not produce perennial flow. Springs and seeps are typically small, but are well distributed on all three forests in the plan area. Species that inhabit seeps and springs are displayed in the following table.

Table 355. Seeps and springs habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Encalypta intermedia	In permanent seep, on thin soil over calcareous rocks. 8-19-1996, D. Wagner. Goodrich Lake, Baker Ranger District.			D
Entosthodon fascicularis	Occurring as individual plants or forming small sods on seasonally wet, exposed soil in seeps or along intermittent streams.	S	S	S
Jungermannia polaris	In permanent seep, on thin soil over calcareous rocks. 8-19-1996, D. Wagner. Goodrich Lake, Baker Ranger District.	S		D
Peltolepis quadrata	In permanent seep, on thin soil over calcareous rocks. 8-19-1996, D. Wagner. Goodrich Lake, Baker Ranger District.	S		D
Preissia quadrata	In permanent seep, on thin soil over calcareous rocks. 8-19-1996, D. Wagner. Goodrich Lake, Baker Ranger District.			D
Thelypodium eucosmum	Under and around western Juniper, in canyons, seasonal creek drainages, and seeps/springs. Also found in vernally moist areas in ponderosa pine forests and in sage steppe areas. Known sites are 1,800-5,000 feet.	D	D	S
Trollius laxus ssp. *Albiflorus*	Open, wet places, more or less acidic soils, montane to alpine; 1,200-3,800 meters. Seeps, springs, and vernally wet swales in spruce/fir forest.	S	S	S

D: documented within the national forest, S: suspected to occur within the national forest.

Affected Environment – Intermittent Streams

Species that occupy intermittent stream channels are displayed in the following table.

Table 356. Intermittent streams habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Mimulus evanescens	Vernally moist sites and fluctuating banks of intermittent streams or pools in sagebrush-juniper zone. Amid heavy gravel and boulders at one site. 1,200-1,700 meters. Historic site on Bear Valley Ranger District.	H	S	S
Muhlenbergia minutissima	Open, more or less disturbed, sandy, gravelly drainages, rocky slopes, flats, roads.	S	S	S
Schistidium cinclidodonteum	Rocks along watercourses of intermittent and seasonal streams. Union County. Reported for calcareous rocks.	S	S	D

D: documented within the national forest, S: suspected to occur within the national forest.

Affected Environment – Riparian Areas

Riparian areas are the ecotone between rivers or streams and uplands. They are seasonally or perennially moist. Species that inhabit riparian areas are displayed in the following table.

Table 357. Riparian areas habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Carex capillaries	Mesic to moist tundra, seeps on cliffs, rocks, and slopes, fens, meadows, shores, prairie sloughs, edges of sphagnum mats, moist woods zero-3,500 meters.			D
Carex crawfordii	Pond margins that are wet in spring and other seasonally wet spots.	S	S	S
Carex media	Forest openings, meadows, bog margins; 100-1,800 meters. Riparian areas, seeps, moist meadows. In WA, is found near perennial streams and ponds, and in moist meadows at elevations of 4,900-7,120 feet.			D
Carex retrorsa	Swamps, wet thickets, often along streams, marshes, sedge meadows, shores of streams, ponds, and lakes zero-1,900 meters.	S	S	D
Carex saxatilis	Lake shores, fens, bogs at high elevations.			D
Lycopodium complanatum	Dry open coniferous or mixed forest alpine slopes; zero-2,000 meters. Coniferous forest, with thick duff. Often on rotting logs, moist forest, riparian areas. Also in meadows and on open ridgetops.	S	S	D
Ptilidium pulcherrimum	Perennially moist tree bases, rotten logs, and on rocks. Baker County.	S		D
Ribes oxyacanthoides ssp. Irriguum	Riparian conifer forest: PIPO-PSME; associated with *Amelenchier alnifolia, Crataegus douglasii, Ribes cereum, Symphoricarpos albus*.		D	
Rorippa columbiae	Near all types of bodies of water, including along the Columbia River, intermittent snow-fed streams, permanent lakes, snow-fed lakes, wet meadows, irrigation ditches, and roadside ditches. Sandy soils.	S	D	S
Schistostega pennata	Mineral soil in crevices and sheltered portions on underside of rootwads of fallen trees.	S	S	S
Tetraphis geniculata	On cut or broken ends or lower sides of logs, decay class III-V, greater than 15 inches.	S	S	S
Trifolium douglasii	Moist or mesic meadows, prairie remnants, along riparian areas along streams. In swales, along intermittent streams, and in vernally wet areas.		D	D

D: documented within the national forest, S: suspected to occur within the national forest.

Affected Environment – Moist Meadows

Moist meadows are typically saturated in the spring, but by mid to late summer the water table has fallen below the soil surface. Species that inhabit moist meadows are displayed in the following table.

Table 358. Moist meadows habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Botrychium campestre	Prairies, dunes, grassy railroad sidings, and fields over limestone. 50-1,200 meters. Moist meadows, riparian zones, roadsides, openings in cold forests. Occurs in dry to mesic, sunlit habitats, often on till or moraines. Does not need direct sunlight.		S	D
Botrychium hesperium	Grassy mtn. slopes, snow fields, and road ditches, w/willows, and sand dunes, 200-2,800 meters. Moist meadows, riparian, moist roadsides, openings and edges of forests. Often on calcareous soils. Sometimes found in roadside ditches and at edges of lakes.	S	D	D
Botrychium lineare	Moist meadows, riparian zones, moist roadsides, openings and edges of cold forests. Sometimes in limestone, but not always.	S	S	D
Botrychium lunaria	Open fields, occasionally forest in southern occurrences; 0-3,700 meters. Moist meadows, riparian zones, moist roadsides, openings and edges of cold forests.	S	D	D
Calochortus longebarbatus var. peckii	Grassy margins of wet meadows, and under pines; 1,600-1,800 meters. Wet to moist meadows. Along stream edges. Often partially shaded by ponderosa pine.	D		
Carex idahoa	Riparian moist meadows, 2,000-2,600 meters. Driest communities of moist meadows, swales, and moist, low ground around streams and lakes, and on prairies and high plains as well.	D	S	S
Eleocharis bolanderi	Fresh, often summer-dry meadows, springs, seeps, stream margins; 1,000-3,400 meters. Wet places, low to mid-montane. In vernally wet swales. Along intermittent streams, moist meadows.	D	D	S
Gentianella tenella ssp. Tenella	*Gentianella tenella* appears to favor disturbed sites in subalpine to alpine meadows. Associated with high levels of sheep dung and bare ground. Around but not on hummocks.		D	
Listera borealis	In moist, rich humus of mossy coniferous forest, swamps, often along cold streams, acidic soils. Most known sites in WA are in older forests. Associated tree species include spruce, true firs, and Douglas-fir. Moderate elevations.	D	S	D
Phacelia minutissima	Moist meadow and seep edges, or on vernally wet open meadows and barren slopes. Reported to occur with aspen.	D	S	D
Ranunculus populago	Moist meadows, stream terraces, riparian corridors, open areas along the edge of shrubs, and adjacent to a perennial streams and bogs, at 4,480 to 5,920 feet (1,366-1,804 meters) elevation. Associated species at one or more sites include green false hellebore (*Veratrum viride*), Gray's licorice root (*Ligusticum grayi*).		D	
Tauschia tenuissima	Grassy openings in moist-wet meadows, river floodplains and streambanks. 2580 to 3200 feet in WA. Assoc. spp: *Potentilla gracilis*), straight-beaked buttercup (*Ranunculus orthorhynchus*), wild strawberry (*Fragaria virginiana*), and blue-eyed grass (*Sisyrinchium inflatum*).		D	

D: documented within the national forest, S: suspected to occur within the national forest

Affected Environment – Wet Meadows

Wet meadows are saturated throughout the growing season with the water table at or slightly below the soil surface. Species that inhabit moist meadows are displayed in the following table.

Table 359. Wet meadows habitat group description for each species

Scientific Name	Habitat Description	MAL	UMA	WAW
Antennaria corymbosa	Wet meadows, moist meadows; at mid elevations.		D	
Botrychium montanum	Dark, coniferous forests, usually near swamps and streams; 1,000-2,000 meters. Wet meadows, saturated soils. Often growing in a bed of mosses. This species tends to grow in wetter sites than the other *Botrychium* species.	D	D	D
Carex atrosquama	Subalpine and alpine meadows, river gravels, shorelines. Wet meadows to dry open slopes.			D
Carex capitata	Wet or seasonally wet meadows, often alpine or lower in cold air drainages; sandy, acidic soils.		D	S
Carex comosa	Marshes, lake margins, wet meadows, bogs and wet thickets.		S	
Carex subnigricans	Moist rocky slopes, alpine meadows, high elevation only; above 2,500 meters.			D
Heliotropium curassavicum	Wet ground, saline flats, alkaline soils. Low elevations.	S	S	S
Juncus albescens	Peat bogs, peaty riparian areas. In the Wallowa Mountains, on a peaty creek bank in limestone drainage. High elevations.			D
Ophioglossum pusillum	Open fens, marshes edges, pastures, grassy shores and roadside ditches, 100-2,000 meters. Wet meadows, damp sand, grassy swales, seeps/springs. In pastures, old fields, and flood plain woodlands in seasonally wet, rather acid soil.	S	S	D
Pleuropogon oregonus	Open, wet meadows, marshes, and riparian areas. Grows in areas of standing or flowing water early in season. Known sites are not near forested habitats. Sluggish water in depressions and sloughs.	S	S	S
Salix farriae	Wet meadows, streambanks, moderate to high elevations. Sites in the Wallowa Mountains are in calcareous soils.	S	D	D
Thalictrum alpinum	Wet meadows, damp rocky ledges and slopes, and cold (often calcareous) bogs in willow-sedge, lodgepole pine, and spruce-fir forest; zero-3,800 meters. High elevations here.			D

D: documented within the national forest, S: suspected to occur within the national forest

Environmental Consequences – Aquatic and Riparian Habitat Dependent Species

Indirect Effects

The riparian habitats listed previously would be managed as riparian management areas (RMAs) where aquatic and riparian-dependent resources receive primary emphasis and where special management direction applies. RMAs encompass lands adjacent permanently flowing streams, ponds, lakes, wetlands, seeps, springs and intermittent streams. RMAs will have minimum widths

but are designed to extend to the outer edge of riparian vegetation, or to the outer extent of the 100-year floodplain, whichever is greater. RMAs are managed to maintain and restore the riparian dependent plant and animal species, enhance habitat conservation for organisms that depend on the transition zone between the upland and riparian areas, and provide for greater connectivity within and between watersheds for both riparian and upland species. Table 360 displays minimum widths for RMAs.

Table 360. Riparian management area widths

Category	Minimum RMA Width*
Fish bearing streams	300 feet slope distance on either side of stream or to outer edge of 100-year floodplain, whichever is greatest
Permanently flowing non-fish-bearing streams	150 feet slope distance on either side of stream or to outer edge of 100-year floodplain, whichever is greatest
Constructed ponds, reservoirs and wetlands greater than one acre	150 feet slope distance from the outer edge of wetland or from the maximum pool elevation, whichever is greatest
Lakes and natural ponds	300 feet slope distance
Seasonally flowing intermittent and ephemeral streams; wetlands smaller than 1 acres, and unstable areas	100 feet slope distance

*Additional delineation criteria apply, as described in the glossary

Within riparian areas, management activities would be designed to maintain properly functioning conditions or improve conditions in areas not functioning properly. Standards and guidelines direct management activities for a variety of activities, including wildland fire, fuels, timber, silviculture, range, domestic livestock grazing, roads, recreation, minerals, and land ownership (hydropower) to accomplish desired conditions. Most standards and guidelines seek to minimize impacts from land management activities. For example, guideline MA 4B RMA-FOR-3 directs new landings, designated skid trails, staging or decking for timber operations to be located outside RMAs, unless no reasonable alternatives exist, in which case they should (1) be of minimum size, (2) be located outside the active floodplain, and (3) minimize effects to large wood, bank integrity, temperature, and sediment levels. Several guidelines are specific to sensitive plants whether or not plants are located within the RHCA: PL-TES-5, -6, -7, -8, -9, and -10, which would protect populations of sensitive plants using avoidance buffers. PL-TES-10 would require mining activities to avoid sensitive plant species to the greatest extent possible.

The major difference between alternatives B, D, E, and F and alternative C concerns range management guideline MA 4B RMA-RNG-2, where the maximum percent utilization of herbaceous vegetation within the greenline riparian zone is reduced from 40 percent (B, D, E, and F) to 10 percent (alternative C). Woody vegetation utilization is reduced from 40 percent to 25 percent within the guideline. Residual stubble height and bank alteration standards remain the same between all alternatives. Recreation management guidelines MA 4B RMA-REC-1 and MA 4B RMA-REC-2 for alternatives B, D, E, and F become standards for alternative C. There is no substantive change in their wording. Where aquatic and riparian dependent habitat is occupied by sensitive species, herbaceous utilization is further reduced to 30 percent under alternatives B, E, and F. Riparian management areas within bull trout spawning and rearing reaches would be grazed to 25 percent utilization, providing slight additional benefits to sensitive plants inhabiting the riparian areas of these reaches.

For alternatives B, E, and F, guideline PL-TES-3would prevent grazing of sensitive species that occur in peatlands. Sensitive species occupying springs and seeps would benefit from the desired condition designed specifically to conserve these unique groundwater dependent ecosystems. Although some sensitive plants would be impacted, the majority of plants, as well as the overall integrity of the spring or seep, would be maintained.

The Livestock Grazing and Rangeland Vegetation section describes general indirect effects to riparian vegetation. Alternative C is expected to result in the most rapid short-term recovery of riparian and wetland areas. Alternatives B, E and F are expected to have upward trends for riparian and wetland areas. Under alternative A, riparian integrity would remain similar to the present, with a slow but steady rate of recovery. Sensitive plants benefitting from reduced riparian greenline vegetation utilization standards belong to the Aquatic and Riparian habitat groups. Reduced greenline utilization would mean livestock would spend less time in these areas, and there would be less opportunity to compact soils or damage plants from herbivory or trampling. Species benefiting from reduced trampling are small, fragile plants, particularly members of *Botrychium* and aquatic plants rooted in shallow or drying shorelines: *Rotala ramosior*, *potamogeton diversifolius*, and *Elatine brachysperma*. One species, *Ribes oxyacanthoides* ssp. *irriguum*, a shrub growing in riparian areas in coniferous forest of ponderosa pine and Douglas-fir, would directly benefit from alternative C from a reduced standard for woody vegetation utilization to 25 percent of the current year's growth.

The alternatives vary also in the number of grazing animal unit months (AUMs) for each national forest. Presumably, how the AUMs vary by alternative would not matter because overall vegetation utilization standards would still apply, regardless of the number of livestock allowed in to graze in any area. However, for alternative C there would be a beneficial affect achieved through a combination of a reduction in AUMs by 75 to 80 percent and a reduction in the acres designated suitable for grazing by about 65 percent. With fewer acres available for grazing and much reduced utilization levels, sensitive species impacted by grazing, even at levels that would sustain their populations, would benefit. The desired condition: "the natural range of habitats of… plant species… is of adequate quality, distribution, and abundance to contribute to maintaining native and desired nonnative species diversity," would be achieved more easily with alternative C compared to other alternatives. Although some individual plants may be impacted, the guidelines specific to sensitive plants are expected to maintain populations for alternatives B, E, and F. These three alternatives would provide greater protection than alternatives A and D. Alternative C would provide protection to riparian and wetland dependent sensitive plants largely through a reduction in livestock AUMs and a reduction in land area deemed suitable for grazing. Even so, the action alternatives do not vary in the biological evaluation finding: all alternatives may impact individuals or habitat, but would not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.

Cumulative Effects - Aquatic and Riparian Habitat Dependent Species

Because of the expected life of the plan, cumulative effects to rare plants would arise mainly from reasonably foreseeable future actions or events occurring beyond the plan area whose effects might extend to within the plan area. These effects would originate from actions on adjacent public (BLM), state, county, or private lands. Private lands comprise the largest proportion of adjacent lands followed by public (BLM), state, and county lands. The actions or events outside the national forest most likely to contribute to cumulative area invasions by nonnative plants and wildfires. Trespass by livestock is possible, but is expected to be infrequent with minor cumulative effects. The effects of climate change also contribute potential cumulative effects to rare plants.

Non-native Invasive Plants – Cumulative effects from invasion by nonnative plants would arise from lands nearby the plan area. The plan addresses these effects in the same manner as effects from nonnative plants spreading from sites within the plan area. These effects are discussed in the Non-native Invasive Species section.

Wildland Fire – Wildfires arising from adjacent lands then spreading to within the plan area mainly threaten rare plants located within 5 to 10 miles of the national forest boundary. Rare plants in the conifer forest habitat group are at the greatest risk of lethal effects from wildfire. Wildfires with severe or perhaps even moderate intensities would likely kill plants in this habitat group. Following severe wildfire, suitable habitat for species in the conifer habitat group may not return for several decades. Species in the aquatic, peatlands, and wet meadows habitat groups would probably be least affected from wildfire because these groups are expected to withstand the effects of wildfire, suffering damage only to crowns of graminoid plants, but not the basal meristem tissues of the root crown. Species occupying the grasslands habitat group are largely adapted to periodic wildfire, and may benefit from them. Increases in nonnative exotic plants, such as cheatgrass, may increase fire frequencies in the grasslands habitat group favoring increase in exotic species cover to the detriment of native bunchgrasses, though this pattern, widely reported from the basin and range, has not been observed in the Blue Mountains. Alpine fellfields and subalpine parkland are not expected to be frequented by wildlife, though it is possible. Any cumulative effects from wildlife to this habitat group are expected to be minor. In sagebrush shrubland, some species (*Astragalus tegetariodes*, *Camissonia pygmaea*) may benefit from the presence of wildlife while *Castilleja flava* var. *rustica* may experience decline because sagebrush may be a necessary host plant for this hemiparasite. Although wildfire is possible in the basalt lithosol habitat group, any effects are expected to be minor due to light fuel loads. On the other hand, species inhabiting the talus, cliffs, and rock outcrops habitat groups are threatened by wildfire. These species' strategy of avoidance by occupying areas with light, discontinuous fuels is not foolproof as wind driven wildfires spot through these habitats. Many species occupying this group have no inherent defenses for fire, particularly the cryptic nonvascular plants that grow on peaty soil on ledges and in crevices. Mat-forming plants such as *Geum rossii* var. *turbinatum* and *Luina serpentina* would be consumed and killed by fire. Species occupying the seeps/springs, riparian, and intermittent stream habitat groups could either survive or be killed by wildfires, depending on fire severity. Most species occupying moist meadows are not expected to be significantly impacted by wildfire.

Climate Change – Climate change is affecting the Pacific Northwest. Projections are for the climate to warm 0.2 to 1 degree Fahrenheit per decade for the foreseeable future (OCCRI 2010). Precipitation levels may be more difficult to predict, but there is some confidence to expect decreases in winter snowpack, earlier spring snowmelt, earlier initiation of growing seasons, increase in growing season length, but under drier conditions, and increases in extreme weather events. Gradual warming and drying is expected to change species composition and community structure, possibly resulting in a decline in biodiversity. The most significant effects of climate change on biological diversity are expected to be in response to increasing summer temperatures (Currie 2001), although there is too much uncertainty about potential climate change effects on rare plant populations to confidently distinguish differences between the alternatives.

Species occupying the alpine fellfields and subalpine parkland habitat group are most at risk from climate change as this habitat has been and will continue to decline in the next century. Species dependent on snow melt basins or other moist micro sites (*Carex vernacula*, *C. micropoda*, *Lomatium erythrocarpum*, and *Saxifraga adscendens* ssp. *oregonensis*) are also at risk, as these habitats may decline first. Species or habitats dependent on snowmelt runoff, such as the

cottonwood habitat group, may decline in abundance. Cottonwoods depend on period flooding and sediment deposition for seedling germination (Rood and Mahoney 1995). With reduced peak spring streamflows, cottonwood seedlings may not have proper conditions to germinate on floodplains. Where germination has been successful, reduced late summer discharge may not provide sufficient moisture for seedlings to survive through the first growing season and establish (Naiman et al. 2005). Many other species within the plan area are endemic to small ranges or comprise disjunct populations beyond the species' contiguous range, regardless of their habitat group. These species are at risk of local extinction due to factors cited earlier.

The assessment of current environmental conditions in the affected environment incorporates the combined effects of past action. Ongoing and reasonably foreseeable future actions are addressed under the analysis in environmental consequences. Because the forest plan has an anticipated lifespan of 15-20 years, this analysis incorporates the effects of reasonably foreseeable future actions. When forest plan activities are considered within a context of climate change, an additional factor is added to the cumulative effects analysis. Reid and Lisle (2008) identified two issues regarding cumulative impacts and climate change:

1. Human-induced climate change is itself a cumulative impact of multiple human activities. Prediction of the local magnitude, style, and timing of climate changes will require an understanding of how the many influences on climate interact.
2. Outcomes from this episode of climate change will differ from those of previous episodes in part because of interactions with environmental changes that humans have already caused—outcomes will be a cumulative effect. For example, Pleistocene climate changes resulted in elevational and latitudinal shifts of ecosystem boundaries. However, ecosystems now are highly fragmented by land-use activities, so climate change is more likely to result in extirpations than in the past because incremental shifts along a gradient may no longer be possible. In addition, geomorphic and ecosystem processes have been extensively modified by land-use activities, impairing some systems' mechanisms for resilience and thereby increasing their sensitivity to change.

One option for management recommended by Reid and Lisle is to incorporate adaptive management, whereby management actions are administered as experiments, along with a monitoring program to evaluate the efficacy of each action, such that management may be redesigned as appropriate to improve future actions.

Nonnative Invasive Species

Invasive species are recognized as a major threat to native plant and animal communities, as well as to social and economic conditions. The effects of invasive species can cause economic loss and reductions in the long-term productivity of the land, disrupt recreational use, and reduce resource production. A wide range of species can be invasive, including vascular and nonvascular plants, terrestrial and aquatic animals, and pathogens, such as white pine blister rust and white-nose syndrome.

Invasive aquatic plants and animals are not yet widespread in the headwater streams and lakes in the Blue Mountains. However, many highly invasive aquatic species are well established in neighboring states, in the Columbia River, and in the lower reaches of major tributaries adjacent to the national forests. Streams and springs on the national forests are at risk of invasion by detrimental invasive organisms, such as New Zealand mudsnails and Asian clams. Lakes and reservoirs are at risk of invasion by zebra mussels, hydrilla, and other highly undesirable

introduced plant and animal species. Because the distribution of invasive aquatic plants and animals in the Blue Mountains is not well understood, the analysis will focus on invasive terrestrial plant species. Invasive insects and pathogens of conifers are addressed in the vegetation section.

Invasive plants are defined as "nonnative plants whose introduction do or are likely to cause economic or environmental harm or harm to human health" per Executive Order 13112. The Chief of the Forest Service declared invasive species as one of the four main threats to ecosystem health (USDA Forest Service 2004). The threat is considered serious because invasive plants have the potential to displace or change native plant communities and can increase wildfire hazard, degrade fish and wildlife habitat, eliminate rare and endangered plants, impair water quality and watershed health, and adversely affect a wide variety of other resource values, such as recreational opportunities.

The area affected by invasive plant species has increased throughout the Interior Columbia Basin during the last 100 years. The same trend has occurred in the Blue Mountains during the last 20 years. A large portion of the Blue Mountains is characterized as being susceptible to invasive plants (Quigley and Arbelbide 1997). The susceptibility is most prevalent in vegetation types that many invasive plants are adapted to: areas dominated by dry forest, dry grass, dry shrub, and cool shrub types.

This section discusses the analysis of how well invasive plants forest plan components (objectives, standards, and guidelines) would achieve the desired condition. The existing condition describes the current infestation of invasive plants for each national forest and describes the 1990 forest plan direction for managing invasive plants.

Affected Environment – Nonnative Invasive Species

Invasive plants occupy thousands of acres within the Umatilla and Wallowa-Whitman National Forests, but far fewer acres are inventoried within the Malheur National Forest. The Malheur National Forest is thought to have more acres of invasive plants than what is currently mapped but is not likely infested to the same degree the Umatilla or Wallowa-Whitman National Forest is infested. Table 361 displays the known infested acres for each national forest. Within the Malheur National Forest, 30 species infest 2,160 acres; within the Umatilla National Forest, 37 species infest 27,755 acres; and within the Wallowa-Whitman National Forest, 37 species infest 20,352 acres.

Other infestations that have not been inventoried are likely to occur on each national forest. In addition, annual grasses and other invasive plants that are considered naturalized are not included in this total.

Table 361. Acres and percent of National Forest System (NFS) lands infested by invasive plants

National Forest	Current Infestation (acres)	Total NFS lands* (acres)	NFS Lands Infested by Invasive Plants (%)
MAL	2,160	1,709,047	0.13%
UMA	27,755	1,404,246	2.0%
WAW	20,352	1,777,596	1.1%

*For the Wallowa-Whitman National Forest, values exclude the HCNRA.

In 2005, the regional forester amended the 1990 forest plans with the record of decision (ROD) for the Preventing and Managing Invasive Plants FEIS (USDA Forest Service 2005). This amendment added management direction for invasive plants to the 1990 forest plans, including goals, objectives, standards and a monitoring framework. Appendix A displays the goals, objectives, and standards from the R6 2005 ROD. Current forest plan direction for managing invasive plants would continue for the no-action alternative and all action alternatives.

Forest plan components have not been developed specifically for invasive aquatic plants and invasive animals (aquatic or terrestrial vertebrates and invertebrates). National forests in the Blue Mountains would follow strategies outlined in the National Strategy and Implementation Plan for Invasive Species Management and the Regional Aquatic Invasive Species Strategy and Management Plan (2011) for prevention and early detection/rapid response. Emphasis would likely be placed on coordination programs with Oregon and Washington to increase public awareness of exotic pests, especially where visitors have the potential to spread organisms, and to monitor water resources for the presence of invasive aquatic organisms. Exotic insect infestations and diseases that threaten conifer forests are addressed in the vegetation section.

All alternatives were assessed for their predicted ability to meet the desired condition and by the degree to which ground disturbance could lead to conditions that would increase the invasive species spread rate.

Current and ongoing management direction has the potential to meet this desired condition. The Preventing and Managing Invasive Plants FEIS (USDA Forest Service 2005) disclosed that the adopted invasive plant management direction had a “moderate to high potential to reduce rate of spread,” and concluded that effective treatment of the existing populations along with prevention measures applied to land uses and activities could reduce the current 8 to 12 percent rate of spread to about 4 to 6 percent (ibid). Thus, to meet the desired condition, both current infestations and new infestations need to be contained, controlled, or eradicated.

Table 362 displays the average annual acres that have been treated during a three-year period (2009-2011) on the three national forests compared to the acres that would hypothetically need to be treated each year to make progress toward achieving the desired condition for invasive plants containment, control, and eradication. The objectives are for a five-year period because of the time it takes to control invasive plants given the existing soil seed bank, the typical need for retreatment, weather, and funding. To effectively control invasive plants, treatments (manual, mechanical, herbicide, or biological) are often repeated for several years. Subsequent treatments usually require fewer resources, e.g., labor or herbicides, because each treatment effectively reduces the density or size of the target population. The acreage needed to be effectively treated annually in table 362 was adjusted to account for need for retreatment (each entry is assumed to be 80 percent effective) (Desser 2006).

Table 362 displays that invasive plant treatments need to be increased from current levels to meet 5-year objectives for all alternatives. Forest plan management direction is intended to facilitate effective treatments over time.

Table 362. Annual acres of invasive plants treatments necessary to make progress towards achieving the desired condition for each national forest

National Forest	Average Acres Treated Annually (2009-2011)	5-year Benchmark (acres contained, controlled, eradicated)	Average Acres Effective Treatments Needed
MAL	266	2,270 to 3,470	570 to 868
UMA	5,029	33,770 to 48,913	8,433 to 12,228
WAW	4,533	24,760 to 35,870	6,190 to 8,968
Totals	9,828	60,800 to 88,253	15,193 to 22,064

Environmental Consequences – Nonnative Invasive Species

Indirect Effects

The environmental consequences of the alternatives relative to nonnative invasive species are similar since all alternatives retain existing management direction. There are no direct impacts. However, since invasion and dominance by invasive plants is highly correlated to soil disturbances (Cox 1999), the greater the potential extent and intensity of timber harvest, fuels reductions, recreation, livestock grazing, mining operations, road maintenance and prescribed fire, the greater the potential for indirect effects from soil disturbances (e.g., conditions favorable to invasive plants).

To compare alternatives, an index was created to display the relative amount of soil disturbing activities (timber harvest and associated actions, fuels reductions, and AUMS for livestock grazing) for each alternative for each national forest. The index equals the sum of annual projected acres of soil disturbing activities divided by the sum of these values for alternative B. The index value for alternative B is 1.

The index values for alternatives C, D, E, and F are displayed relative to alternative B in table 363. There is no standard for measuring soil disturbance as a predictor of nonnative plant invasion, either as an observable measurable value or as a percent of managed lands. The index serves only to compare alternatives and suggest which alternatives are more or less likely to create conditions favorable to the invasion of nonnative invasive plants. In fact, the management direction for invasive species requires that each project prevent or minimize potential for invasive species introduction, establishment, and/or spread.

Table 363. Index values for soil disturbing actions that favor invasion by nonnative plants for each of the action alternatives for each national forest

National Forest	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
WAW	1	0.29	1.48	1.07	1.02
UMA	1	0.37	1.51	1.16	1.04
MAL	1	0.37	1.22	1.08	1.02
Averages	1	0.34	1.39	1.09	1.02

Compared to the proposed action, alternatives E and F would have slightly more projected activities that would provide opportunities for nonnative invasive plants to establish (the indices for E and F are less than 10 percent more than alternative B). Alternative D, with nearly 40 percent projected activities that would provide opportunities, would have the most widespread

favorable conditions for establishing invasive plants. Projections for alternative C are about one-third of projections for alternative B and would likely result in the least area of conditions favorable to the spread of invasive plants. All management activities would be designed to include measures to help prevent invasive plant spread.

Cumulative Effects

Cumulative effects may arise from the introduction of invasive species from lands adjoining the plan area. These lands consist of other Federal (BLM), tribal, state, county, or largely, privately owned lands. The plant invasion process occurs in three phases: introduction, establishment, and spread. Invasive species are introduced via vectors, such as wind, water, or wildlife, in addition to the actions of people, which move seeds or plant fragments from one location to another. Wind and water, in particular, are major natural dispersal agents. For example, windblown seed of rush skeleton weed can be carried up to 20 miles (USDA Forest Service 2005). Water is a primary aid in the dispersal of many species, including Japanese knotweed. Rivers and waterways have been identified as one of the biggest spread mechanisms for invasive plants (Sheley et al. 1995). Various wildlife species can contribute to the spread of invasive plant species by dispersing seeds in their dung, on their coats or feathers, or between their hooves. Ants even have been identified as one of the dispersal agents for the seeds of Scots broom (Parker, et al. 1998). Though invasive plant propagules (seeds or plant fragments capable of establishing) may originate from outside sources, the Forest Service does exert management control on conditions on the ground where they may be deposited. Therefore, the cumulative effects analysis area is the plan area for the Blue Mountains national forests.

People travelling to the national forests may transport invasive plant propagules from adjacent or even distant lands. This may be done through a variety of means: motor vehicles, clothing and footwear, pets, stock, etc. Motor vehicles, in particular, have been shown to pick up and move invasive species seeds that can be deposited along roads (Schmidt 1989 and Hodkinson and Thompson 1997). Roadside habitats are particularly susceptible to plant invasions for a number of reasons. Roads eliminate some of the physical and environmental barriers that help prevent invasion by increasing available light and dispersal opportunities. Disturbances associated with the use and maintenance of roads provide habitat easily exploited by invasive species, which can then seed themselves relatively swiftly along roadsides or be transported by animals or people (vehicles). Roads are primary vectors for the spread of invasive plants and the most likely vector for human transport of invasive plant propagules from outside the plan area.

Cumulative effects may be incurred from the transport and establishment of nonnative invasive plants from sources adjacent to the plan area. And, likewise, weeds from the National Forest System lands could spread to adjacent areas. However, these effects are expected to be small compared to the anticipated spread from invasive plants sites within the plan area. While the forest plan addresses invasive plant spread via prevention standards, invasive plants would continue to move freely across borders, to and from ownerships, because the movement of seeds and propagules via wind, water, or wildlife are largely beyond the control of the Forest Service.

Cumulative effects may also result from climate change. Much of the research on invasive species interactions with climate change has contributed to the growing body of evidence that global warming has enabled invasive species to expand to areas where they were not previously able to persist (Dukes and Mooney 1999, Weltzin et al. 2003, Thuiller et al. 2007, and Walther et al. 2009). Some researchers have modeled range expansions for some invasive species (*Centaurea solstitialis* and *Tamarix*) while predicting reduced invasion risk and significant range contractions for others (*Bromus tectorum*, *Euphorbia esula*, and *Centaurea biebersteinii*) by the

year 2100 (Bradley et al. 2009). As the climate changes, the ranges of invasive species will change: some species may become less invasive, and others may become more invasive. Given their adaptive traits, invasive plants may be able to outcompete native species in the migration process to new suitable habitat (Hellman 2008). Compared to a stable climate, the degree to which global warming has contributed to the current spread of invasive plants is unclear.

The forest plan responds to the challenges of increased risk of invasion from invasive plants, whether or not introduced from external sources and whether or not climate change may influence their spread, by incorporating standards to prevent the transport and establishment of invasive plant propagules and by including objectives to reduce the area infested by invasive plants over time. The cumulative effects do not add significantly to effects expected from each alternative. Cumulative effects, when added to indirect effects of the alternatives, would be similar to the effects described previously.

Social Environment

Tribal and Treaty Resources

The legal responsibilities of the Federal government to American Indian tribes are clarified in statutes, executive orders, and case law enacted and interpreted for the protection and benefit of federally recognized American Indian tribes. The Forest Service honors American Indian treaty reserved rights to hunt, fish, gather, and graze on present-day national forests through consultation, coordination, and agreements with the affected Indian tribes. The agency maintains a government-to-government relationship with federally recognized tribal governments. The Forest Service and the tribes take time to meet to gain an understanding of each other's rights, responsibilities, and interests. Through these relationships, the Forest Service and the tribes build and enhance a mutual understanding, as well as pursue cooperative and partnership initiatives and efforts.

Numerous laws, executive orders, and regulations govern the relationship between American Indian tribes and the Federal government, which is represented here by the three national forests. In project planning and implementation, the Forest Service complies with these laws and regulations, and, in doing so, meaningfully consults with tribal governments.

In addition, numerous laws, regulations and policies govern the use and protection of forest resources that may be of tribal interest or covered under tribal reserved rights. Activities authorized or implemented by the Forest Service must comply with these laws, regulations, and policies that are intended to provide general guidance for the implementation of management practices, and for protection of resources, including those of interest to the tribes.

In the plan area, a significant portion of lands ceded by the tribes in the various treaties was designated as part of the National Forest System by the Organic Administration Act of June 4, 1897. Lands were ceded though the Treaties of 1855 by the Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of Warm Springs, Nez Perce Tribe, and Confederated Tribes and Bands of the Yakama Indian Nation of the Yakama Reservation. The treaty with the Klamath Nation of 1870 ceded lands extending into the Malheur National Forest. These treaties are known for their specific language recognizing certain reserved rights of the tribes in aboriginal use areas. The Burns Paiute Tribe, Shoshone-Paiute Tribes of the Duck Valley Reservation, Fort McDermitt Paiute and Shoshone Tribes, Fort Bidwell Indian Community of Paiute Indians, and the Confederated Tribes of the Colville Reservation (through the Joseph Band

of the of the Nez Perce Tribe) are federally recognized American Indian tribes that also have interests in the management direction and project planning of the Blue Mountains national forests.

Tribes and Forest Plan Revision

As a Federal agency, the Forest Service's legal responsibilities are identified in treaties and clarified in statutes, executive orders, and case law enacted and interpreted for the protection and benefit of federally recognized tribes. In meeting these responsibilities, the Forest Service consults with the tribes whenever proposed policies or management actions may affect their interests.

While Federal laws apply to all federally recognized tribes, each tribe is different and is recognized as a separate and unique government. Treaty rights and the historic relationships between the tribes and the lands differ and there are cultural differences between them. In some cases, several tribes may each have legitimate interests in the same lands because they each may have occupied or otherwise used those lands during different historic periods or jointly during the same period. In other cases, a tribe or a group of tribes has a Memorandum of Understanding with the Forest Service. These factors and others combine to make each Forest Service tribal consultation relationship unique.

The Forest Service sent letters regarding the Blue Mountains forest plan revision to interested tribal governments in 2004, 2006, 2007, 2009, 2010, and 2013. Numerous meetings were held with the Confederated Tribes of the Umatilla Indian Reservation, Nez Perce Tribe, and Confederated Tribes of the Warm Springs between 2002 and 2009. These include government-to-government and staff-to-staff meetings. During this period, the Blue Mountains forest plan revision team has received formal comments from Confederated Tribes of the Colville Reservation (2007), the Nez Perce Tribe (2007), and the CTUIR (2007, 2008, 2011). No comments from any tribes were received during the formal scoping period.

Further details of tribal consultation are included in chapter 1 of this DEIS and in the project record.

Culturally Significant Foods

The tribes are concerned about the availability and protection of treaty resources, including culturally significant foods. These culturally significant foods are plants, animals, and fish that are used for both ceremonies and subsistence needs. According to the tribes, the protection of culturally significant foods includes the protection of habitats, upon which those resources depend, and use and access to traditional cultural sites. Adequate availability of these resources allows harvest in sufficient quantities to satisfy the subsistence needs of tribes while still providing for the conservation needs of the resources. Adequate access that would not compromise cultural practices at traditional, cultural, or spiritual places is a concern to the tribes.

Traditional foods in the Pacific Northwest include salmon, game (such as elk and deer), roots (such as cous, camas, and bitterroot), and berries (such as huckleberries and chokecherries). These plants and animals, as well as others, have cultural significance. They also provide nutrition to many tribal people. Culturally significant foods are especially important and provide critical subsistence given the high incidence of poverty in Native American communities.

Affected Environment – Tribal and Treaty Resources

The affected environment includes the treaty reserved resources the tribes utilize within the Blue Mountains national forests. The affected environment, including the current conditions of treaty resources, is discussed in the related resource sections of chapter 3. The affected environment for indirect effects is the lands administered by the Malheur, Umatilla, and Wallowa-Whitman National Forests.

Environmental Consequences – Tribal and Treaty Resources

Management direction for tribal treaty reserved rights and interests is included in all alternatives for the three national forests and can be found in greater detail in appendix A.

Key Issues for Tribal Treaty Reserved Rights, Interests, and Culturally Significant Foods

Consultation, collaboration, and coordination with tribal communities would continue to inform on overall resource condition, however the following selected measures are indicators of resource condition that are of tribal interest. The key issues for tribal concerns are access, vegetation management, and watershed function. The following indicators are relevant to tribal and treaty rights but detailed analysis of effects for these indicators between alternatives is available in the respective sections.

Effects Common to All Alternatives

Forest plan direction for resource management, such as heritage, vegetation, soils, water, riparian, aquatic, and wildlife for all alternatives, is designed to provide for the protection of cultural resource sites or traditional cultural properties. All alternatives would also provide protection for habitat and watershed conditions that would contribute to species viability at sustainable and harvestable levels. Invasive species would be managed to avoid encroachments on culturally significant foods. Monitoring of resource conditions would also occur.

Effects Common to Alternatives B, C, D, E, and F

Alternatives B, C, D, E, and F would result in the following common conditions. The following are desired future conditions that are common to all action alternatives.

Access

The access issue includes the impacts on tribal governments and tribal practices from resource management activities including road building or other modifications of the landscape. The forest plans would include the desired condition that “the need for tribal access to traditional sites is acknowledged and supported.” While the tribes need access to traditional sites, there are some sacred sites where American Indians conduct ceremonies that require privacy. Building roads to or near such sites may lead to increased visitation that could affect ceremonies and undermine cultural practices. Roads or extraction activities may also alter the character and diminish the value of historic or cultural places. Adequate access should not compromise cultural practices at traditional, cultural, or spiritual places.

The indicators for access are:

- Percent suitable for summer motor vehicle use
- Number of miles open motor vehicle routes in excess of the desired conditions

Access will vary by alternative due to the desired road density. Road density would be highest to lowest in the following order: A, D, B, E, F C respectively.

Refer to the Access section for detailed discussion on these indicators. Alternatives with higher road densities would provide for greater tribal access but may also result in greater impacts to resources of value to the tribes such as culturally significant foods which are dependent on terrestrial and aquatic habitats. Alternatives with lower road densities would slightly impact accessibility, particularly for elders, of forest resources for tribal accessibility. While there may be some variation between the alternatives for access, tribal treaty rights will be protected in all alternatives from impacts from access.

Culturally Significant Foods and Vegetation Management

The availability of culturally or traditionally significant foods is one aspect of vegetation management that is of particular importance to the tribes. Culturally significant foods are plants, animals, and fish that are used for both ceremonies and subsistence needs. According to the tribes, the protection of culturally significant foods includes the protection of habitats upon which those resources depend. Adequate availability of these resources allows harvest in sufficient quantities to satisfy the subsistence needs of tribes while still providing for the conservation needs of the resources.

The following indicator is used to assess vegetation management:

- Acres of annual timber harvest
- Acres of annual fuels treatment

Vegetation management activities would be designed to move the forested landscape closer toward the historic range of variability (HRV). These indicators are appropriate because forests that are closer to their HRV support more culturally significant foods. Refer to the Forest Vegetation, Timber Resources, and Wildland Fire section for detailed information on annual acres treated.

The amount of annual acres of timber harvest and prescribed burning varies between alternatives, however the following desired future conditions are common to all action alternatives and can be found in appendix A.

The amount of acres of annual forest vegetation treatments vary by alternative. In general, alternatives that have more acres treated would result in larger areas of the forested landscape returning to the Historic Range of Variability, which support more culturally significant foods. Alternatives with lesser amount of vegetation treatments may also return the forested landscape to the HRV, but at slower pace and scale. The Forest Vegetation, Timber Resources, and Wildland Fire section provides detailed analysis of these indicators.

Watershed Function

The availability of clean water is important to the tribes. Some tribes also consider clean water a culturally significant food. Clean water is part of the watershed function issue. The indicators of clean water are:

- Aquatic species viability
- Watershed condition class: number of watersheds in improved condition

Culturally significant foods and watershed function are both related to ecological resiliency. The tribes are particularly concerned about ecological resiliency. Some of the tribes have participated in planning efforts aimed at improving elk and big game habitat as well as partnered with the Forest Service for the removal of culverts impacting fish passage. The tribes are interested in ecological resiliency as it relates to ecological restoration projects for aquatic and terrestrial resources including salmon and big game. The indicators listed above for vegetation management and watershed function are also useful for determining progress toward ecological resiliency. Refer to the Aquatic and Watershed sections for detailed discussion on the indicators for each alternative.

The number of watersheds with improved conditions varies by alternative. Alternative C improves the largest number of watersheds, alternatives D, E, and F represent an intermediate amount, and alternative B improves the least. Alternatives with more watersheds in improved condition are beneficial for water quality and aquatic species viability, each considered resources of tribal interest. See the Watershed Function, Water Quality, and Water Uses section for detailed analysis of this indicator.

Environmental Justice

Environmental justice is discussed in the Economic and Social Well-being section. The desired future conditions are consistent for all action alternatives.

American Indian populations would not be disproportionately impacted by any alternative. Environmental justice as it relates to tribes is analyzed in detail in the Economic and Social Well-being section.

Cumulative Effects

The affected environment for cumulative effects includes lands administered by the three national forests and lands of other ownerships both within and adjacent to these national forest boundaries. The indirect effects of forest plan implementation would be 20 years. Future actions within these spatial and temporal boundaries would meet the stated desired conditions for all action alternatives for tribal and treaty resources. While there is variation between alternatives within the current analysis, all alternatives would contribute to the exercise of treaty reserved rights, interests, and cultures in a manner that should promote sustainability of the ecosystem. The need for tribal access to traditional sites would be acknowledged and supported for all alternatives for all National Forest System lands administered by the Malheur, Umatilla, and Wallowa-Whitman National Forests.

Recreation

The Malheur, Umatilla, and Wallowa-Whitman National Forests are important local and national recreation destinations. Recreation and related tourism, especially during hunting season, is a major component of the rural economy in northeastern Oregon. The planning area includes all National Forest System lands within a portion of the Ochoco, and all of the Malheur, Umatilla, and Wallowa-Whitman National Forests, with the exception of the Hells Canyon National Recreation Area. The 2009 National Visitor Use Monitoring survey (NVUM) recorded more than one million recreation visits to the three national forests.

National forest recreation provides a wide range of opportunities in a natural setting to meet the needs and desires of visitors. People have always enjoyed relatively un-restricted vehicle access and opportunities in Federal public lands. There are also areas of national forests that have only

been accessible by foot, horseback, and bike. Local lifestyles and economics are closely linked to the type and amount of recreation that is occurring in the Blue Mountains, with a majority of the visitors coming from within two hours of the national forest in which they recreate. The climate and demographics in the Blue Mountains national forests sustain a summer and fall recreation program; and, elevation and snow conditions sustain a strong winter recreation program in much of the project area.

Each national forest has established use patterns, with a large percent of users coming from the counties that are associated with each of the national forests. Wallowa-Whitman National Forest visitors are predominately from Union and Baker counties. Umatilla National Forest visitors are predominately from Walla Walla and Umatilla counties. Malheur National Forest visitors are predominately from Grant and Harney counties. However, considering the distances that are involved, there is a considerable amount of visitation from major metropolitan areas, such as Portland and Seattle, and most importantly secondary population centers that have very high growth rates. Examples of these areas, such as the Tri-Cities area (Benton and Franklin counties in Washington), Bend (Deschutes county in Oregon), and Boise (Ada County in Idaho), have high population growth rates with a large percent of the population desiring to take advantage of outdoor recreation opportunities in the nearby national forests. These large populations and high growth rate areas will have an increasing effect on recreation opportunities and demands within the Blue Mountains national forests. The following table displays visitation rates by county (top three counties) (NVUM 2009), the percent of population from that county that visited each national forest (NVUM 2009), and the county populations and growth rates (2010 Census).

Table 364. Recreation visitation by county for each national forest

County in each National Forest	State	Percent Visitation	County Population	Change in Population 2000 to 2010
Malheur National Forest				
Grant	Oregon	31.9%	7,445	-6.2%
Harney	Oregon	6.4%	7,442	-2.5%
Deschutes	Oregon	3.7%	157,733	36.7%
Umatilla National Forest				
Walla Walla	Washington	21.0%	58,781	6.5%
Umatilla	Oregon	16.6%	75,889	7.6%
Benton	Washington	6.4%	175,177	23.0%
Wallowa-Whitman National Forest				
Union	Oregon	8.8%	25,748	5.0%
Baker	Oregon	7.1%	16,134	-3.6%
Ada	Idaho	1.1%	392,365	30.4%

As displayed in table 364, the rural counties for all three national forests have the highest visitation and the lowest growth rates, and in some cases population losses. The metropolitan centers have a low percent of visitation, but the population is large and growing at a much greater speed then the national average. The Umatilla National Forest has the greatest potential for increasing visitation due to the higher rural population and the higher metropolitan population, both growing at a greater rate than the other two forests.

Within the planning area for the Blue Mountain national forests, congress has designated 11 wild and scenic river segments and 6 wilderness areas. In addition, there are four designated scenic byways, including the Hells Canyon All-American Road. An extensive road system is used by recreation visitors for recreation pursuits that include hunting, fishing, accessing motor vehicle and nonmotorized trail systems, camping, picking huckleberries, viewing wildlife, driving for pleasure, and riding over-the-snow vehicles in the winter. Winter recreation is popular, with three downhill and Nordic ski areas and extensive miles of groomed snowmobile routes.

The Forest Service initiated and developed a framework for sustainable recreation entitled, "Connecting People with America's Great Outdoors: A Framework for Sustainable Recreation" (USDA Forest Service 2010). The framework affirms the USDA forest service mission and concludes:

> Despite changes in population and fluctuations in visitor patterns, it is obvious that outdoor recreation on the National Forests and Grasslands is a traditional part of the American way of life, and will remain so in the years ahead. There are numerous challenges to providing quality recreation experiences and tourism opportunities while protecting the land. But, through the strength of our partnerships . . . we can meet these challenges of a sustainable future for the benefit of American society.

The purpose of sustainable recreation is to create recreation and tourism programs and services that directly contribute to the long-term ecological, social, and economic health in a specified area by building partner relationships between visitors, communities, and providers. Sustainable recreation is currently defined as the set of recreational opportunities, uses and access that, individually and combined, are ecologically, economically, and socially sustainable, allowing the responsible official to offer recreation opportunities now and in the future.

During the past two years, additional funds have been allocated through the American Recovery and Reinvestment Act of 2009 to reduce the backlog of maintenance issues for numerous recreation facilities. This funding has been particularly effective for trail maintenance and developed recreation facilities, with the Forest Service receiving a different mix of funds for each national forest:

- $1.7 million to focus on correcting recreation facilities maintenance issues and accessibility upgrades within the Malheur National Forest
- $1.6 million to address 1,400 miles of wilderness area and Hells Canyon National Recreation Area trails maintenance within the Wallowa-Whitman National Forest
- $1.7 million to correct recreation facilities maintenance issues and $2.8 million to replace trail bridges and to accomplish heavy trail maintenance within the Umatilla National Forest

It is anticipated that this additional funding will have a positive effect on the Blue Mountains national forests recreation and trails facilities over the next decade.

An additional diversity of recreation settings has also been provided with special area designations in the 1990 forest plans. These special areas have specific management direction for their designation, and while many provide a motor vehicle or nonmotorized recreation setting, they are designated for other purposes, such as historical significance or preservation of unique ecosystem components. Where motor vehicle use is deemed suitable, it is because that recreation activity does not interfere with the purpose for which the area was designated. See the Special Areas section for more discussion.

Affected Environment – Recreation

Recreation Settings

Recreation Setting Suitability

Key indicators for recreation setting suitability are:

- acres of back country motor vehicle, backcountry nonmotorized, and wilderness/recommended wilderness
- acres of winter motor vehicle access
- acres available for motor vehicle and nonmotorized hunting access

For each recreation setting, there is a table depicting the results of the most recent National Visitor Use Monitoring survey data (NVUM 2009). After identifying their main recreation activity, visitors were asked how many hours they spent participating in that main activity during the national forest visit. Because most national forest visitors participate in several recreation activities during each visit, it is more than likely that other visitors also participated in this activity, but did not identify it as their main activity. For example, in one national forest, 39 percent of visitors identified viewing wildlife as a recreational activity that they participated in during the visit; however, only 1.3 percent identified that activity as their main recreational activity.

The demographic results from the National Visitor Use Monitoring survey indicate that the average visitor to the Blue Mountains national forests is male (67 percent of respondents), between 50 and 69 years old (35 percent of respondents), and white (99 percent of respondents). The majority of visitors come from counties contiguous or adjacent to the three national forests. The national forests serve as federal “backyards” to moderate population areas for activities that are not often available in the private sector (viewing scenery and wildlife, developed and primitive camping, hiking, and walking).

Existing Condition of Developed Recreation

High to moderate use levels occur at well-maintained recreation sites. Developed sites across the national forests, including campgrounds, picnic areas, boating sites, and ski areas, continue to provide varied recreation facilities. Developed recreation sites act as a central hub of activity, with many people recreating on roads, trails, creeks, lakes, and rivers near the site. Continued access to developed sites is of central importance, while maintaining access to these nearby attractive locations is of equal importance. About one-third of the visits to the Blue Mountains national forests are to developed sites: 23 percent visit day use areas and 11 percent visit overnight camping areas (NVUM 2009). This equates to about 400,000 visits to developed sites in the three national forests.

A recreation facility analysis has been completed for all three of the national forests to determine a program of work for facilities management. As a general observation across the three forests, the use of facilities within all three forests was determined to be below capacity, so additional facility construction is not anticipated. However, in certain locations which are particularly popular or near towns where facilities are not meeting user expectations or use is at full capacity, additional recreation facilities may be constructed in suitable areas (Malheur National Forest Recreation Site Facility Master Plan, May 2006, Wallowa-Whitman National Forest Recreation Site Facility Master Plan June 2006, Umatilla National Forest Recreation Site Facility Master Plan, October 2007).

Table 365. Percent of developed site recreation visits

National Forest	Participated or Primary Visit	Developed Camping	Resort Use	Nature Center	Historic Sites	Picnicking
Malheur	Participated	16.2	0.2	0.9	3.6	22.3
	Primary	5.9	0.1	0.0	0.0	0.8
Umatilla	Participated	14.2	0.5	1.2	5.7	16.7
	Primary	5.1	0.1	0.0	0.2	2.7
Wallowa-Whitman	Participated	13.4	3.7	12.1	17	15.7
	Primary	1.9	0.3	0.2	0.5	1.4

Source: NVUM 2009

The forest plan revision team has addressed the importance and special need for management of developed sites by allocating developed recreation sites to the same management area as administrative sites (MA 5). In the existing condition, alternative A, there are a total of 12,680 acres in MA 5. Approximately 50 percent of these acres are associated with recreation facilities, and the remaining acres are associated with administrative use by the Forest Service. For action alternatives, additional acres would be allocated to MA 5, and this allocation would be the same for each of the action alternatives.

Table 366 displays the acres currently allocated to developed recreation and administrative sites for each of the Blue Mountains national forests. For this analysis, developed recreation and administrative areas will not be used as an indicator, as they will not vary by alternative and would not contribute to a comparison of the alternatives.

Table 366. Existing condition displaying acres of developed recreation and administrative site setting

National Forest	Acres of Developed Recreation and Administrative Site Settings
Malheur	650
Umatilla	4,920
Wallowa-Whitman	7,110

Existing Condition of Dispersed Backcountry Motor Vehicle Recreation Areas

Table 368 displays the current acres within the dispersed backcountry motor vehicle for each forest.

Table 367. Percent of motor vehicle dispersed and backcountry recreation visits

National Forest	Participated or Primary Visit	Primitive Camping	Relaxing	OHV Use	Motor Vehicle Trail	Driving for Pleasure	Motor Vehicle Water Activity	Other Motor Vehicle Activity
MAL	Participated	37.8	38.3	14.9	13.2	54.5	0.0	0.3
	Primary	8.2	3.6	0.0	0.0	7.6	0.6	0.0
UMA	Participated	4.7	31.8	5.6	12.2	42.6	1.0	0.1
	Primary	0.1	4.0	1.9	1.9	11.3	0.0	0.0
WAW	Participated	9.2	39.4	2.6	3.1	30.0	11.5	0.1
	Primary	0.2	5.7	1.5	0.1	11.2	3.1	0.0

Source: NVUM 2009

Table 368. Existing condition acres of dispersed backcountry motor vehicle setting

National Forest	Acres of Dispersed Backcountry Motor Vehicle Setting
Malheur	650
Umatilla	4,920
Wallowa-Whitman	7,110

Existing Condition of Dispersed Backcountry Nonmotorized, Proposed Wilderness, And Wilderness Recreation areas

Low to high use can occur in many backcountry and wilderness sites, depending on the location, and especially depending on proximity to water. Frequently, the pristine nature of a setting becomes the primary reason it is attractive to the exclusion of other sites that may be easier to access, but are much less pristine. The desire to get away from others for a remote or pristine recreation opportunity can create a crowded situation at desirable and relatively easily accessed sites, or a situation where those seeking a pristine setting must look to locations farther away to achieve the desired recreation experience. Pristine recreation settings are at a premium and can be difficult to maintain from the manager's standpoint.

Hiking, walking, horseback riding, mountain biking, snowshoeing, cross country skiing, nature study, and viewing wildlife have been and continue to be popular backcountry activities, as reflected in table 369. Backcountry recreation users usually do not support any change to the way they have been accessing an area. They know they have to hike, ride horses, or ride bikes (in nonwilderness areas) into the area, and they would like it to remain that way. Frequently, for an area to be considered pristine by recreation users, avoidance of the sights and sounds of others or of motor vehicles is necessary. This can be difficult to achieve as motor vehicle sounds can carry a long way.

Table 369. Percent of nonmotorized backcountry wilderness area recreation visits

National Forest	Participated or Primary Visit	Hiking/ Walking	Back-packing	Horse-back Riding	Bicycling	Other Nonmotorized Activity	Nature Study	View Natural Features
MAL	Participated	47.3	1.1	2.5	3.3	1.6	5.3	39.3
	Primary	10.0	0.2	2.2	0.1	0.5	0.0	1.3
UMA	Participated	32.6	0.6	4.3	1.1	3.7	4.8	37.9
	Primary	4.7	0.4	4.0	0.2	1.6	0.4	8.6
WAW	Participated	46.5	12.9	1.8	1.5	2.5	7.0	49.9
	Primary	15.3	6.6	1.0	0.4	0.3	0.3	13.3

Source: NVUM 2009

In some areas, there are management goals that are associated with fish, wildlife, and water that may also be beneficial to nonmotorized recreation experiences. Areas may also have other resource management goals that are associated with excluding motor vehicle activities from an area. These areas will be considered as suitable for nonmotorized backcountry recreation for the purposes of this analysis.

There are management areas in alternative A where this type of recreation activity is provided and for which the area is managed. These include MA 1A Congressionally Designated Wilderness Areas, MA 1C Wilderness Study Area, and MA 3A Backcountry (nonmotorized use). Acres of Blue Mountains national forests currently allocated to these management areas are displayed in table 370 and table 371. There are no proposed wilderness areas in the 1990 forest plans.

Table 370. Existing condition acres of dispersed backcountry nonmotorized setting

National Forest	Acres of Dispersed Backcountry Nonmotorized Setting
Malheur	47,500
Umatilla	29,800
Wallowa-Whitman	0

Table 371. Existing condition acres of designated wilderness areas

National Forest	Acres of Designated Wilderness
Malheur	82,557
Umatilla	304,173
Wallowa-Whitman	372,900*

* Wallowa-Whitman National Forest private inclusions are included in the acre totals for congressionally designated wilderness areas in the existing condition

Existing Condition of Winter Recreation

Winter recreation occurs in all of the areas described previously. Due to the increased difficulty, challenges of access, and need for specialized equipment and clothes designed for winter activities, winter recreation in the Blue Mountains is far less common than summer recreation. However, winter recreation has significant tourism effects for the communities of the Blue Mountains because non-local visitors predominately use local lodging and restaurants. In addition, downhill and cross-country ski areas have a disproportionately large daily visitation compared to all other developed sites in the national forests. As reflected in table 372, snowmobiling has the most extensive participation and is the most widely distributed winter activity in the national forests. Visitors travel great distances to ride in deep snow in wide-open high-elevation areas. Snowmobiling is a controversial topic, with parties interested in maintaining or expanding snowmobiling, and other parties seeking to restrict or eliminate it. In alternative A, snowmobiling is identified as a suitable use and is allowed in approximately 1,575,500 acres within the Malheur National Forest, in approximately 1,061,700 acres within the Umatilla National Forest, and in approximately 1,369,200 acres within the Wallowa-Whitman National Forest.

Table 372. Percent of winter recreation visits

National Forest	Participated or Primary Visit	Downhill Skiing	Cross Country Skiing	Snowmobiling
MAL	Participated	0.0	0.0	8.0
	Primary	0.0	0.0	8.0
UMA	Participated	9.3	3.3	3.0
	Primary	9.1	3.2	1.4
WAW	Participated	5.6	2.8	0.8
	Primary	5.1	1.9	0.5

Source: NVUM 2009

The following table is repeated from the "Access" section.

Table 373. Areas suitable for winter motor vehicle use (existing condition/1990 forest plans)

National Forest	Acres Suitable for Winter Motor Vehicle Use	Percent of National Forest
MAL	1,575,500	93%
UMA	1,061,700	76%
WAW	1,369,200	78%

Existing Condition of Hunting and Fishing

Table 374 includes the National Visitor Use Monitoring (2009) survey information gathered for visitors participating in fishing, hunting, viewing wildlife, and gathering forest products. The national forests of the Blue Mountains maintain a reputation as one of the best places to hunt big game in the Pacific Northwest. Hunting continues to be a featured recreation activity and, in some areas, the single most important recreation activity. Hunting access is a complex topic, as some hunters prefer a high amount of motor vehicle access while others prefer large reductions in motor vehicle access. Regardless, minimal road systems have been proven desirable to manage habitat of the big game species that are hunted. As additional roads are closed to improve big game habitat, there will be a reduction in the easy access afforded by those roads.

Table 374. Percent of Hunting and fishing recreation visits

National Forest	Participated or Primary Visit	Fishing	Hunting	Viewing Wildlife	Gathering Forest Products
MAL	Participated	11.0	49.7	39.3	6.5
	Primary	1.5	40.7	1.3	1.8
UMA	Participated	12.6	12.2	42.6	28.2
	Primary	7.5	9.7	3.0	16.7
WAW	Participated	24.7	11.2	46.8	8.5
	Primary	13.2	8.7	3.5	1.2

Source: NVUM 2009

Nationally, hunting has seen a declining trend. During the last two decades, participation rates of Oregon residents in hunting and angling have declined significantly. Even though Oregon's population has expanded by nearly a million people, the number of licensed resident hunters has

declined in absolute numbers, and the number of licensed resident anglers has not increased. Of the adjacent states of California, Idaho, Nevada, and Washington, only Nevada and Idaho hunters have not declined in numbers. For the same adjacent states, anglers have increased in all four states (Staff Report, Oregon Department of Fish and Wildlife, Review of License Sales Trends, Chris Carter, Harry Upton).

Among the most important factors identified in the literature and hypothesized as causes of the trends are:

- Changing values/attitudes toward wildlife – shift from utilitarian/traditionalist attitude to protectionist attitude
- Urbanization (the social process in which the populations of cities and suburbs grow relative to the populations of rural areas)
- Residential stability has declined, reducing the number of people with a stable, rural background and decreasing the prevalence of individuals with both area knowledge and a utilitarian attitude
- Increasing difficulties in gaining access to fish and wildlife
- Increasing pace of life – not enough time, increasing work obligations, family obligations
- Declining conditions of some fish and wildlife populations
- A population with greater average age, composed of more persons with lower physical fitness and fewer persons with a traditionalist attitude
- Fee increases have caused some individuals to quit or become less frequent participants

The trend in county participation rates has similar negative implications. Oregon net in-migration represents the majority of population growth between the 1990 and 2000 Census. Most of the counties with the largest population gains from in-migration are more urban/suburban counties. Many of the counties associated with the Blue Mountains have had overall population decreases. Table 375 displays the change in annual hunter participation rates for each county by comparing the 2003 participation rate to the 1991 rate. For each county, participation rates have decreased.

Table 375. Relative difference in hunter participation rates by county (from 1991 to 2003)

County	Percent Change in Hunting Participation 1991 to 2003
Harney	-7
Wheeler	-15
Wallowa	-19
Malheur	-27
Morrow	-26
Baker	-26
Union	-5
Umatilla	-27

Fishing access is another complex topic. Fishing participation has increased nationwide, but has only held steady in Oregon in spite of population growth. Oregon state data indicates many of the

counties within the project area have reduced participation rates. Some anglers prefer easy access to fishing sites, while others would like reductions in motor vehicle access and prefer to fish where there are no roads at all.

Table 376 displays the change in annual fishing participation rates for each county by comparing the 2003 participation rate to the 1991 rate. For each county, participation rates have decreased.

Table 376. Relative difference in fishing participation rates by county (from 1991 to 2003)

County	Percent Change in Fishing Participation 1991 to 2003
Harney	-12
Wheeler	-20
Wallowa	-14
Malheur	-33
Morrow	-24
Baker	-27
Union	-13
Umatilla	-23

Hunting and fishing is an important part of recreation activities in the Blue Mountains; however, it is difficult to determine benefits or losses to the activities based on the variability of factors. Many aspects of an enjoyable hunting and fishing experience are within the control of state fish and wildlife management agencies, including increases or decreases in game populations from year to year, difficulty or cost of obtaining tags, and locations where certain types of hunting or fishing may occur. One aspect of the hunting or fishing experience that could be affected by the forest plan revision is the availability of motor vehicle access.

The clear issue facing recreation managers is the ongoing conflict between motorized and nonmotorized access. The national forests provide two principle types of recreation: recreation at developed sites, where activities are dependent on constructed facilities, for example RV camping and downhill skiing; and dispersed recreation, where the activities are not dependent on constructed facilities, for example hunting, fishing, and off-highway vehicle use. Where there is a low road or motor vehicle trail density in a dispersed setting, the setting is considered backcountry.

Useful indicators of differences between alternatives within a dispersed or backcountry setting are the acres of land allocations suitable for motor vehicle use and the acres of land allocations suitable for nonmotorized use. This topic is also discussed in the Access section.

Table 377 and table 378 are repeated from the “Access” section of this chapter.

Table 377. Areas suitable for motor vehicle use (existing condition/1990 forest plans)

National Forest	Acres Suitable for Motor Vehicle Use	Percent of National Forest
MAL	1,428,050	84%
UMA	934,240	67%
WAW	1,315,750	75%

Table 378. Areas suitable for nonmotorized use (existing condition/1990 forest plans)

National Forest	Acres Suitable for Nonmotorized Use	Percent of National Forest
MAL	272,010	16%
UMA	460,150	33%
WAW	438,580	25%

Environmental Consequences – Recreation

This analysis considers the effects to recreation setting suitability that are associated with a motor vehicle use or a nonmotorized use designation for both summer and winter recreation.

Effects associated with changes in the road or trail system for either density or suitability are discussed in the access section.

Effects associated with a change in allocation to Preliminary Administratively Recommended Wilderness Areas are discussed in the wilderness area section.

Recreation Setting Suitability

The indicator for recreation setting suitability is:

- acres available for dispersed backcountry motor vehicle, dispersed backcountry nonmotorized, and wilderness/recommended wilderness

Effects from Alternative A on Recreation Setting Suitability

The 1990 forest plans for the Malheur and Umatilla National Forests include designations for areas for nonmotorized recreation that are primitive in nature, while the Wallowa-Whitman National Forest 1990 forest plan does not. There are areas within all three national forests that are designated for motor vehicle recreation that are primitive in nature, or classified as backcountry, with very low densities of motor vehicle roads. The Umatilla National Forest is closed to cross-country motor vehicle travel, unless posted open. In contrast, the travel management approach for the Malheur and Wallowa-Whitman National Forests has been that areas are open to cross-country motor vehicle travel unless closed by order. All three national forests have road density limitations as plan components, although they vary by national forest. Refer to the Access section for more information.

Developed Recreation

Effects from Alternative A on Developed Recreation

The Blue Mountains national forests 1990 forest plans have inconsistent approaches to developed recreation sites.

There is a management area designated specifically for developed recreation sites for the Malheur and Umatilla National Forests. Developed recreation sites are included in a management area with other administrative sites for the Wallowa-Whitman National Forest. For alternative A, there would be a variety of management areas within the three national forests where developed recreation would be appropriate and encouraged. For the purpose of this analysis, the management area designation developed in the proposed action will be used: MA 5 Developed Sites and Administrative Sites. To determine how this recreation setting is affected by proposals in each alternative, the total acres available in this allocation will be compared (table 379).

Table 379. Acres of recreation setting allocations, including acres from more than one management area, for each alternative for each national forest

Recreation Setting Suitability	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Malheur						
Developed recreation	650	2,200	2,200	2,200	2,220	2,220
Dispersed backcountry motor vehicle	1,428,100	1,533,000	876,000	1,591,500	1,543,500	1,543,500
Dispersed backcountry nonmotorized	47,500	59,300	643,200	0	53,556	53,556
Wilderness and recommended wilderness areas	82,600	83,700	166,400	82,600	113,002	113,002
Umatilla						
Developed recreation	4,920	3,700	3,700	3,700	3,700	3,700
Dispersed/ backcountry motor vehicle	934,200	1,004,000	507,000	1,019,100	884,599	884,599
Dispersed /backcountry nonmotorized	29,800	19,300	292,600	0	105,475	105,475
Wilderness and recommended wilderness areas	304,200	305,600	552,700	304,000	344,239	344,239
Wallowa-Whitman						
Developed recreation	7,110	7,700	7,700	7,700	7,700	7,700
Dispersed backcountry motor vehicle	1,315,800	1,289,000	606,000	1,305,100	1,182,500	1,182,500
Dispersed backcountry nonmotorized	0	0	543,700	0	104,450	104,450
Wilderness areas, recommended wilderness areas, and wilderness study areas	376,000	383,700	545,700	373,000	393,251	393,251

Effects from Alternatives B, C, D, E, and F on Developed Recreation

Administrative and recreation sites would be managed the same for all action alternatives. All three national forests would have slight changes to the developed recreation area allocation. The use of facilities within all three forests was determined to be below capacity, so additional facility construction is not anticipated. However, in certain locations which are particularly popular or near towns where facilities are not meeting user expectations or use is at full capacity, additional recreation facilities may be constructed in suitable areas.

The Malheur National Forest would increase acres allocated to developed sites and administrative sites (MA 5) for the action alternatives with an overall increase of 1,150 acres. The Umatilla would decrease acres allocated to MA 5 for the action alternatives with an overall decrease of 1,220 acres. The Wallowa-Whitman National Forest would have a slight increase in acres allocated to MA 5 for the action alternatives with an overall increase of 590 acres. It is expected that moderate to high use levels will continue to occur at well-maintained and varied recreation

sites including campgrounds, picnic areas, boating sites, ski areas, and other developed recreation sites for all action alternatives

Dispersed Backcountry Motor Vehicle Use

Management areas that include a dispersed backcountry motor vehicle recreation setting include MA 3B Backcountry (limited motor vehicle use) and MA 4A General Forest.

The recreation setting for each national forest results from a composite of multiple factors and elements including the amount of acres allocated to each management area and the specific combination of management areas that comprise each of the four recreation settings. As an example, an alternative that allocates more acres to MA 3B and 4A and fewer acres to MA 3A (nonmotorized use) would have a comparative emphasis on dispersed backcountry motor vehicle recreation. Conversely, an alternative that allocates more acres to MAs 1B and 3A with lesser amounts to MAs 3B and 4A would have a comparative emphasis on dispersed backcountry nonmotorized recreation.

Effects from Alternative A on Dispersed Backcountry Motor Vehicle Use

Alternative A would not change the amount of land allocated to motor vehicle recreation.

For the Malheur National Forest, the amount of land allocated to dispersed backcountry motor vehicle recreation would not change. For dispersed backcountry motor vehicle use, alternative A allocates more acres for this use compared to alternative C, but less than alternatives B, E, F, and D.

For the Umatilla National Forest, the amount of land allocated to dispersed backcountry motor vehicle recreation would not change. For dispersed backcountry motor vehicle use, alternative A allocates an intermediate amount of acres for this use compared to other alternatives: alternatives E, F, and C each would allocate fewer acres for this use, and alternatives D and B would each allocate more.

For the Wallowa-Whitman National Forest, the amount of land allocated to dispersed backcountry motor vehicle recreation would not change. For dispersed backcountry motor vehicle use, alternative A allocates the largest amount of acres for this use compared to the action alternatives.

Effects from Alternative B on Dispersed Backcountry Motor Vehicle Use

Management areas that would provide a summer motor vehicle backcountry recreation setting component for alternative B include MAs 3B and 4A, and all three national forests would have open route density desired conditions for managing summer motor vehicle recreation in MAs 3B and 4A. Refer to the Access section for a detailed discussion.

All three national forests would have areas designated suitable for motor vehicle use. This would include areas where recreation is primitive in nature that would be allocated to MA 3B Backcountry (limited motor vehicle use). The Umatilla and Malheur National Forests would have areas where recreation is primitive in nature and designated unsuitable for motor vehicle use that would be allocated to MA 3A Backcountry (nonmotorized use). The Wallowa-Whitman National Forest does not have a management area equivalent to MA 3A for alternative B.

Within the Malheur National Forest, alternative B would allocate an intermediate amount of acres to dispersed backcountry motor vehicle use compared to other alternatives: alternatives D, E, and F each would allocate more acres for this use, and alternatives C and A would each allocate less.

Within the Umatilla National Forest, alternative B would allocate an intermediate amount of acres to dispersed backcountry motor vehicle use compared to other alternatives: alternative B would allocate more acres than alternatives A, E, F, and C, but fewer acres than alternative D.

Within the Wallowa-Whitman National Forest, alternative B would allocate an intermediate amount of acres to dispersed backcountry motor vehicle use compared to other alternatives: alternative B would allocate more acres than alternatives E, F, and C, but fewer acres than alternatives A and D.

Effects from Alternative C on Dispersed Backcountry Motor Vehicle Use

MA 4A would comprise the summer motor vehicle backcountry recreation setting for alternative C. All three national forests would have open route density desired conditions for managing summer motor vehicle recreation in MA 4A. Refer to the Access section for a detailed discussion.

In this alternative, the three national forests would not have areas designated for motor vehicle recreation that is primitive in nature. There would be no acres allocated to MA 3B as in the other alternatives.

In general, there would be a decrease in area suitable for summer motor vehicle use across the three national forests in alternative C. The overall decrease results from the combination of an increase in acres allocated to MA 3A Backcountry (nonmotorized use), no acres allocated to MA 3B Backcountry (limited motor vehicle use), and an increase of acres allocated to MA 1B, MA 3C, and MA 4C. Additionally, the amount of acres allocated to MA 4A General Forest would be reduced. Alternative C would result in a large increase in area suitable only for summer nonmotorized use and would enhance walking, hiking, horseback riding, and mountain biking opportunities and experiences. Conversely, this alternative would reduce and displace motor vehicle use and activity such as snowmobiling and riding off-highway vehicles or motorcycles.

For all three national forests, alternative C would allocate the least amount of acres to dispersed backcountry motor vehicle use compared to other alternatives.

Effects from Alternative D on Dispersed Backcountry Motor Vehicle Use

MAs 3B and 4A would comprise the motor vehicle dispersed and backcountry recreation setting. All three national forests would have open route density desired conditions for managing summer motor vehicle recreation in MAs 3B and 4A. Refer to the “Access” section for a detailed discussion. In general, alternative D would allocate the largest amount of acres to backcountry motor vehicle use across the three national forests, primarily through an increase in acres allocated to MA 4A for each forest and a similar increase in acres allocated to MA 3B. Alternative D would result in a large increase in area suitable for summer motorized vehicle recreation use and would enhance snowmobiling, off-highway vehicle, and motorcycle riding opportunities and experiences. Conversely, this alternative would reduce walking, hiking, horseback riding, mountain biking opportunities, and experiences that emphasize quiet recreation.

For both the Malheur and Umatilla National Forests, alternative D would allocate the largest amount of acres to dispersed backcountry motor vehicle use compared to other alternatives.

Within the Wallowa-Whitman National Forest, alternative D would allocate more acres to dispersed backcountry motor vehicle use compared to alternatives B, E, F, and C, but fewer acres than alternative A.

Effects from Alternatives E and F on Dispersed Backcountry Motor Vehicle Use

MAs 3B and 4A would comprise the motor vehicle dispersed and backcountry recreation setting for alternatives E and F. All three national forests would have open route density desired conditions for managing summer motor vehicle recreation in MAs 3B and 4A. Refer to the Access section for a detailed discussion. In general alternatives E and F would allocate a relatively large amount of acres to dispersed backcountry motor vehicle use across the three national forests compared to other alternatives.

Within the Malheur National Forest, alternatives E and F would allocate more acres to dispersed backcountry motor vehicle use compared to alternatives B, A, and C, but fewer than alternative D.

For both the Umatilla and Wallowa-Whitman National Forests, alternatives E and F would allocate more acres to dispersed backcountry motor vehicle use compared to alternative C, but fewer acres than alternatives D, B, and A.

Dispersed Backcountry Nonmotorized and Wilderness Area Recreation

Management areas that comprise a dispersed backcountry nonmotorized recreation setting would primarily include MA 1A Designated Wilderness, MA 1B Preliminary Administratively Recommended Wilderness, MA 3A Backcountry (nonmotorized use), MA 3C Wildlife Corridor, and MA 4C Old Forest. All of these management areas would support and enhance dispersed backcountry nonmotorized use.

Effects from Alternative A on Dispersed Backcountry Nonmotorized And Wilderness Area Recreation

Alternative A would not change the amount of acres allocated to nonmotorized recreation, and there are no allocations to MA 1B Proposed Administratively Recommended Wilderness Areas in this alternative.

Within the Malheur National Forest, the amount of acres allocated to dispersed backcountry nonmotorized recreation would not change. For dispersed backcountry nonmotorized use, alternative A allocates more acres for this use compared to alternative D, but less than alternatives C, B, E, and F.

Within the Umatilla and Wallowa Whitman National Forests, the amount of acres allocated to dispersed backcountry nonmotorized recreation would not change. For dispersed backcountry nonmotorized use, alternative A allocates an intermediate amount of acres for this use; alternatives C, E, and F each allocate more acres for this use; and alternatives B and D each allocate less.

Effects from Alternative B on Dispersed Backcountry Nonmotorized and Wilderness Area Recreation

Management areas that would comprise a summer nonmotorized backcountry recreation setting for alternative B include MAs 1A, 1B, 1C, and 3A.

For both the Malheur and Wallowa-Whitman National Forests, alternative B would allocate an intermediate amount of acres to dispersed backcountry nonmotorized recreation use. Alternatives C, E, and F would each allocate more acres for this use, and alternatives A and D would allocate less.

Within the Umatilla National Forest, alternative B would allocate more acres to dispersed backcountry nonmotorized recreation use than alternative D, but less that alternatives C, E, F, and A.

Effects from Alternative C on Dispersed Backcountry Nonmotorized and Wilderness Area Recreation

All three national forests would have areas designated for nonmotorized recreation in MA 3A Backcountry (nonmotorized use). This alternative also would include allocations to MA 3C Wildlife Corridors to increase habitat connectivity at the landscape level for wildlife and would contribute to providing opportunities for quiet recreation in roaded areas. Additional allocations would include MA 4C Old Forest and MA 1B Preliminary Administratively Recommended Wilderness Areas where motor vehicle use is generally unsuitable (see general suitability matrix table in appendix A). Future site-specific planning and decision making would need to consider the desired condition for open route density.

Management areas that would comprise a summer nonmotorized dispersed and backcountry recreation setting for alternative C include MAs 1A, 1B, 1C, 3A, 3C, and 4C.

For all three national forests, alternative C would allocate the largest amount of acres to backcountry nonmotorized recreation use compared to the other alternatives. Alternatives E, F, B, A, and D would each allocate fewer acres for this use

Effects from Alternative D on Dispersed Backcountry Nonmotorized and Wilderness Area Recreation

MAs 1A and 1C would comprise the nonmotorized backcountry recreation setting.

In this alternative, no MA 1B Preliminary Administratively Recommended Wilderness Areas (PARWA) would be designated. See the PARWA section for detailed information.

None of the three national forests would have areas designated for nonmotorized recreation that is primitive in nature (MA 3A in other alternatives), other than previously designated wilderness areas. All three national forests would have areas designated for remote motor vehicle experiences in MA 3B Backcountry (limited motor vehicle use).

For all three national forests, alternative D would allocate the least amount of acres to backcountry nonmotorized recreation use compared to the other alternatives. Alternatives A, B, F, E, and C would each allocate more acres for this use.

Effects from Alternatives E and F on Dispersed Backcountry Nonmotorized and Wilderness Area Recreation

MAs 1A, 1B, 1C, and 3A would comprise the nonmotorized backcountry recreation setting for alternatives E and F.

For all three national forests, alternatives E and F would allocate fewer acres to backcountry nonmotorized recreation use compared to alternative C, but more than alternatives B, A, and D.

Cumulative Effects to Recreation

The cumulative effects analysis timeframe for recreation is 15 years and the spatial bounds are the lands managed by the Blue Mountains national forests and those lands of other ownership that intermix with the three national forests. Recreational access across the Blue Mountain national

forests is likely to be influenced by a variety of factors. The mixed land ownership (State lands, private, Bureau of Land Management) in and around the forests and the continuing management actions taken on these lands will likely continue providing quality recreation opportunities. It is anticipated that population changes, and changes in the types and intensity of recreation, will continue to influence management actions and responses to these changing factors.

The rural counties immediately adjacent to the Blue Mountain national forests have the highest percent visitation, but these areas have the lowest growth rates, and in some cases population loses. In contrast, the metropolitan centers, with generally further proximity from the national forests, have a low percent of visitation, but the population is large and growing at a faster rate than the national average. The Umatilla National Forest has the greatest potential for increasing visitation due to the combination of a relatively large rural population, a large metropolitan population, and a growth rate that is higher than the other two forests.

The Blue Mountain national forests have experienced significant changes in recreation since the forests were first established and conditions continue to change from those identified in the 1990 forest plans. Initially, recreation was light and concentrated in just several popular areas, with few campgrounds or other site development. A major boom in recreation occurred after World War II through the early to mid-1960s, as post-war populations were attracted to the national forest and placed additional demands on the quantity and quality of recreation facilities.

Since the 1970s, interest in and appreciation of the environment has increased national forest recreation visitation and has shifted activities and expectations. Technical advancements in motorized vehicles (all-terrain vehicles, motorcycles, snowmobiles, etc.) allow these types of vehicles to travel many places where they were unable to travel as recently as five years ago. The invention and advancement of the mountain bike has added a summer nonmotorized use that was not a prominent component of the 1990 forest plans. All of these issues, along with several others, have led to more crowded recreation experiences during peak use times, increasing levels and range of demands on natural resources and resource managers, and generated conflicts among the users themselves.

Continuing changes in equipment technology used for recreational purposes on the Blue Mountain national forests will have effects as new uses, or existing uses change the ease or areas where people recreate. These changes in uses may alter the recreational experience in some areas. Those who pursue nonmotorized recreation opportunities, such as hiking or backcountry skiing, will continue to be afforded widespread opportunities to experience activities that exemplify solitude, risk, challenge, and primitive recreation opportunities.

All alternatives emphasize a mix of recreation opportunities providing today’s recreationists with reasonable assurances of future motorized and nonmotorized recreational opportunities. Alternative D may provide more recreation opportunities toward the developed end of the recreation opportunity spectrum classes by accelerating development of the Blue Mountain national forests with a variety of management actions. Some values such as remoteness, solitude, and wildlife-related recreation opportunities may be reduced in alternative D. Alternative C proposes the least amount of forest management, thereby, emphasizing the primitive and semi-primitive classes of recreational opportunities, and potentially reducing developed and motor vehicle oriented recreation opportunities. Alternative B would emphasize a combination of active management and natural processes for restoring the landscape, a combination that would provide balanced opportunities across a recreational spectrum. Similarly, alternatives E and F would provide for a combination of recreational opportunities that would improve or enhance the qualities, quantities, and visitor use satisfaction of recreationists.

Special Areas

Introduction

Special areas on the national forests are managed to protect and where appropriate, foster public use and enjoyment of areas with scenic, historical, geological, botanical, zoological, paleontological, or other special characteristics. A special area must possess unusual recreation and scientific values, and it would be desirable that these values be available for public study, use, or enjoyment. These areas provide for conservation of representative, unique, or rare ecosystems or ecological components, as well as culturally significant components. Some of these areas provide natural reference areas to represent eco-regions within each state. Management emphasis is primarily focused on protecting or improving, and where appropriate, developing and interpreting the area's special characteristics for public education and enjoyment.

This section discusses five types of special areas: wild and scenic rivers, municipal watersheds, research natural areas, experimental forest, and special interest areas. Wilderness and recommended wilderness can be found in a separate report.

Acreages for all current special areas has been recalculated since distribution of the proposed action for public scoping by using the latest GIS technology, so although boundaries may not have changed, the acres reported may have. Changes are noted in the alternatives.

Special areas are formally designated either by congressional statute or by administrative action. Congressionally designated areas are established through a formal act of Congress, such as wilderness areas, wild and scenic rivers and national recreation areas. Administratively designated areas include research natural areas, and special interest areas (SIAs) such as historic areas, geologic areas, scenic areas, and botanical areas. These areas may be proposed in forest plans but are established through a separate process. SIAs exist for the protection and public enjoyment of areas of special characteristics. Once areas have been designated, either by Congress or agencies, the designation does not usually change. Areas recommended or proposed in forest plans may change. The following types of administratively designated areas occur on the Blue Mountains national forests: scenic areas, historical, geological, and botanical areas; research natural areas; municipal watersheds; scenic byways and nationally designated trails.

Many special areas have their own management plans, which supplement the direction in the forest plans.

Management Area Designations for All Action Alternatives

Special areas would be allocated to:

- MA 2A Designated, Eligible, and Suitable Wild and Scenic Rivers
- MA 2B Research Natural Areas
- MA 2C Botanical Areas
- MA 2D Geological Areas
- MA 2E Historical Areas
- MA 2F Scenic Byways and All-American Roads
- MA 2G Nationally Designated Trails
- MA 2H Scenic Areas
- MA 2I Starkey Experimental Forest and Range
- MA 2J Municipal Watersheds

Standards and guidelines specific to some of these management areas are available in appendix A. Management areas 2D, 2E, 2F, 2G, and 2H do not have specific standards or guidelines.

Special area management area allocations are the same throughout all action alternatives and will not be instrumental in displaying the differences between action alternatives.

Overlapping management areas: many special areas overlap with or are contained in other management areas, such as wilderness or riparian management areas. In this event, the more restrictive management applies.

Affected Environment – MA 2A Designated, Eligible, and Suitable Wild and Scenic Rivers

Congress enacted the Wild and Scenic Rivers Act in 1968 to preserve certain selected rivers for their free-flowing condition, water quality, and outstandingly remarkable values. The Wild and Scenic Rivers Act (WSRA), provides contrast to national policy of dam, construction, and water resources projects. To protect designated rivers' free-flowing character the Federal Energy Regulatory Commission (FERC) (which licenses nonfederal hydropower projects) is prohibited from licensing construction of dams, water conduits, reservoirs, powerhouses, transmission lines, or other project works on or directly affecting wild and scenic rivers. Other federal agencies may not assist by loan, grant, and license or otherwise any water resources project that would have a direct and adverse effect on the values for which a river was designated.

The Wild and Scenic Rivers Act directs that each river in the National Wild and Scenic Rivers System (National System) be administered in a manner to protect and enhance a river's outstanding natural and cultural values. It allows existing uses of a river to continue and future uses to be considered, so long as existing or proposed use does not substantially interfere with protecting river values. The Wild and Scenic Rivers Act also directs building partnerships among landowners, river users, tribal nations, and all levels of government.

Rivers may be identified for suitability studies by an act of Congress under Section 5(a), or through federal agency-initiated study under Section 5(d)(1). By the end of 2002, Congress had authorized 138 rivers for study. Section 5(d) (1) directs federal agencies to consider the potential of wild and scenic rivers in their planning processes; and its application has resulted in numerous individual river designations, and state and area-specific legislation.

Both Sections 5(a) and 5(d) (1) require determinations to be made regarding a river's eligibility, classification, and suitability. Eligibility and classification represent an inventory of existing conditions. Eligibility is an evaluation of whether a river is free-flowing and possesses one or more outstandingly remarkable value. If found eligible, a river is analyzed as to its current level of development and a preliminary classification determination is made as to whether it should be placed into one of three classes; wild, scenic, or recreational.

The potential classification of a river found to be eligible is based on the condition of the river and the adjacent lands as they currently exist. Section 2(b) of the Wild and Scenic Rivers Act (1968) specifies and defines these terms as follows:

> **Wild Rivers:** Wild river segments are free of impoundments and are generally inaccessible except by trail and or water trail; the shorelines are essentially natural appearing. Signs of human activity, including structures or evidence of resource use, are minimal. Visitors have the opportunity to interact with a natural environment with minimal sights and sounds of other

people. Wild rivers within designated wilderness areas meet the desired condition for MA 1A Congressionally Designated Wilderness Areas.

Scenic Rivers: Scenic river segments are free of impoundments; shorelines and viewing areas are largely natural appearing. Some recreation structures, evidence of timber harvest roads, and other evidence of human activity may be present but do not detract from the near natural appearance and scenic qualities of the immediate environment. A variety of water related recreational opportunities are available. The river may be accessible from roads in some places.

Recreational Rivers: Recreational river segments are free of impoundments and are readily accessible from roads. Some major public use facilities, such as developed campgrounds, administrative buildings, bridges, private residences, and commercial businesses, may be within the corridor. Considerable development and timber harvest may have occurred and may be evident near the river. A range of recreational opportunities is available in settings where visitors are likely to share their recreational experience with other individuals or groups.

The final procedural step, a suitability study, provides the basis for determining whether to recommend a river as part of the National System. A suitability study is designed to answer the following questions:

- Should the river's free-flowing character, water quality, and outstandingly remarkable values be protected; or are one or more other uses important enough to warrant doing otherwise?
- Will the river's free-flowing character, water quality, and outstandingly remarkable values be protected through designation? Is it the best method for protecting the river corridor? In answering these questions, the benefits and impacts of Wild and Scenic rivers designation must be evaluated and alternative protection methods considered.
- Is there a demonstrated commitment to protect the river by any nonfederal entities that may be partially responsible for implementing protective management?

Rivers authorized for suitability studies by Congress are protected under the Wild and Scenic Rivers Act: Section 7(b) prevents the harmful effects of water resources projects; Section 8(b) withdraws public lands from disposition under public land laws; Section 9(b) withdraws locatable minerals from appropriation under mining laws; and Section 12(a) directs actions of other federal agencies to protect river values. These protections last through the suitability study process, including a three-year period following transmittal of the final suitability study report by the President to Congress. The integrity of the identified classification must also be maintained during the protection period.

The identification of a river as eligible through the forest planning process does not trigger any protections under the Wild and Scenic Rivers Act. To manage the river for its potential inclusion into the National System, the administering agency applies existing authorities (such as the Clean Water Act and Endangered Species Act) to protect its free-flowing character, water quality, outstandingly remarkable values, and preliminary or recommended classification. Rivers identified as eligible are managed to maintain eligibility until suitability is determined.

The Forest Service completed two environmental impact statements on the suitability for 11 eligible river segments within the Wallowa-Whitman National Forest. The Wild and Scenic River Study Report and Final Legislative Environmental Impact Statement for Eight Rivers (1997), and Dutch Flat Creek, Killamacue Creek and Rock Creek Wild and Scenic River Study Report (1996) recommended 3 of the 11 rivers as suitable. In three alternatives, these two documents will be

used to complete the suitability process for Dutch Flat Creek, East Eagle Creek, and Five Points Creek.

The Blue Mountains forest plan revision will not include analysis of the suitability for all rivers that have been determined eligible. Only the 11 rivers considered in the two EISs for the Wallowa-Whitman National Forest were analyzed and will be discussed here. When a suitability recommendation is deferred, the forest plan must provide management direction for protecting the outstandingly remarkable values until a suitability recommendation is reached. To provide realistic protection, the appropriate classification for each segment of each eligible river has been established and is listed by river segment with classification in table 380.

Table 380. Suitable wild and scenic rivers Wallowa-Whitman National Forest*

River Name	Wild	Scenic	Recreational	Outstanding Remarkable Values
Dutch Flat Creek	5.3	0	0	Scenery, recreation, geological, hydrological, botanical
East Eagle Creek	9	2.1	4.5	Scenery, recreation, fisheries, hydrological, geological, cultural
Five Points Creek	0	12.1	0	Scenery, fisheries, wildlife
Totals	**14.3**	**14.2**	**4.5**	

*These rivers have been determined suitable in Dutch Flat Creek, Killamacue Creek and Rock Creek Wild and Scenic River Study Report (1996) and Wild and Scenic River Study Report and Final Legislative EIS for Eight Rivers (1997).

Environmental Consequences – MA 2A Designated, Eligible, and Suitable Wild and Scenic Rivers

Effects from Alternative A (No-action Alternative)

For this alternative, management direction from the management plans that were written for each of the designated wild and scenic rivers remains in place. For this alternative, no additional rivers would be added as eligible.

For alternative A only those rivers already designated by Congress as part of the Wild and Scenic Rivers System are included in MA 2A. There are 10,807 acres in this management area within the Malheur National Forest, 6,926 acres within the Umatilla National Forest, and 21,936 acres within the Wallowa-Whitman National Forest.

While the eligible rivers in listed in appendix A must be managed to retain their eligibility, they will be managed under their current management area designations which vary by national forest set by the 1990 forest plans.

Effects from Alternatives B and C

For these alternatives, MA 2A includes congressionally designated rivers, and those rivers that have been determined to be eligible for designation and warrant further study that may lead to suitability, and ultimately to congressional designation. Management direction from the management plans that were written for each of the designated wild and scenic rivers remains in place. There would be 12,100 acres in this management area within the Malheur National, 44,600 acres within the Umatilla National Forest, and 88,400 acres within the Wallowa Whitman National Forest.

Effects from Alternatives D, E, and F

Malheur and Umatilla National Forests

For these alternatives, MA 2A includes congressionally designated rivers and those rivers that have been determined to be eligible for designation and warrant further study that may lead to suitability, and ultimately to congressional designation. Management direction from the management plans that were written for each of the designated wild and scenic rivers remains in place. MA 2A acres would be the same as alternatives B and C for the Malheur National Forest at 12,100 acres and the Umatilla National Forest at 44,600 acres.

Wallowa-Whitman National Forest

For these alternatives, MA 2A includes congressionally designated rivers and those rivers that have been determined to be suitable as components of the National Wild and Scenic River System. The EISs associated with the three rivers listed as suitable will serve as the environmental documentations needed to request congressional review of the suitability determination. MA 2A would be 52,900 acres for the Wallowa-Whitman National Forest. For alternatives D, E, and F, the eight rivers identified as not suitable for National Wild and Scenic River System designation would be considered ineligible. This finding is documented in the Wild and Scenic River Study Report and Final Legislative Environmental Impact Statement. Please refer the management area maps for the locations of MA 2A for each of the alternatives.

Specific Management Direction for MA 2A

Standards and guidelines for MA 2A are available in appendix A. Some are specific to particular rivers or river segments due to a correlation with the comprehensive river management plan for that river and are being incorporated from those plans for all alternatives.

Affected Environment – MA 2B Research Natural Areas

Research natural areas are natural areas established by Federal agencies. For the Blue Mountains national forests, the Pacific Northwest Research Natural Area Committee oversees the criteria and process for designating and managing these areas in conjunction with the Natural Heritage Programs of the states of Oregon and Washington.

Research natural areas form a network of ecological reserves for research and education purposes and for the maintenance of biodiversity. The purposes of research natural areas are: (1) to preserve examples of all significant natural ecosystems for comparison with those influenced by man, (2) to provide educational and research areas for ecological and environmental studies, and (3) to preserve gene pools of typical and endangered plants and animals.

Federal agencies identify areas that have unrepresented plant associations or other elements identified in the Oregon or Washington Natural Area Plan. These areas are evaluated by staff, boundaries are proposed, alternatives are examined, and a site and its boundaries are selected through the planning process. An establishment record is created for each research natural area. These reports include the justification for establishment, legal boundary descriptions, maps, distinguishing ecological features, environmental analyses, and management issues and guidelines. Research natural areas become officially established once an establishment record is completed and signed by the regional forester with concurrence from the Forest Service Pacific Northwest Research Station director.

Research, study, observation, monitoring, and educational activities that are nondestructive and nonmanipulative are generally allowed within research natural areas. While research natural areas

are generally unsuitable for livestock grazing, some incidental use by livestock could occur within these areas as administrative boundaries are typically not fenced.

The desired condition for MA 2B is that established and proposed research natural areas exhibit natural conditions with minimal human intervention. Ecological processes prevail. Under some circumstances (i.e., when there is an approved establishment record that includes a management plan for Research Natural Areas), deliberate manipulation may occur to maintain the ecosystem or the unique feature(s) for which the research natural area was established.

Established and proposed research natural areas within the Blue Mountains national forests are displayed in table 381.

Effects from Alternative A (No-action Alternative)

For this alternative, no new proposed research natural areas would be allocated to MA 2B (see table 381 for research natural area acres). The forest plan would not recognize additional areas for their special or unique characteristics. These areas would continue to be managed as part of their current management area allocations, which may or may not protect the characteristics for which the additional proposed research natural areas are designated.

Effects from Alternatives B, C, D, E, and F

The total acres of research natural areas would increase within the Malheur and Wallowa-Whitman National Forests as displayed in table 381. Acres of research natural areas within the Umatilla National Forest would have a slight decrease. Refer to the following discussion for the rationale for the proposed changes.

Additional Proposed Research Natural Areas for Alternatives B, C, D, E, and F

Since the approval of the existing forest plans, Forest Service ecologists have formally proposed additional research natural areas to help fill missing ecological representations in the natural areas network as published by the Natural Heritage Programs of Oregon and Washington.

Malheur National Forest

Strawberry Mountain: this proposed research natural area would serve as the representative for whitebark pine in the southern Blue Mountains.

Umatilla National Forest

No new research natural areas are proposed.

Wallowa-Whitman National Forest

Clear Creek Ridge: this proposed research natural area contains green fescue communities of high value to future research.

Nebo: this proposed research natural area in the Eagle Cap Wilderness is the site of historic benchmark areas for early grazing studies in the Tenderfoot Basin. Since 1938, the green fescue communities in this proposed research natural area have been relatively unimpacted from domestic grazing. The area contains extensive green fescue grasslands in relatively late seral stages.

Table 381. Acres of research natural areas in each alternative for each national forest

Research Natural Area Name	Alt. A	Alts. B, C, D, E, and F	Status	Change
Malheur National Forest				
Baldy Mountain	2,591	3,861	Proposed	Boundary update
Canyon Creek	738	738	Established	NA
Dixie Butte	86	335	Proposed	Boundary update
Dry Mountain	2,260	2,260	Established	NA
Dugout Creek*	908	908	Established	NA
Shaketable	375	385	Established	Boundary update
Silver Creek	802	802	Proposed	NA
Stinger Creek	354	1,663	Proposed	Boundary update
Strawberry Mountain	0	107	Proposed	New
Totals	**8,114**	**11,059**		
Umatilla National Forest				
Birch Creek Cove	411	411	Proposed	NA
Kahler Creek Butte (formerly Kelly Creek Butte)	84	84	Proposed	NA
Mill Creek	7,702	7,486	Proposed	Boundary Update**
Pataha Bunchgrass	63	63	Established	NA
Rainbow Creek	570	570	Established	NA
Vinegar Hill	424	424	Proposed	NA
Wenaha Breaks (formerly Elk Flats-Wenaha Breaks)	1,970	1,970	Established	Boundary update
Totals	**11,224**	**11,008**		
Wallowa-Whitman National Forest				
Clear Creek Ridge	0	637	Proposed	New
Craig Mountain Lake	172	172	Proposed	NA
Glacier Lake	102	102	Proposed	NA
Haystack Rock	425	425	Proposed	NA
Horse Pasture Ridge	338	338	Proposed	NA
Indian Creek	1,003	1,003	Established	NA
Johnson (formerly Cougar Meadow)	131	131	Proposed	Name change
Lake Fork*	224	224	Proposed	Boundary update
Mount Joseph	705	705	Proposed	NA
Nebo*	0	1,695	Proposed	New
Point Prominence	365	365	Proposed	NA
Standley	0	742	Proposed	New
Gerald S. Strickler (formerly Government Meadow)	195	195	Established	Name change
Sturgill	0	139	Proposed	New
Tenderfoot Basin	0	891	Proposed	New
Vance Knoll	190	190	Established	NA
West Razz Lake	47	47	Proposed	NA
Totals	**3,897**	**8,001**		

* The Lake Fork and Nebo proposed research natural areas are partially in the HCNRA. Acreage only for the portions outside the HCNRA is displayed in this table.

** This research natural area is also a designated watershed.

Standley: this proposed research natural area was prominent in early rangeland sampling and investigation into green fescue use and succession. It continues to provide permanent monitoring opportunities.

Sturgill: this proposed research natural area contains green fescue communities of high value to future research.

Tenderfoot Basin: this proposed research natural area is another historic area of early rangeland sampling and investigation into green fescue community use and succession.

Acreage Changes for Proposed and Established Research Natural Areas for Alternatives B, C, D, E, and F

Malheur National Forest

Baldy Mountain: This proposed research natural area would be increased from 2,591 to 3,861 acres. The boundaries have been modified to include the complete range of ecological significant serpentine plant communities on Baldy Mountain.

Dixie Butte: This proposed research natural area would be increased from 86 to 335 acres. The boundaries have been modified to encompass the spatial extent of a nonforested vegetation mosaic of subalpine shrub steppe and grassland plant communities.

Stinger Creek: This proposed research natural area would increase from 354 to 1,663 acres to include sagebrush scabland/dry pine-mountain mahogany mosaic that is needed for the ponderosa pine-mountain mahogany element.

Umatilla National Forest

Mill Creek: this proposed research natural area would decrease from 7,702 acres to 7,486 acres. The boundaries have been modified to exclude existing National Forest System roads from the southwest portion of the proposed research natural area.

Wallowa-Whitman National Forest

No acreage changes are proposed.

Effects from Research Natural Area Designation for Alternatives B, C, D, E, and F

Research natural areas listed in table 381 are either established or proposed, as identified in the “Status” attribute column. Of the proposed research natural areas, there is additional distinction between those proposed research natural areas that were included in the 1990s forest plans—and have yet to be formally designated—and those proposed after the 1990 forest plans that too have yet to be formally designated.

The research natural areas that were proposed and included in the 1990 forest plans as candidate research natural areas have been managed to preserve their unique values and qualities. These areas have been managed to exhibit natural conditions with minimal human intervention, and to maintain prevalent ecological processes. A change from proposed status to designated status for those research natural areas included in the 1990 forest plans would have no effect on either the research natural area itself or surrounding area. Previous management actions conserved the research natural area’s unique value and characteristics; and those past management objectives align with the current management allocation to MA 2B. It is expected that formal designation

will not have any effect on those lands within the proposed research natural areas or the surrounding area.

The research natural areas that have since been proposed subsequent to the 1990 forest plans represent new, unique areas and the effects of allocation to MA 2B are discussed below by forest.

Malheur National Forest

A total of nine research natural areas are listed for the Malheur National Forest. Of this total, four are formally designated through establishment records, and five are proposed. Of the five that are proposed, four were included in the 1990 forest plan as candidate research natural areas, where the areas were subsequently managed to conserve the natural qualities and characteristics that make them eligible for inclusion in the research natural area program.

The remaining proposed research natural area, Strawberry Mountain, would serve as the representative for whitebark pine in the southern Blue Mountains. The proposed research natural area is situated wholly within the designated Strawberry Mountain Wilderness. It is expected that changing the research natural area's status from proposed to designated would have no effects on the lands contained within the proposed research natural area or to the surrounding area. Both areas would continue to be managed to conserve their respective unique qualities within the framework of the forest plan and adhere to standards and guidelines for all alternatives.

Umatilla National Forest

A total of seven research natural areas are listed for the Umatilla National Forest (see table 381 above). Of this total, three are formally designated through establishment records, and four are proposed. All four of the proposed research natural areas were included in the 1990 forest plan as candidate research natural areas. As noted above for the Malheur National Forest, it is expected that changing the research natural areas' status from proposed to designated (through formal designation) would have no effects on the lands contained within the proposed research natural area or the surrounding areas. Past management of these proposed research natural areas would align with the management objectives and standards and guidelines presented in the current forest plan revision.

Wallowa-Whitman National Forest

A total of 17 research natural areas are listed for the Wallowa-Whitman National Forest (see table 381 above). Of this total, three are formally designated, and the remaining 14 are proposed. Of the 14 that are proposed, nine were included in the 1990 forest plan as candidate research natural areas, where the areas were subsequently managed to conserve the natural qualities and characteristics that make them eligible for inclusion in the research natural area program.

The remaining five proposed research natural areas were proposed after the 1990 forest plan, and each is described below.

Clear Creek Ridge: This proposed research natural area is situated along the southern boundary of the Eagle Cap Wilderness; only a relatively small, northern portion of the proposed research natural area overlaps with the designated wilderness. For alternatives B, D, E and F the management area surrounding the proposed research natural area would be comprised of MA 3B (Backcountry—limited vehicle motor use). For alternative C, the proposed research natural area would be entirely contained within MA 1B, preliminary administratively recommended wilderness. For all alternatives, formal designation of the proposed research natural area would likely have no effect, as the lands contained within the proposed research natural area and the

surrounding area are generally managed to conserve these special and unique features for which the area is eligible.

Nebo: This proposed research natural area is situated partially within the Eagle Cap Wilderness (MA 1A), partially within the Hells Canyon National Recreation Area (outside of the current planning area), and partially within general forest allocation (MA 4A). For alternatives B and C, the land management allocations located along the northern portion of the proposed research natural area would be MA 2A, designated and eligible wild and scenic river. For alternatives D, E and F the surrounding allocation would be comprised of general forest (MA 4A). For all alternatives, formal designation of the proposed research natural area would likely have no effect, as the lands contained within the proposed research natural area are managed to conserve these special and unique features for which the area is eligible, and the surrounding areas are similarly managed to preserve these conditions.

Standley, Sturgill, and Tenderfoot Basin: These proposed research natural areas are situated wholly within the designated Eagle Cap Wilderness. It is expected that changing the research natural area status from proposed to designated would have no effect on the lands contained within the proposed research natural areas or to the surrounding area. Both areas would continue to be managed to conserve their respected unique qualities through forest plan standards and guidelines that would preserve these natural features.

Affected Environment – MA 2C Botanical Areas

Botanical areas have special values and unique natural characteristics. Botanical areas contain specimens, groups of plant colonies, or plant communities that are significant because of form, color occurrence, habitat location, life history, ecology, variety, or other features. While botanical areas are generally unsuitable for livestock grazing, some incidental use by livestock could occur within these areas as administrative boundaries typically are not fenced. The network of established or proposed botanical areas on the national forests of the Blue Mountains is displayed in table 382.

Effects from Alternative A (No-action Alternative)

The Malheur National Forest has two botanical areas totaling 123 acres. The Umatilla National Forest has four botanical areas totaling 828 acres. There are no botanical areas within the Wallowa-Whitman National Forest.

For this alternative, no new botanical areas would be allocated to MA 2C and boundaries would not change. Botanical areas proposed for alternatives B, C, D, E, and F would continue to be managed as part of their current management area allocations, which vary by national forest.

Effects from Alternatives B, C, D, E, and F

Botanical areas within the Malheur National Forest would not change; however, updated mapping recognizes that the Cedar Grove Botanical Area is 116 acres instead of the currently reported 94 acres. For the Umatilla National Forest, an addition would be made to the Charley Creek Botanical Area and three new botanical areas would be added (see table 382). Botanical areas within the Umatilla National Forest would increase from 828 to 2,437 acres.

Table 382. Botanical areas (acres) for each alternative for each national forest

Botanical Area	Alt. A	Alts. B, C, D, E, and F	Change
Malheur National Forest			
Fergy Spruce Grove	29	29	NA
Cedar Grove	94	116	Mapping correction
Totals	**123**	**145**	
Umatilla National Forest			
Charley Creek	50	111	Increased acres to protect unique values
Ruckel Junction	5	9	NA
Karl Urban	500	500	Name changed from Sheep Creek Falls Botanical Area
Shimmiehorn Canyon	197	197	NA
Sourdough	0	1,511	Proposed
Farr Meadows	0	12	Proposed
Elk Flats Meadow	0	97	Proposed
Teal Springs	61	0	Removed
Woodward Campground	15	0	Removed
Totals	**828**	**2,437**	
Wallowa-Whitman National Forest			
None	NA	NA	NA

Affected Environment – MA 2D Geological Areas

Geological areas have outstanding formations or unique geological features of the earth's development, such as caves, fossils, dikes, cliffs, or faults. These areas are protected or enhanced, and where appropriate, public use and enjoyment is fostered. The established geological areas within the Blue Mountains national forests are displayed in table 383.

Table 383. Geological areas (acres) for each alternative for each national forest

Geological Area Name	Alt. A	Alts. B, C, D, E, and F	Change
Malheur National Forest			
Magone Lake	40	185	Mapping correction
Tex Bridge	1	1	NA
Totals	**41**	**186**	
Umatilla National Forest			
Big Sink	416	416	NA
Wallowa-Whitman National Forest			
None	NA	NA	NA

Effects from Alternative A (No-action Alternative)

The Malheur National Forest has two geological areas totaling 41 acres. The Umatilla National Forest has one geological area totaling 416 acres. There are no geological areas within the Wallowa-Whitman National Forest.

For this alternative, no new geological areas would be allocated to MA 2D and boundaries would not change. The geological areas proposed under alternatives B, C, D, E, and F would continue to be managed as part of their current management area allocations, which vary by national forest.

Effects from Alternatives B, C, D, E, and F

Geological areas within the Malheur National Forest would increase to 185 acres at Magone Lake, and include Tex Bridge, which is 1 acre. No changes are proposed for Big Sink Geological Area within the Umatilla National Forest.

Affected Environment – MA 2E Historical Areas

Historical areas have historic sites, buildings, or objects of significance. The network of established historical areas within the Blue Mountains national forests is displayed in table SA7. Historical areas are protected or enhanced, and, where appropriate, public use and enjoyment is fostered.

Table 384. Historical areas (acres) for each alternative for each national forest

Historical Area Name	Alt. A	Alts. B, C, D, E, and F	Change
Malheur National Forest			
Sumpter Valley Railroad	13	444	NA
Depression ERA CCC Buildings	0	11	New
Early and Intermediate Period Buildings	0	4	New
Historic Lookouts	0	7	New
Malheur Headwaters National Register District	0	4,950	New
Camas Oven Site	0	10	New
Pre-Mazama Site	0	10	New
Arch Rock Site	0	2	New
Historic Mining Districts	0	598	New
Obsidian Source Archaeological Complex	0	28,000	New
Totals	**13**	**34,036**	
Umatilla National Forest			
Greenhorn	90	90	NA
Olive Lake-Fremont Powerhouse	1,000	1,000	NA
Target Meadows	83	83	NA
Totals	**1,173**	**1,173**	
Wallowa-Whitman National Forest			
None*	NA	NA	NA

* The Sumpter Valley Railroad, the Oregon Trail, portions of the Camp Carson and Granite Mining Districts, and the Starvation Springs archaeological site are being considered for designation.

Effects from Alternative A (No-action Alternative)

The Sumpter Valley Railroad site (13 acres) is the only historical areas within the Malheur National Forest. There are three historical areas totaling 1,173 acres within Umatilla National Forest. There are no designated historical areas within the Wallowa-Whitman National Forest.

Effects from Alternatives B, C, D, E, and F

Nine additional historical areas within the Malheur National Forest with a total of 33,605 acres are proposed for designation. No changes are proposed for the Umatilla National Forest.

While no proposals are being made at this time, the Forest Service is considering the following designations for the Wallowa Whitman National Forest: Sumpter Valley Railroad, the Oregon Trail, portions of the Camp Carson and Granite Mining Districts, and the Starvation Springs archaeological site.

Affected Environment – MA 2F Scenic Byways and All-American Roads

The national scenic byways program is a part of the U.S. Department of Transportation. The program is a grassroots, collaborative effort established to help recognize, preserve, and enhance selected roads throughout the United States. The U.S. Secretary of Transportation recognizes certain roads as all-American roads or national scenic byways based on one or more archeological, cultural, historic, natural, recreational, or scenic quality.

The purpose of the scenic byways program is to create a distinctive collection of American roads, their stories, and treasured places by creating a unique travel experience and enhanced local quality of life through efforts to preserve, protect, interpret, and promote the intrinsic qualities of designated byways. Table 385 displays the miles of designated scenic byways within the Blue Mountains national forests. Each of the scenic byways has additional mileage outside of national forest boundaries.

Table 385. Scenic byways within the Blue Mountains National Forests (miles) for each alternative for each national forest

Scenic Byway Name	Alt. A	Alts. B, C, D, E, and F	Change
Malheur National Forest			
Journey Through Time Scenic Byway	0	13	New
Umatilla National Forest			
Blue Mountain Scenic Byway	0	48	New
Elkhorn Scenic Byway	0	3	New
Totals	**0**	**51**	
Wallowa-Whitman National Forest			
Blue Mountain Scenic Byway	0	2	New
Hells Canyon Scenic Byway*	0	10	New
Journey Through Time Scenic Byway	0	21	New
Elkhorn Scenic Byway	0	52	New
Totals	**0**	**85**	

* A portion of the Hells Canyon Scenic Byway, an All-American Road, is within the HCNRA.

Effects from Alternative A (No-action Alternative)

There are no scenic byways or all-American roads allocations in the 1990 forest plans.

For this alternative, no scenic byways or all-American roads would be allocated to MA 2F. The scenic byways and all-American road allocations proposed for alternatives B, C, D, E, and F would continue to be managed as part of their current management area allocations, which vary by national forest.

Effects from Alternatives B, C, D, E, and F

Thirteen miles of scenic byways within the Malheur National Forest, 51 miles of scenic byways within the Umatilla National Forest, and 85 miles of scenic byways and all-American roads within the Wallowa-Whitman National Forest would be allocated to MA 2F. Through collaboration with multiple partners, a management plan has been developed for each scenic byway.

Additional routes are recognized locally by state or local governments, or by special interest groups for scenic or historic values, but are not recognized by forest plans.

Affected Environment – MA 2G Nationally Designated Trails

The National Trail System Act (1968) authorized the creation of a national trail system comprised of National Recreation Trails, National Scenic Trails, and National Historic Trails. These trails are included in the listing of specially designated areas because of their scenic, recreational, and historic value. Table 386 displays the trails that are designated within the Malheur, Umatilla, and Wallowa-Whitman National Forests.

Table 386. Designated trails (miles) for each alternative for each national forest

Trail Name	Alt. A	Alts. B, C, D, E, and F	Change
Malheur National Forest			
Arch Rock National Recreation Trail	0	0.3	New
Cedar Grove National Recreation Trail	0	1	New
Malheur River National Recreation Trail	0	8	New
Totals	**0**	**9.3**	
Umatilla National Forest			
Jubilee Lake National Recreation Trail	0	3	New
North Fork John Day National Recreation Trail	0	22.9	New
South Winom Creek National Recreation Trail	0	4	New
Totals	**0**	**29.9**	
Wallowa-Whitman National Forest			
Elkhorn Crest National Recreation Trail	0	23	New
High Wallowa National Recreation Trail	0	2	New
Oregon Trail National Historic Trail	0	8.3	New
Totals	**0**	**33.3**	

* The following designated trails are within the HCNRA and are not included in this table: Nez Perce-Nee Me Poo National Historic Trail and the Western Rim/Summit Ridge, Heaven's Gate, and Snake River National Recreation Trails.

Effects from Alternative A (No-action Alternative)

No nationally designated trails are recognized by the 1990 forest plans.

For this alternative, no nationally designated trails would be allocated to MA 2G. The nationally designated trails proposed for allocation to MA 2G in alternatives B, C, D, E, and F would continue to be managed as part of their current management area allocations, which vary by national forest.

Effects from Alternatives B, C, D, E, and F

The 9.3 miles of nationally designated trails within the Malheur National Forest, 29.9 miles of nationally designated trails within the Umatilla National Forest, and 33.3 miles of nationally designated trails within the Wallowa-Whitman National Forest would be allocated to MA 2G.

Affected Environment – MA 2H Scenic Areas

Scenic areas are places of natural variety where unique physical characteristics provide pleasing views and dispersed recreational opportunities. Scenic areas are designated to protect or enhance, and, where appropriate, foster public use and enjoyment of areas with special landscapes noted for their natural beauty. There are three designated scenic areas within the national forests of the Blue Mountains. The network of established scenic areas on the national forests of the Blue Mountains is displayed in table 387.

Table 387. Scenic areas (acres) for each alternative for each national forest

Name	Alt. A	Alts. B, C, D, E, and F	Change	Establishment
Malheur National Forest				
Vinegar Hill-Indian Rock Scenic Area	12,835	12,385	NA	Established in 1966 by regional forester
Silver Creek Scenic Area	1,572	1,572	proposed	Proposed established scenic area addition
Totals	**14,407**	**14,407**		
Umatilla National Forest				
Vinegar Hill-Indian Rock Scenic Area	21,956	21,956	NA	Established in 1966 by regional forester and amended in 1978 by adding the Desolation Unit
Grande Ronde Scenic Area	9,158	9,158	NA	Established in 1979 by regional forester
Totals	**31,114**	**31,114**		
Wallowa-Whitman National Forest				
None	NA	NA	NA	

Effects from Alternative A (No-action Alternative)

The Vinegar Hill-Indian Rock Scenic Area is the only scenic area within the Malheur National Forest (12,800 acres). The scenic area is shared with the Umatilla National Forest (21,900 acres). In addition, Silver Creek Scenic Area, a 1,500 acre area that was treated in the past forest plan as

a scenic area, has not had formal designation. The Umatilla has an additional 9,100 acre scenic area. There are no scenic areas within the Wallowa-Whitman National Forest.

For this alternative, no new scenic areas will be allocated to MA 2H and boundaries would not change. The scenic areas proposed for alternatives B, C, D, E, and F would continue to be managed as part of their current management area allocations, which vary by national forest.

Effects from Alternatives B, C, D, E, and F

The Silver Creek Scenic Area within the Malheur National Forest would be formally designated. No additional scenic areas are proposed for the Umatilla and Wallowa-Whitman National Forests.

Scenery Resources

The Blue Mountains national forests are known for their scenic value. The scenic qualities of the national forests represent the backdrop for the communities of the Blue Mountains and encompass the attractive recreational aspects of living in eastern Oregon and southeastern Washington. The way the Malheur, Umatilla, and Wallowa-Whitman National Forests are managed plays an integral part in the high quality scenery of this region. The high quality scenic environment is vital to the communities that use and support the three national forests.

Scenic attributes, including identifiable patterns, distinct color, texture, form, and elements, such as aspen stands and rock formations, are derived from specific geological features and functioning ecosystems. These features provide a scenic identity and image that is valued as a backdrop for the activities and experiences that create memories and meet expectations of national forest visitors (Bacon et al. 1974, Ryan 2005). People visiting or recreating in the area value the scenery of the Blue Mountains for the natural beauty, undeveloped or undisturbed scenes, and rural western setting. There are many opportunities to view historic structures and traditional uses, such as historic mining operations, ranching facilities, Civilian Conservation Corp structures, pole fences, and historic ditches. Mountains and canyons present dynamic vertical change, plant communities that are present at differing elevations, and geological features, such as rock outcrops and peaks. Water features create strong visual images that are highly valued. All of these attributes and many more create patterns and mosaics that contribute to the scenery of the Blue Mountains.

No significant issues related to scenic resources were identified during scoping or the need for change analysis process. At least one-third of the landscape within the three national forests has been altered by human developments and activities as well as recent disturbance events, such as large-scale fires. Some of these alterations are not obvious to casual viewers because the landscapes present natural-appearing scenery. This is especially true when looking at some of the vegetation conditions that have resulted from fire exclusion and prescribed fire. Another third of the national forest landscape is less altered by human activities, but roads and trails allow visitors access to these areas. The area seems to be predominately natural and is very attractive to visitors given the easy access. The last third is largely natural and is designated wilderness areas or backcountry. Access to these areas is much more difficult, but the visitor is rewarded with scenery that appears natural. However, many backcountry areas have been manipulated by fire suppression and may have looked much different had natural processes prevailed, but it would be hard for the casual observer to detect this. Results from the 2009 National Visitor Use Monitoring (NVUM) report indicates that visitors found scenery and condition of the environment to be highly satisfactory and highly important to their recreation experience across the Blue Mountains.

Affected Environment – Scenery Resources

Scenery is inventoried and placed into one of seven scenic classes with Scenic Class 1 being highly valued and distinctive and Scenic Class 7 being nondistinctive and valued the least. Each classification is determined by the combination of scenic attractiveness, viewpoint, viewing distance, and duration along with the frequency and/or number of viewers (USDA Forest Service 1995). Determining this range of scenic classes allows managers to understand the social acceptability of any change in scenery. Table 388 shows the distribution of scenic classes as inventoried for each national forest.

Table 388. Percent distribution of scenic classes for each national forest

Scenic Class	MAL	UMA	WAW
1	15	37	46
2	45	37	36
3	32	18	14
4	2	1	NA
5	6	7	4
6	NA	NA	NA
7	NA	NA	NA

Scenic integrity and scenic stability are two indicators used to evaluate the condition of scenery resources. Scenic integrity addresses human caused disturbances and development that may detract from the desired scenic character. Scenic stability addresses the relative stability of the valued scenic character and its scenic attributes. Further in depth scenic character descriptions can be found in the project record.

Scenic Integrity

Scenic integrity was developed to measure the amount of visual disturbance that contrasts with and/or detracts from the natural or socially valued appearance in a landscape. It provides a contextual measurement of the presence, intensity and dominance of human-caused visual disturbances in the landscape. Within a natural resources setting, these visual disturbances can include timber harvest, road construction, mining, utilities development, recreation facilities, ski areas, and other special uses.

Scenic integrity also applies to extreme scenic disturbances caused by natural events whenever these events are outside the historic range of variability (HRV) for the landscape. Large scale or high intensity events, such as catastrophic wildfires, insects and disease disturbances, and wind or ice storms that exceed the HRV are considered negative visual disturbances to the valued landscape character, while those within the HRV are considered neutral elements.

Scenic Integrity Levels

Very High Integrity

The valued scenery appears natural or unaltered. Only minute visual disturbances to the valued scenery, if any, are present. When used as a standard or guideline, this level should be achieved immediately upon project completion.

High Integrity

The valued scenery appears natural or unaltered, yet visual disturbances are present; however, they remain unnoticed because they repeat the form, line, color, texture, pattern, and scale of the valued scenery. When used as a standard or guideline, this level should be achieved as soon after project completion as possible but within no more than 3 years.

Moderate Integrity

The valued scenery appears slightly altered. Noticeable disturbances are minor and visually subordinate to the valued scenery because they repeat its form, line, color, texture, pattern, and scale. When used as a standard or guideline, this level should be achieved as soon after project completion as possible but within no more than 3 years.

Low Integrity

The valued scenery appears moderately altered. Visual disturbances are co-dominant with the valued scenery and may create a focal point of moderate contrast. Disturbances may reflect, introduce, or borrow valued scenery attributes from outside the landscape being viewed (such as the size, shape, edge effect, and pattern of natural openings, vegetative type changes, or socially valued architectural styles). Scenery attributes borrowed from outside the viewed landscape appear compatible with or complimentary to those within. When used as a standard or guideline, this level should be achieved as soon after project completion as possible but within no more than 3 years.

Very Low Integrity

The valued scenery appears heavily altered. Disturbances dominate the valued scenery being viewed, and may only slightly borrow from, or reflect valued scenery attributes within or beyond the viewed landscape (due to their size, shape, edge effect, and pattern). However, disturbances must be shaped and blended with the natural terrain (primary landforms) so they do not dominate the overall composition when viewed as background (beyond 3 to 4 miles). Such disturbances might include unnatural appearing openings, roads, landform modifications, or structures. If used as a standard or guideline, this level applies immediately upon project completion. However, its use as a management objective or standard or guideline is strongly discouraged; its primary use should be to inventory existing scenic integrity.

No Integrity

The valued scenery appears extremely altered. Disturbances are excessively dominant regardless of viewing distance and borrow little if any form, line, color, texture, pattern or scale from the valued scenery within or near the vicinity. Scenery at the unsuitable level needs rehabilitation. This level should only be used to inventory existing scenic integrity and never as a management objective or standard or guideline.

The existing impacts to scenic integrity are predominately related to harvest activities dating before 1980. More recent harvest activities were designed to blend with natural appearing settings. Within the Blue Mountains, approximately15 percent of the landscape has a low or very low scenic integrity level, where visual disturbances detract from the valued scenic character. An example is a vegetation harvest unit that appears distinctly geometric and unnatural. Twenty percent of the area has a moderate scenic integrity level, where openings in the vegetation are largely out of scale, but the edges are blended or shaped in a manner that appears somewhat natural. Fifty percent of the area has a high scenic integrity level, and 12 percent very high, where

the valued scenic character appears intact with no detracting visual disturbances. The distribution of existing scenic integrity level for each national forest is summarized in table 389.

Table 389. Distribution of existing scenic integrity levels (percent) for each national forest

National Forest	Existing Integrity Level	Scenic Class 1	Scenic Class 2	Scenic Class 3	Scenic Class 4	Scenic Class 5	Scenic Class 6	Scenic Class 7
MAL	High	41	54	56	75	68	88	75
	Low	15	11	8	4	8	11	19
	Moderate	28	34	35	20	24	1	5
	Very high	16	0	0	0	0	0	0
	Very low	1	2	1	0	1	0	0
UMA	High	31	60	53	55	54	75	69
	Low	15	17	15	9	13	4	3
	Moderate	6	21	30	35	31	20	27
	Very high	47	0	0	0	0	0	0
	Very low	1	2	2	1	2	1	1
WAW	High	44	62	63	73	64	93	86
	Low	11	13	13	8	15	2	2
	Moderate	12	24	23	18	21	5	12
	Very high	33	0	0	0	0	0	0
	Very low	0	0	0	0	0	0	0

Scenic Stability

Scenic stability is an indicator for the Scenery Management System (SMS), introduced to specifically identify the ecological sustainability of the valued landscape character and its scenery attributes. Scenic stability is a consideration of the condition of valued scenery attributes identified in the landscape character description and an evaluation of whether or not the condition is within the historic range of variability (HRV). The condition of forested vegetation-related scenery attributes (pattern, stand structure and density, species composition, etc.) gives an indication of whether or not the ecosystem is functioning properly and if the vegetation components of valued scenery can be sustained. If conditions are outside of HRV or are trending away from that range, then it is likely that scenery attributes are at greater risk of decline or loss. The distribution of existing scenic stability classes are summarized in table 390 for each national forest.

Scenic Stability Levels

Very High Stability

All dominant and minor scenery attributes of the valued landscape character are present and are likely to be sustained.

High Stability

All dominant scenery attributes of the valued landscape character are present and are likely to be sustained. However, there may be scenery attribute conditions and ecosystem stressors that present a low risk to the sustainability of dominant scenery attributes.

Moderate Stability

Most dominant scenery attributes of the valued landscape character are present and are likely to be sustained; a few may have been lost or are in serious decline.

Low Stability

Some dominant scenery attributes of the valued landscape character are present and are likely to be sustained. Known scenery attribute conditions and ecosystem stressors may seriously threaten or have already eliminated the others.

Very Low Stability

Most dominant scenery attributes of the valued landscape character are seriously threatened or absent due to their conditions and ecosystem stressors, and are not likely to be sustained. The few that remain may be moderately threatened but are likely to be sustained.

No Stability

All dominant scenery attributes of the valued landscape character are absent or seriously threatened by their conditions and ecosystem stressors. None are likely to be sustained, except relatively permanent attributes, such as landforms

In many areas, the long-term stability of scenery resources is at risk of large scale impacts due to conditions exacerbated by past wildfire suppression and timber harvest practices. The resultant conditions of homogenous, overly dense forests of non-fire-resistant species heavily laden with fuels put scenery resources at risk from uncharacteristically large, stand-replacing wildfires, and insects and disease disturbances.

Table 390. Existing scenic stability by scenic class for each national forest (percent)

Scenic Class	National Forest	Unstable	Very Low	Low	Moderate	High	Very High
1	MAL	0.54	10.75	39.27	49.17	0.19	0.08
	UMA	0.42	18.98	44.66	35.92	0.03	0.00
	WAW	0.05	3.92	14.10	79.70	2.22	0.00
2	MAL	0.03	9.84	50.66	39.41	0.05	0.00
	UMA	0.30	12.92	47.36	39.39	0.04	0.00
	WAW	0.01	5.03	18.15	75.65	1.16	0.00
3	MAL	0.02	9.79	61.66	28.50	0.03	0.00
	UMA	0.11	21.22	50.05	28.61	0.00	0.00
	WAW	0.02	9.66	17.17	70.65	2.50	0.00
4	MAL	0.05	15.57	54.85	29.43	0.10	0.01
	UMA	0.48	14.26	38.21	46.74	0.26	0.05
	WAW	0.27	0.55	4.23	84.12	9.95	0.89
5	MAL	0.17	19.10	57.81	22.75	0.17	0.00
	UMA	0.03	24.44	44.11	31.27	0.15	0.00
	WAW	0.08	10.43	12.38	77.03	0.07	0.00
6	WAW	0.00	0.00	0.00	82.66	14.59	2.75
7	WAW	0.14	0.00	0.00	73.89	16.48	9.49

Sixty-three percent of scenic class 1 has moderate scenic stability, meaning that most dominant scenery attributes of the valued landscape are present but there are conditions that pose a threat to the stability of the attributes, such as large-scale wildfire or disturbance from insects and disease. Less than 5 percent of scenic class 1 has high scenic stability, meaning that the dominant scenery attributes are present and are likely to be sustained.

Environmental Consequences – Scenery Resources

Effects from Alternative A (no-action alternative)

Alternative A would continue the current visual management system including visual quality objectives (VQO) described in National Forest Landscape Management, Volumes 1 and 2. The 1990 forest plans include requirements (standards and guidelines) for limitations on the types and size of activities in visual foreground retention and partial retention areas. These areas are generally located along well-traveled routes.

No visual resource management areas are designated within the Wallowa-Whitman National Forest. The Umatilla National Forest includes several management areas (A3 and A4) where the visual resource is emphasized. The Malheur National Forest has approximately 190,000 acres allocated to MA 14 Visual Corridors.

No desired conditions would exist for scenic stability which would likely result in larger areas of National Forest System land in lower scenic stability than the action alternatives.

Effects Common to Alternatives B, C, D, E, and F

The desired conditions for scenery are common to all action alternatives. All action alternatives would result in activities on National Forest System land meeting the desired condition for scenic classes and provide the visual landscape character attributes that are valued by local communities and visitors of the national forests. Table 391 summarizes the desired condition for scenic integrity and stability. While all alternatives would meet desired conditions there would be variation in the speed at which scenic stability and integrity desired conditions are met as well as in the long and short term effects. Acres of vegetation management are the primary variable that would result in different effects between the action alternatives.

Specific scenic attributes are preserved across the Blue Mountains national forests. These include:

- Aspen groves
- Open ponderosa pine stands
- Civilian Conservation Corps era structures
- Historic mining structures
- Rock outcrops
- Water features
- Grassy meadows
- Component of western larch in stands
- Riparian hardwoods
- Herbland/timberland mosaic
- Homesteads
- Deciduous shrubs

Table 391. Scenic integrity levels and scenic stability levels (desired condition)

Scenic Class	Scenic Integrity Levels					Scenic Stability				
	Very High	High	Moderate	Low	Very Low	Very High	High	Moderate	Low	Very Low
1	x	x				x	x			
2	x	x	x			x	x	x	x	
3	x	x	x			x	x	x	x	
4		x	x	x		x	x	x	x	
5		x	x	x		x	x	x	x	
6		x	x	x		x	x	x	x	
7		x	x	x		x	x	x	x	

Effects from Vegetation Management on Scenery Resources

All alternatives include vegetation management. Vegetation management activities that result in conditions outside of the historic range of variability can result in adverse effects to scenic integrity and stability and conditions which do not meet scenery objectives. Lack of vegetation management can also result in conditions of further departure from the historic range of variability and as such lower scenic stability in the long term. Effects from vegetation management can result in adverse effects in foreground, middle ground and background viewing distance zones. Short term effects are typically limited to foreground visibility of vegetation management such as cut faces and tree spacing, which can be mitigated through design and project planning. Associated activities such as logging debris skid trails and landings can result in adverse effects to scenic integrity, primarily when viewed from foreground distances. Vegetation treatments that include burning may result in short-term effects that include patches of blackened forest, scorched tree crowns, hazy skies, and smoke concentrated in some areas. Activities associated with vegetation management can be designed to meet scenic integrity standard in most conditions within 2 to 5 years following implementation.

All action alternatives include guideline SCEN-1, which states that short term reductions to existing scenic integrity levels should be authorized only when needed to achieve the long-term restoration or rehabilitation of scenic integrity and/or scenic stability.

The majority of short term impacts to scenic integrity can be mitigated through project design, however this guideline would allow for flexibility to achieve longer term stability in scenic quality. Alternatives with more acres treated to return the forested landscape to historic ranges of variability would result in longer term stability of the valued landscape characteristics but would likely have more areas of short term reduction in scenic integrity as viewed from foreground positions. The effects from the alternatives apply to each national forest.

Effects from Vegetation Management on scenery Resources for Alternatives B, E, and F

The effects of these three alternatives are similar to each other, and the magnitude is in between that of alternatives C and D for acres treated. The level of vegetation treatment anticipated may result in improved scenic stability conditions in the long term due to the emphasis on reducing fuels and treating vegetation to move it toward the historic range of variability, but at a level less than anticipated for alternative D. Vegetation management would emphasize active management in the dry forest type, creating more open stands of trees with a park-like appearance. There would be more evidence of logging, including stumps visible from tree removal, skid trails, and debris piles, but at a level less than anticipated for alternative D.

Effects from Vegetation management on Scenery Resources for Alternative C

Low levels of vegetation management anticipated for this alternative may result in improved scenic integrity conditions in the long term due to the emphasis on nonmotorized use and protection of wilderness characteristics. However, there is indication that this alternative would create a greater fire risk, increasing the likelihood of uncharacteristic wildfire. This alternative would result in larger areas of lower scenic stability than other action alternatives due to larger areas of forest left untreated outside the historic range of variability.

Effects from Vegetation Management on Scenery Resources for Alternative D

The level of vegetation management anticipated for alternative D may result in an improved scenic stability condition in the long term due to the emphasis on reducing fuels and treating vegetation to move it toward the historic range of variability. However, this alternative may create a more managed and less natural appearing landscape. Vegetation management would emphasize active management in the dry forest type, creating more open stands of trees with a park-like appearance. There would be more evidence of logging, including stumps visible from tree removal, skid trails, and debris piles.

Long-term effects may include landscapes that appear more as they might have at the turn of the century, reduced brush density, and vistas available because of reduction of vegetation density.

Effects from Other Management Activities

Visual disturbances can include road construction, mining, utilities development, recreation facilities, ski areas, and other special uses. These types of activities generally would not improve scenic integrity or stability in the long term, unlike vegetation management activities. Scenic integrity and stability desired conditions would be common to all action alternatives. The level of development of these activities is anticipated to only have negligible variations between alternatives and not to an extent that would result in different scenic integrity or stability. While access is a key issue, little to no new road construction is anticipated for any of the alternatives. All new development would be evaluated at project level planning to achieve scenic integrity and stability desired conditions.

Cumulative Effects

The implementation of the forest plans would result in indirect effects to scenery within the greater region of the Blue Mountains including the surrounding communities and public travel routes off National Forest System land. Effects to scenery would last approximately 30 years, considering lasting effects of implementation of vegetation management activities beyond the anticipated life of the plan. Past actions have created the existing scenic integrity and stability conditions. Areas modified by timber harvest in the 1980s and 1990s may in some cases continue to appear highly managed during the next 10 to 15 years and scenic integrity will remain low to very low in those areas. Reasonably foreseeable future actions that would affect scenic quality that overlap within the time and space include timber harvests off National Forest System land, wildfire and other disturbances. Timber harvest that would occur on neighboring private, state, and public lands may influence overall scenic integrity within the greater plan area. Harvest that would occur in the wildland-urban interface as directed by the National Fire Plan may also add to these effects. Wildfire and other disturbance processes, if large enough in scale and intensity, may result in decreased scenic attractiveness for a few years in those areas affected by the disturbance. Driving for pleasure and other scenery dependent activities could be affected slightly by human disturbance to areas outside the national forests. Considering the type of activities and distances from communities, the scenic backdrop above the valleys would remain generally unchanged for

all alternatives. The long-term effects of implementing the forest plan combined with ongoing and reasonably foreseeable future actions would result in conditions that continue to provide the valued and restorative qualities of the landscape to forest visitors and the surrounding communities.

Heritage Program

Introduction

Humans have inhabited the Blue Mountains for more than 12,000 years. As warming climatic conditions caused glacial retreat and population increased, early hunting and gathering societies diversified. American Indian cultures in the Blue Mountains adapted as needed to environmental fluctuations within a yearly rhythm of seasonal rounds. American Indians established villages along the drainages of major rivers and utilized seasonal camps for hunting, fishing, plant gathering, and other activities. Specific places for fishing, hunting, and gathering became important. Favored areas for berry picking, root gathering, hunting, and collection of other necessary materials offered continuity with the land and affirmed spiritual beliefs.

The Blue Mountains were not pristine wildernesses prior to the arrival of non-Indian emigrants, but ecological systems in which humans had been an active component. Harvest of fish, game, and plant resources was timed to ensure future availability. Plant gathering methods increased the productivity of the soil and increased the yield of food crops. The rivers provided salmon, steelhead, sturgeon, lampreys, suckers, and trout. American Indians employed low-intensity fire as a tool to manage vegetation and enrich forage for grazing for livestock and other large mammals, and to promote growth of berries for human and animal consumption. Fire was also used to signal other tribes or send warnings, and was used in ceremonial events.

American Indian cultures in the region remained generally stable until the effects of European colonization of North America reached the area as early as 500 years ago. Long before the arrival of non-Indian emigrants in the region, European diseases swept across the area and caused significant population loss and social disruption. Several tribes adapted the horse into their culture as early as 1700. In the 1850s and 1860s, most tribes entered into treaties with the United States in which they retained their sovereignty and access to critical resources.

The Lewis and Clark Expedition in 1804 is generally considered the beginning of the historic period in the Blue Mountains. American and Canadian fur trappers followed, and Oregon Trail migration began in the early 1840s. Gold was discovered in the Blue Mountains in the 1860s and Euro-American settlement began in earnest. Mines and settlements required timber, and logging became a big industry in the area in the 1880s. Grazing and farming increased as the population grew. Mining and logging required roads and the beginnings of today’s road systems were put in place. Mining and agriculture required water, and ditches were constructed to move it to where it was needed. As the population increased, more people began visiting the national forests for recreation. In the 1930s, the Civilian Conservation Corps constructed or improved many Forest Service recreation sites in the Blue Mountains. The Forest Service also established many fire lookout towers, along with cabins and other administrative sites.

Understanding the role of humans in past and present ecosystems provides a context for understanding contemporary landscapes and natural resource issues. Cultural resources have local, regional, and national scientific interest and significance, and are elements of worldwide patterns and processes. Beyond scientific value, these sites offer a tangible connection to history and culture as well as a sense of place. Cultural resource sites, objects, and areas have an intrinsic

value to people whose ancestors used and occupied the lands. The heritage program ensures that significant archaeological and historical resources are identified, protected, and preserved for the inspiration and benefit of present and future generations.

Affected Environment – Heritage Program

Cultural resources are categorized into three broad types: prehistoric site, historic site, or traditional cultural property. A prehistoric site is one that was established before the advent of a continuous written record, or before approximately 1800 in this area. A historic site postdates this time. A traditional cultural property is associated with cultural practices or beliefs of a living community, is rooted in that community's history, and is important in maintaining the continuing cultural identity of the community.

Prehistoric and historic sites and traditional cultural properties that are eligible for listing on the National Register of Historic Places (NRHP) are considered historic properties under the National Historic Preservation Act (NHPA) and are managed and protected under that law. Cultural resources for which NRHP eligibility has not yet been determined are managed as historic properties until a determination is completed. The most significant and historic properties can be identified as priority heritage assets and would be proactively monitored and managed.

In order for a cultural resource to be eligible for listing on the NRHP, a district, site, building, structure, or object must meet at least one of four criteria. Sites that qualify for listing include sites:

A. That are associated with events that have made a significant contribution to the broad patterns of our history

B. That are associated with the lives of persons significant in our past

C. That embody the distinctive characteristics of a type, period, or method or construction, or that represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction

D. That have yielded, or may be likely to yield, information important in prehistory or history

Sites must also possess integrity of location, design, setting, materials, workmanship, feeling, and/or association.

More than one-third of all cultural resource sites identified on National Forest System lands within Oregon and Washington are located in the Blue Mountains national forests (table 392).

Prehistoric sites common to the Blue Mountains include quarries, tool manufacturing sites, hunting camps, fishing stations, plant gathering and processing sites, rock art sites, villages and sites resulting from other types of activities. Historic sites in the area include, but are not limited to homesteads, mines, railroads, cabins, corrals, lookout towers, and Forest Service administrative sites. Traditional cultural properties include sites, districts, buildings, structures or objects that are valued by human communities for the role they play in sustaining a community's cultural integrity and could include plant gathering sites, fishing stations, a rural community or a rodeo ground. The exact number and kind of cultural resources in the Blue Mountains is not known. Additional cultural resources will continue to be discovered and evaluated as surveys are completed for potential management activities.

Educational and volunteer projects, such as the Forest Service's Passport in Time program, foster public participation in identifying, understanding and protecting cultural resources.

Table 392. Identified cultural resource sites within the Blue Mountains national forests

National Forest	All Sites	NRHP Eligible Sites	NRHP Ineligible Sites	Unevaluated Sites	NRHP Listed Sites	Priority Assets	Interpreted Sites
MAL	5,125	2,274	399	2,433	19	207	8
UMA	1,914	691	122	1,100	1	7	3
WAW*	4,377	701	753	2,921	2	6	10

* Does not include sites in the Hells Canyon National Recreation Area.

Environmental Consequences – Heritage Program

Effects Common to All Alternatives

Potential risks to cultural resources include development, public use, looting and vandalism, management activities, timber harvest, cattle grazing, and mining, along with natural processes such as erosion by wind and water, weathering, and wildfire. Cultural resource surveys during the planning phase for site-specific projects and prior to ground disturbance can identify previously unknown cultural resources and require changes to the operating plan that mitigate potential damage. Potential effects to cultural resources from project activities are addressed through project-specific mitigation measures during the project planning process. Though the potential to effect cultural resources always exists, under all alternatives cultural resources are carefully managed to avoid or mitigate adverse effects whenever possible.

All alternatives would provide management direction for cultural resources in a manner consistent with the laws, executive orders, and regulations listed previously. Cultural resource inventories are part of the analysis process for management activities and known significant sites are protected during implementation of those activities. Though concerted efforts are made to avoid damaging cultural resources during Federal undertakings or authorized actions, in rare instances inadvertent impacts or damage may occur. Unanticipated indirect effects may occur in some instances, such as providing new or improved access to an area, which increases the potential for illegal collection of artifacts or vandalism, and modifying vegetative cover, which may increase the potential for damage due to erosion or decay.

The Heritage Program will be managed to national standard based on a national forest specific mix of the following seven indicators:

1. A Heritage Program plan would be developed and maintained by each national forest (FSM 2362.3).
2. Lands where cultural resources are most likely to occur would be surveyed (FSM 2363.03, 2363.1).
3. Legacy cultural resources would be evaluated for eligibility for listing on the National Register of Historic Places (NRHP) and historic properties would be nominated for NRHP listing (FSM 2363.2, 2364.41).
4. Condition assessments for priority heritage assets, including allocation to the appropriate management category, would be accomplished (FSM 2362.4, 2363.3, 2366).

5. Stewardship activities would preserve, protect, and enhance historic properties (FSM 2364.36, 2364.42).
6. Opportunities for study and appropriate public use of cultural resources including research, traditional use, and interpretation would be provided (FSM 2364.43, 2365.2).
7. Volunteer opportunities would be provided (FSM 2365.2).

By managing the Heritage Program for the Blue Mountains national forests to national standards, the Forest Service will work to ensure that cultural resources are identified and protected for future generations.

Effects Specific to Alternative A (No-action Alternative)

Management Direction

All 1990 forest plans have goals that provide for the identification, protection, interpretation and management of significant cultural resources consistent with the legal framework described previously. There are no management area allocations specific to cultural resources in any of the 1990 forest plans.

The Malheur National Forest 1990 forest plan includes the historic Sumpter Valley Railroad site in special interest areas along with geologic, botanical, and other unique sites.

The Umatilla National Forest 1990 forest plan includes the Greenhorn area, Olive Lake-Freemont Powerhouse area, and Target Meadows in special interest areas along with botanical areas, viewpoints, and other unique areas.

The Wallowa-Whitman National Forest 1990 forest plan does not recognize historic sites specific to any management area allocation.

Effects from Alternative A

Management direction would continue the inventory, documentation, evaluation, and protection of cultural resources at current levels. Additional sites would continue to be found as surveys are done during project analysis. The cultural resources identified as part of special interest areas would continue to be identified with areas that have other resource values.

Effects Specific to Alternatives B, C, D, E, and F

Management Direction

Historical areas have historic sites, buildings, or objects of significance. The specific areas identified for their historic or prehistoric value would be protected and enhanced, and, where appropriate, public use and enjoyment would be fostered. Historical areas would be added as a management area allocation (MA 2E) under these alternatives.

Effects from Alternatives B, C, D, E, and F

Indirect effects to cultural resources from alternatives B and F would be similar to alternative A. Alternatives D and E, due to the proposal of more intensive management, would have a greater likelihood of identifying additional sites, but the likelihood that those management activities would damage sites is greater, as described previously. Alternative C, due to the proposal of fewer management activities and likely lower use levels by the public, would have the lowest potential for damaging cultural resources, but also would have the lowest potential for identifying additional sites.

Effects from Other Resource Management Areas

Potential Effects from Aquatic Resources Management on Cultural Resources

Cultural resources generally benefit from management actions that improve the stability and functionality of watersheds. This reduces erosion and stabilizes stream banks. Cultural resources have a high probability of occurrence along streams. Management actions that require ground disturbance or the use of heavy machinery have the potential to adversely affect cultural resources.

All alternatives would allocate miles of riparian area improvement and vary by alternative. Effects to cultural resources from riparian area improvement would be greatest in alternatives A, B, and D (the least amount of restoration miles), are intermediate for alternatives E and F, and are the least for alternative C (largest amount of restoration). Effects to cultural resources from ground disturbance associated with restoration activities would be reduced, eliminated, or mitigated through project specific protection measures and mitigation.

Potential Effects from Wildfire Management on Cultural Resources

Fire suppression activities have a high potential to adversely affect cultural resources. Fire lines, helicopter landings, camp locations, and other fire suppression actions may adversely affect cultural resources. Wildfires have a high potential to adversely affect historic structures, such as ranches, homesteads, and mining structures. Prehistoric cultural resources, such as rock art, can be damaged by heat and smoke generated by wildfire, as well as by post-fire erosion. Post-fire management activities that promote rapid growth of ground cover can stabilize sites and reduce their visibility, thereby reducing their vulnerability to looting and vandalism.

The location of cultural resources related to vegetation type plays a role in the possible effects to sites. The temperature and duration of fire affects soil temperature, and buried archeological remains may be seriously affected by high temperatures and long fire duration. Fires in grasslands are generally of short duration and cooler temperatures, and have fewer effects. Fires in forested vegetation types are usually more intense and of longer duration than those in grasslands, and have the potential for greater effects.

Wildfire consists of unplanned ignitions. Although the occurrence is unplanned, mitigation measures to reduce the effects to cultural resources include a program of pre-incident survey of potential fuelbreaks and other fire suppression-related activity locations. Where heritage resources are found, programmatic agreement standard protection measures such as project redesign, relocation and monitoring would be used to protect the affected heritage resources. Inventories should also occur on those incident activities not previously inventoried prior to the completion of the incident. Effective treatment measures should be used to rehabilitate fire suppression-related ground disturbance.

Potential Effects from Preliminary Administratively Recommended Wilderness Areas Allocations on Cultural Resources

Wilderness areas are subject to far fewer land management activities than other multiple-use areas. Activities related to recreation use, such as dispersed camping, trail construction and maintenance, and hiking, along with livestock grazing and wildfire, can affect cultural resources in designated wilderness areas, but little other active management takes place in those areas. Few effects to known and unknown cultural resources would take place from these activities.

The majority of new cultural resource sites are identified during archaeological inventories conducted for proposed management activities, the majority of which are conducted in areas located outside of designated wilderness. In wilderness areas new sites are discovered during inventories that are often conducted for the sole purpose of identifying cultural resources. This type of inventory is generally conducted by the heritage program staff, often with the assistance of volunteers, using dedicated heritage program funds. The frequency and extent of surveys within wilderness is dependent on funding which varies annually, but generally is relatively limited compared to the number of surveys conducted for site-specific projects for identification purposes per Section 106 of the National Historic Preservation Act.

Alternative C would allocate the largest amount of area to preliminary administratively recommended wilderness (MA 1B), followed by alternatives E and F (equal amounts), and alternative B with the least amount. Both alternatives A and D do not allocate any acreage to MA 1B. In general, alternatives that allocate larger amounts of acreage to MA 1B would conserve cultural resources, but reduce the opportunity for identification, and may increase the potential for wildland fire to affect cultural resources. Conversely, those alternatives with either an intermediate or lesser amount of acreage allocated to MA 1B would still allow for cultural resource conservation achieved through applying cultural resource protection laws and programmatic agreements. The opportunity for identification through project specific undertakings may increase, and effects from wildland fire would likely remain at the same levels through all alternatives.

Potential Effects from Livestock Grazing on Cultural Resources

Domestic livestock can affect both historic and prehistoric cultural resources. Potential impacts include: removal of surface vegetation, compaction or compression of archeological deposits, alteration of soil chemistry, livestock trailing or cutting through archaeological deposits, destruction of historic structures by rubbing or trampling, and breakage of historic and prehistoric artifacts from trampling.

All alternatives would allocate acres suitable for permitted cattle and sheep grazing and vary by alternative. The number of permitted animal unit months also varies by alternative. Effects to cultural resources from livestock grazing would be greatest in alternative D, are intermediate for alternatives A, B, E, and F, and are the least for alternative C.

Potential Effects from Recreation And Access on Cultural Resources

Cultural resource vandalism and looting are potential impacts resulting from access and visitor use. Construction and maintenance of roads, trails, campgrounds, and other developed facilities may also impact cultural resources. Prehistoric and historic cultural resources are often found in optimum locations for developed recreation sites. Dispersed recreation may also impact cultural resources as modern camps are often located on prehistoric sites. Vandalism in the form of target practice or use for firewood often damages historic structures. Interpretation of these sites can reduce the adverse effects from recreation use.

Alternatives that provide for the greatest amount of road maintenance and the highest levels of access would have a greater effect on cultural resources. Effects to cultural resources from recreation and access would be greatest in alternative D, are intermediate for alternatives E and F, are slightly less than intermediate for alternatives A and B, and are the least for alternative C.

Potential Effects from Vegetation Management on Cultural Resources

Vegetation management involves ground disturbance ranging from minimal disturbance for some activities, such as noncommercial thinning and reforestation activities, to high disturbance for other activities, such as construction of access roads, skid roads, trails, and landings, and the felling of trees and the skidding of logs. Potential impacts to cultural resources include soil compaction, soil erosion, streambank erosion, surface mixing of soils, and damage to above- and below-ground features. These impacts are reduced, eliminated, or mitigated through project specific protection measures and mitigation.

Alternatives that contribute to the greatest amount of vegetation management would have the greatest potential to effect cultural resources. Effects to cultural resources from vegetation management would be greatest in alternative D, followed second by alterative E, and both alternatives F and B are similar and effects would be slightly less than alternative E. Alternative C would have the least effect.

Cumulative Effects

The cumulative effects analysis area includes all of northeastern Oregon, southeastern Washington, and western Idaho, including all of the Malheur, Umatilla, and Wallowa-Whitman National Forests, and the time period considered was the planning period. The Hells Canyon National Recreation Area (HCNRA), under the administration of the Wallowa-Whitman National Forest, contains thousands of prehistoric sites and historic sites. The HCNRA Comprehensive Management Plan (CMP), a part of the Wallowa-Whitman National Forest 1990 forest plan, includes added protections for these sites. All sites on all three national forests would be managed in accordance with laws, regulations, executive orders, and Forest Service policies and management direction.

Development of lands not protected by Federal or state cultural resource statutes and regulatory protection could decrease the regional resource base and lead to loss of resources. Cultural resources within the national forests could increase in value and significance as sites outside the national forests are developed or destroyed. Cultural resources are nonrenewable. Cumulative effects could occur through incremental degradation of the resource base on both public and private lands. Identification of significant cultural resource sites on public lands and the preservation and protection of those sites should reduce the downward trend of the cultural resource base and reduce the cumulative effects from management activities across the landscape.

Geology, Mining, Minerals, and Energy

Geologic resources in the Blue Mountains include leasable energy minerals, such as oil, natural gas, coal, and geothermal; saleable minerals, such as sand, gravel, and other rocks, used in the construction and landscaping industry; and locatable minerals, such as gold, silver, and other precious and base metals.

Oil and gas resources are known or suspected to occur in a deep sedimentary basin that underlies parts of the Malheur and Wallowa-Whitman National Forests, and all of the Umatilla National Forest. The potential extent of these resources has been estimated on a broad regional scale, but little interest or exploration has taken place to date near or within the National Forest System lands.

To date there has been very little coal development on National Forest System lands in the Blue Mountains. Coal deposits are known in the Troy and Flora areas, and west of Ukiah in the Arbuckle coal field. These coal deposits have been explored in the past, with little indication that the deposits on National Forest System lands are of economic value. There are no active, proposed, or anticipated coal mining or coal bed methane operations on National Forest System lands.

Geothermal resources exist throughout the Blue Mountains, revealed in numerous hot springs and warm water wells. This indicates the presence of a widespread shallow geothermal resource. This resource is not limited to surface manifestations, such as hot springs, but rather appears to occur throughout the area even where there are no surface indications. The potential for geothermal energy development in the Blue Mountains national forests area is rated as medium to high (DOE 2003).

Areas with potential for wind energy development have been mapped by the Department of Energy, and the most extensive areas with wind energy development potential occur outside the national forests rather than within them. Many areas outside of the forests have been developed in recent years. The areas with highest potential for development on National Forest System lands are generally found at higher elevation, on ridgelines or other open areas, and many of these areas are likely to be either legally excluded from development or within management areas with limited suitability for placement of wind towers and associated utility lines.

Saleable common variety mineral resources exist throughout the Blue Mountains. The over-abundance of volcanic basalt and andesite formations in many areas make this type of resource readily available, but there are some areas of the national forests where high quality materials for construction or road aggregates are rare and not locally available.

Locatable mineral resources occur on all three national forests, but are primarily concentrated in a broad linear path beginning southwest of John Day, and extending northeast through Sumpter, Granite, Unity, Baker City, across to Durkee, Halfway, through the Eagle Caps, and exposed in the bottom of Hells Canyon. These deposits are closely associated with Jurassic age intrusive rocks. Gold, silver, copper, chrome, zinc, and other metals have been produced from placer and lode mines this area.

Affected Environment

Mineral Resources

Leasable Minerals, Oil and Gas

Oil and natural gas resources are known to occur within Mesozoic-age sedimentary rocks in the Columbia basin of Oregon and Washington in areas overlain by up to three miles of Columbia River basalts. Parts of this resource (with a low to moderate potential for development) underlie the Malheur and Umatilla National Forests and parts of the Wallowa-Whitman National Forest. An assessment of the undiscovered gas resources in this basin was completed and documented in a 2008 report by the U.S. Geological Survey (USGS 2008). Based on that assessment, only about 10 percent of the total potential gas resources are located in a 22.2 million acre region that includes portions of the Blue Mountains National Forest System lands. The other 90 percent of potential gas is located in a much smaller (approximately 4 million acre) region located northwest of the Blue Mountains national forests in the Pasco Basin of eastern Washington. Based on that assessment, the potential for occurrence of gas oil resources on the Blue Mountains national

forests is moderate to low, and the development potential is likely low to very low, although it is possible that this could change in the future.

The Oregon Department of Geology and Mineral Industries (DOGAMI) records indicate a number of exploratory permits have been issued in Grant, Harney, Baker, and Umatilla counties, mostly in the 1950s. For some of these sites the records are incomplete, but none of them are known to have been on National Forest System lands, or successfully developed into production wells. There are no current or pending leases for gas or oil exploration on the Blue Mountains national forests.

The Forest Service has made oil and gas leasing decisions for Umatilla and Malheur National Forests (USDA FS 1995), which categorized all of those lands as either (I) open to development subject to the terms and conditions of the standard oil and gas lease form, (ii) open to development but subject to additional constraints, or (iii) closed to leasing, distinguishing between those areas that are closed through exercise of management direction, and those closed by law, regulation, etc. (36 CFR 288.102 (c)), such as wilderness areas and wild river corridors.

For the Umatilla and Malheur National Forests, all lands classified no lease in the 1995 leasing analysis and record of decision should be classified as unsuitable for oil and gas development. All other lands would be classified as generally suitable, although more recent information suggests that development potential on these lands is likely low to very low. It should be noted that portions of the 1995 leasing decision may need to be revisited prior to leasing under that decision, due to potential significant new information or circumstances as defined in 40 CFR 1502.9 requiring further analysis (36 CFR 228.102(e)).

For the Wallowa¬-Whitman National Forest, all existing wilderness areas and wild river corridors would be classified as unsuitable for oil and gas development. Areas that are outside of these existing wilderness areas and wild river corridors would be classified as general suitability not determined because an oil and gas leasing decision for this forest has not yet been made. Leasing suitability may be determined in the future pending a leasing analysis and decision. New information suggests that development potential of lands within the Wallowa-Whitman National Forest is low.

Geothermal Resources

All areas of the Malheur, Umatilla, and Wallowa-Whitman National Forests have medium to high potential for geothermal resource development (USDOE, 2003). Some of the better known hot springs in the Blue Mountains national forests area include the Blue Mountain Hot Springs near Prairie City, Medical Springs east of North Powder, Hot Lake Springs near La Grande, Radium Hot Springs near Haines, Ritter Hot Springs near Ritter, Suplee Hot Springs near Weberg, and Lehman Hot Springs between Ukiah and La Grande. None of these hot springs are on National Forest System lands, but some are very close to the national forest boundaries, and Lehman Hot Springs is on a private inholding within the Umatilla National Forest. There are other known geothermal springs located on National Forest System lands but most are relatively low temperature sources, or warm springs rather than hot springs. Geothermal areas with known high temperature water (>90 degrees Celsius), either near the land surface or at depth may have higher development potential than other geothermal resources. In the vicinity of the Blue Mountains the areas mapped as having known or potential high temperature geothermal sources are near Vale, Oregon and Hot Springs Lake near La Grande, Oregon (NREL 2009). There are no other known high temperature geothermal areas in northeastern Oregon or southeast Washington.

The Oregon Department of Geology and Mineral Industries (DOGAMI) records indicate that two permits for geothermal exploration were issued in Union County in 1974. One was cancelled and the records for the other are incomplete, but neither of them are known to have been on National Forest System lands, or successfully developed into production wells. There have been many permits issued in eastern Oregon by DOGAMI since the 1990s, but all of those have been issued in Deschutes, Harney, Lake, and Klamath counties. There are no current geothermal leases within the Blue Mountains national forests, and none have completed a geothermal leasing analysis to date.

As with oil and gas, geothermal leasing of National Forest System lands can only occur with the consent of, and subject to conditions prescribed by, the Secretary of Agriculture. All lands administered by the Secretary of Agriculture (including all National Forest System lands) are subject to geothermal leasing (30 U.S.C. § 1002), subject to certain prohibitions which include wilderness areas, certain wilderness study areas, national recreation areas and wild river corridors of designated wild and scenic rivers. All of these lands would be classified as unsuitable. All other lands outside of these areas would be classified as general suitability not determined. Leasing suitability may be determined in the future pending a leasing analysis and decision.

Coal

To date there has been very little coal development on National Forest System lands in the Blue Mountains. Coal deposits are known in the Troy and Flora areas, and west of Ukiah in the Arbuckle coal field. These coal deposits have been explored in the past, with little indication that the deposits on National Forest System lands are of economic value. There are no active, proposed, or anticipated coal mining or coal bed methane operations on National Forest System lands.

Locatable Minerals

Historically, about 75 percent of all of the gold mined in Oregon has come from within broad zone extending from Canyon Creek, near John Day, Oregon, north across the Middle and North Forks of the John Day River to the vicinity of Granite, Oregon and east across the Elkhorn Mountains and the southern Wallowa Mountains to the Snake River. Placer mining has occurred in Canyon Creek, the Upper, Middle and North Forks of the John Day River, North Fork and lower Burnt River, Eagle Creek and Pine Creek, and the upper Grande Ronde River. Each of these areas is associated with, or downstream of major areas of past gold production (Ferns and Huber 1984). Gold mineralization in the Blue Mountains may have resulted from multiple geological sources, but many of the areas of gold mineralization are associated with late Jurassic and older granitic rocks (Ferns and Huber 1984).

Gold has been produced from placer deposits and hard rock or lode deposits within and outside of the National Forest System lands. Many claims were patented, whereby they became privately owned land within the national forest boundaries. Mining activity in this area became relatively large scale in the early 1860s, with the most active period between 1895 and 1908. There were in intervals where activity increased and decreased up until about 1954, after which production dropped of drastically. Exact figures were never recorded for early gold production from the Blue Mountains, as much of the gold was sent to a mint in San Francisco and was credited to California. But it has been estimated that approximately $23 million in placer gold and $5 million in lode gold had been produced from mining operations in Grant and Baker counties by 1900. The estimated dollar value for placer and lode gold produced from the area between 1900 and 1965 is $47 million (Orr and Orr 2000). Ferns and Huber (1984) gold production of 480,000

ounces from placer mining 1913 and 1954 with about 60 percent of that production coming from the upper Powder River.

Gold and silver are often found within the same ore deposits, and there was at least $2 million dollars of silver produced from within the Blue Mountains between 1900 and 1965. There has also been some production of copper, mostly from the Iron Dyke mine near Homestead, as well small amounts of chrome, zinc, and other metals from mines within the Blue Mountains national forests. There are also many isolated gold and other metal deposits, including mercury, which were discovered and mined outside of the main mineralized areas in the Blue Mountains. These isolated deposits include the Idol City Mining District northeast of Burns, the Roba-Westfall, Roba Brothers, and York and Rannels mercury mines southwest of John Day, and others.

Locatable mineral development is authorized under the US Mining laws. Locatable mineral development is precluded from lands withdrawn from mineral entry under the US mining laws, subject to valid existing rights. This means that locatable mineral development can occur in wilderness areas, wild river corridors, areas of unique and special characteristics, and other lands withdrawn from mineral entry, provided valid existing rights have been determined. Lands withdrawn from mineral entry would be classified as generally unsuitable for locatable mineral development, and all other National Forest System lands would be classified as generally suitable for locatable mineral development.

By law, individual lode claims must not exceed 1,500 by 600 feet, and placer claims cannot exceed 20 acres, with the exception that an association placer claim can be up to 20 acres per co-locater up to a maximum claim size of 160 acres.

Locatable mineral development is highly dependent upon global mineral commodity values, which greatly determines the number of claims and approved operations at any given timeframe. According to BLM records as of March of 2011, the Malheur National Forest had 84 locatable mineral claims, the Umatilla National Forest had 34, and Wallowa-Whitman National Forest had 748. Approved plans of operations are required on claims where significant disturbance to surface resources are proposed, and NEPA must be completed before the activities can proceed. As of March of 2011, the Malheur National Forest had 2 claims with plans of operations submitted, the Umatilla National Forest had about 18, and the Wallowa-Whitman National Forest had approximately 170. A large majority of the submitted plans of operations for the Umatilla and Wallowa-Whitman National Forests are pending NEPA decisions, and there are currently three environmental impact statements in progress for about 100 different operating plans on those national forests.

The number of current claims on the national forests is less than it was 10 years ago, at least partly because the BLM has increased the fees required to file a claim and keep it active. While it is not reasonable to try to predict how these numbers might change in the next 10 to 15 years, with the value of gold generally rising (greater than $1,600 per ounce in early 2012), the level of interest and inquiries by the public has increased substantially in recent years.

Saleable Minerals

Saleable or common variety mineral resources exist throughout the Blue Mountains. These are usually low unit value materials and typically need to be located both near existing transportation routes and the point of use to be economically viable. Usually basalt and andesite are the most desirable materials for use as construction materials and road aggregates. These rock types are abundant in many areas of the national forests but scarce to nonexistent in other areas, where

other rock types may be used despite having less desirable qualities. There are also some deposits of sand, gravel, limestone, and rock suitable for landscape or building stone and limestone that occur within the national forests.

The national forests have an extensive network of common variety materials sources that were developed over time in conjunction with development of national forest transportation systems. The total number of these sources on the three Blue Mountains national forests probably exceeds 500, but many are considered inactive or have not been used for many years. Some of the sources are located near state and Federal highways or major county roads and have been used extensively by those agencies as well. Use of these types of sources is down dramatically compared to when the national forest transportation systems were being rapidly expanded. They are still used intermittently by the national forests for in-service uses, and a few sources are still used frequently by other government agencies, usually through issuance of free-use permits.

Common variety minerals are also available through the issuance of small free-use permits to individuals or sales to private parties for personal or commercial uses, but the amount of materials disposed of through these permits is usually relatively minor.

Sales, free use, or in-service use of mineral materials would not meet the management objectives of withdrawn National Forest System lands, RARE II roadless areas, and areas of unique or special characteristics. These lands would be categorized as unsuitable for mineral material development. All other lands would be classified as generally suitable. Some expansion of the boundaries or size of active common variety minerals sources is likely to occur in the next 10 to 15 years, but the development of new sources is expected to be relatively rare unless an unforeseeable demand should occur.

Other Energy

Wind Energy

The Energy Policy Act of 2005 encourages energy development in acceptable areas. Interest in wind energy development in the Pacific Northwest has increased greatly in the last 5 years. During that time, wind tower installation has proceeded rapidly at sites along the Columbia River in Oregon and Washington, in Baker Valley, and several other sites surrounding National Forest System lands in northeast Oregon and southeast Washington. If location and development of wind towers on National Forest System lands occurs in the future, it will be guided by provisions of the Forest Service Special Uses Handbook (FSH 2709.11, chapter 70). Specific provisions in FSH2709.11 for wind energy do not exist at the time of this writing. But some terms and conditions currently in chapter 50 of the Special Uses Handbook are likely to apply to wind energy development as are other agency regulations.

In general, the most extensive areas with potential for wind energy development occur outside of the national forests rather than within them. The areas with highest potential for development on National Forest System lands are generally found at higher elevation, on ridgelines or other open areas. Most sites with high wind potential are also likely to be within management areas with limited suitability for placement of wind towers and associated utility lines. Any development that may occur would require special use authorization and prior approval by the appropriate authority, either district ranger or forest supervisor. Even though specific terms and conditions for wind energy special use authorization have yet to be developed by the Forest Service, the general terms and conditions likely to apply are known and can be used accordingly.

Suitability for Wind Energy Development (All Alternatives)

High resolution wind energy potential maps are available from the Department of Energy, National Renewable Energy Laboratory (NREL). Not taking into account management area designations, areas with potential for development of wind energy total 388,500 acres on National Forest System lands on the three national forests (Malheur National Forest: 39, 114 acres; Umatilla National Forest: 168,500 acres; and Wallowa-Whitman National Forest: 181,000 acres). Wind energy development will be generally unsuitable on sites where development is incompatible with desired conditions, where unacceptable impacts cannot be mitigated, or in areas where development is legally excludes, such as in in Congressionally Designated Wilderness Areas. The following criteria are used to determine general suitability of particular management areas for wind development on National Forest System lands.

- Forested sites, areas with slopes greater than 20 percent, and valley bottoms generally do not have high wind exposure and will likely have low wind power classes. This information was used in the creation of the wind power class maps.
- Designated wilderness areas, proposed or potential wilderness areas, wild and scenic river corridors, and inventoried roadless areas are either legally excluded from wind energy development or are areas where wind energy development would be limited by available road access, and new road construction would be inappropriate.
- Areas with existing high scenic value within Scenic Classes 1, 2, and 3 are unsuitable due to the desire to maintain scenic integrity.
- Key watersheds may or may not be excluded due to a limitation on increasing road density above current levels.
- Municipal watersheds are guided by existing agreements between the agency and individual cities. Energy development would require approval by the cities and development could only occur under the provision that drinking water quality is protected.
- In some areas, for example in elk winter or summer range, motor vehicle access is limited during specific time periods. This limitation may not by itself determine suitability of a site for development, but may influence how sites are developed, and would place seasonal restrictions on motor vehicle access.
- Botanical areas are managed to preserve specific vegetative characteristics. Disturbance that would degrade these characteristics, including but not limited to siting of utility corridors or placement of high-voltage power lines, would not be a compatible use.
- Geological areas are managed to preserve specific geological features and development that could degrade these features would not generally be allowed.
- Motor vehicle use is generally not allowed within research natural areas and motor vehicle access would not be appropriate in the Starkey Experimental Forest and Range.
- Access or proximity to existing utility corridors and, more specifically, high-voltage power lines may be a prerequisite for development.

Wilderness areas (MA 1A), proposed recommended wilderness areas (MA 1B), wilderness study areas (MA 1C), wild and scenic rivers (MA 2A), and backcountry areas (MA 3A and 3B) would be generally unsuitable for wind energy development because such use would either conflict with the purpose for which an area was designated, or would be inconsistent with the intended uses of the area. Wind energy development in special areas (MA 2A through MA 2J) would normally be inappropriate, with few exceptions, as such development would likely be inconsistent with the

intended use, or would be difficult to implement while still protecting the intended use of each area. Administrative sites may or may not be suitable sites for placement of individual wind towers but would likely not be suitable sites for commercial-scale wind farms.

Areas of the national forests that are likely to be suitable for wind development will generally be in MA 4A General Forest. Areas within MA 4A with wind power classes of 3 or higher include nearly 122,000 acres of National Forest System lands on the three national forests (Malheur National Forest: 9,505 acres; Umatilla National Forest: 79,104 acres; Wallowa-Whitman National Forest: 33,184 acres). Other considerations that may restrict the suitable area even further, include, but are not limited to:

- Cultural resource protection
- Protection of treaty and tribal trust resources
- Scenic integrity
- Protection of wildlife habitat
- Elk habitat, including summer and winter range, and elk calving areas
- Lookouts and communications sites
- Protection of threatened, endangered, and sensitive species
- Unstable sites
- Proximity to or ability to construct utility lines
- Road access

Sites with wind power classes of 3 and higher, are generally limited to MA 4A and comprise roughly 55 percent of National Forest System lands on the three national forests. It is possible, due to the scale of mapping that there are localized areas within wind power class 2, which could have potential for wind energy development. Protection measures for individual resources may exclude additional areas from consideration, based on project-level analysis. Oregon, Washington, Idaho, U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, and U.S. Department of Energy all have siting criteria and other information that can be used in the assessment of wind energy projects.

Other Geologic Resources

Fossils

Invertebrate fossils and plants are found in sedimentary rocks and ash deposits within the National Forest System lands in the Blue Mountains national forests. Invertebrate marine fossils are common in some of the Jurassic and Triassic formations in sedimentary and meta-sedimentary rocks, typically ammonites, bivalves, and others. Only rarely have vertebrate fossils have been documented to have been found on National Forest System lands, notably an Ichthyosaur from the Triassic Martin Bridge Limestone near Eagle Creek within the Wallowa-Whitman National Forest, and the upper jaw of a Jurassic reptile, tentatively identified as a small crocodile, discovered in 2010 near Delintment Lake in a marine sandstone deposits within the portion of the Ochoco National Forest administered by the Malheur National Forest. While known discoveries of invertebrate fossils to date are rare within the Blue Mountains national forests, there has been relatively little paleontological research done in many areas which have geologic formations that are favorable for discovering more of these types of fossils.

The John Day Fossil Beds National Monument, which is located west of the Blue Mountains national forests, is famous for its plant and animal fossils from the Clarno and John Day formations, which include vertebrate fossils, such as dogs, cats, camels, rhinoceroses, horses, turtles, and others.

Current guidelines relative to fossils are based largely on the Organic Act of 1897, the Preservation of American Antiquities Act of 1906, NEPA, and the some recently proposed regulations for preservation of paleontological resources. These guidelines allow common invertebrate and plant fossils to be collected in small quantities by the public for noncommercial personal use without a permit, but those collecting activities are restricted to surface collection or use of small, non-powered hand tools that would result in negligible surface disturbance. Vertebrate fossils (bones, bone fragments, teeth, and/or tracks) are not available for collection by the public, and commercial fossil collection is not permitted on any National Forest System lands. Collection of vertebrate, invertebrate, plant, and/or trace fossils as part of scientific studies, mitigation or conservation efforts is allowed only by qualified researchers that have been issued permits for specific projects or research.

Petrified Wood

Petrified wood is known to occur in many localities on the Blue Mountains national forests, including within the Clarno Formation and in some formations with deep volcanic ash deposits. Portions of standing petrified trees have been discovered in a few locations. Petrified wood is defined as a mineral material with 1962 amendment to the Mineral Materials Act of 1947. With current regulations, no permit is required to collect petrified wood specimens for private purposes or use from National Forest System lands, providing that such collection does not result in any disturbance of any archaeological resource. The BLM does have a policy that limits free collection to “up to 25 pounds per day plus one piece, but no more than 250 pounds per year,” but the Forest Service does not have any national policy that regulates petrified wood differently than other common variety minerals.

Groundwater

Groundwater potential is largely unexplored and undeveloped in the National Forest System lands of the Blue Mountains national forests. The groundwater potential can be assumed to be highly dependent on the hydrogeological and geologic properties of local and regional formations. For example, metamorphic and the older volcanic formations would generally have low permeability aquifers with low hydraulic conductivities, and many wells in these materials would usually yield only a few gallons per minute. On the other hand, the younger volcanic rocks, and in particular the Columbia River Basalts, have been heavily developed on private lands around Hermiston, Pendleton, Athena, Milton-Freewater, Walla Walla and in the Grande Ronde Valley in Union County. Irrigation wells completed in each of these areas typically yield between 500 and 2000 gallons per minute. Withdrawal from the basalt aquifers in some areas of this formation have caused local water level declines up to or exceeding 300 feet (Snyder and Haynes 2010).

Groundwater resources have seen only very minor exploration and development on the National Forest System lands of the Blue Mountains national forests to date. Small volume wells for campgrounds and administrative sites are currently the most common uses of groundwater within the national forests. There are also a few wells that were drilled specifically for fire suppression and road construction and maintenance activities within the portion of the Ochoco National Forest administered by the Malheur National Forest. The Malheur National Forest currently has about 20 special use permits issued that allow spring developments on National Forest System

lands for domestic water supplies, and there are numerous spring developments for stock watering as well.

Indirect and Cumulative Effects

Effects Common to all Alternatives

Energy and mineral development can have significant effects to physical and biological resources. Those effects are discussed in other sections of this document. The alternatives vary in their influence on mineral, geological, and energy resources primarily through differences in management area designation, as follows:

Leasable Minerals

Oil and Natural Gas. Approximately 1.2 million acres of the Umatilla National Forest and 1.35 million acres of the Malheur National Forest were identified as available for oil and gas leasing (USDA FS 1995). These lands are subject to one of four lease stipulations imposed to protect surface resources. Under the Federal Onshore Oil and Gas Leasing and Reform Act of 1987 (P.L. 100-203), identification of lands available for leasing is the first of four required stages, each requiring a separate environmental analysis, before energy production can occur on National Forest System lands. However, the lands identified in the 1995 analysis were not formally made available for lease; at least parts of that analysis would likely be redone using the management area designations of the selected alternative. In 1995, it was expected that there may be one application for permit to drill on each forest. This has not occurred and it is unknown if an application for permit to drill would be expected over the next 10 years, given the updated information now available on the potential occurrence of oil or natural gas. The potential for oil and gas resources beneath the Malheur and Umatilla national forests is now lower than it was believed to be in 1995, there is a low to moderate potential for development and it is still likely that no exploration interest in the resource will occur until a discovery is made in the area of the basin with the highest potential for occurrence (the Pasco Basin).

For rivers identified as eligible for inclusion in the national Wild and Scenic River system, any leases, licenses and permits under mineral leasing laws would be subject to the conditions necessary for the protection of the values of each identified river corridor in the event it is subsequently included in the national system. Eligible rivers may not be legally excluded from mineral entry (except for areas within ¼ mile of wild rivers once they are officially designated), but may be classed as areas in which no surface occupancy is allowed for mineral leasing. The rivers to which this would apply are listed in tables A-28 and A-29 in appendix A.

The acres of preliminarily administratively recommended wilderness areas on each forest are identified in tables A-22, A-23, and A-24 in appendix A. Total recommended wilderness acres for each forest are summarized by alternative in table A-25. No change in the status of these lands, or their availability for mineral leasing would occur until they are recommended, and officially designated as wilderness by Congress. At that time they may be legally excluded from leasing. There would be no effect from alternatives A or D, since they do not include any recommended wilderness acres. There would be no effect to the Wallowa-Whitman National Forest, because the resource is not known to exist within the boundaries of the forest. A total of up to 2,600 acres on the Umatilla and Malheur National Forests, would be legally excluded from oil and gas leasing under alternative B, 332,300 acres under alternative C, and 70,500 acres under alternatives E and F.

Geothermal Energy

No areas of high potential for geothermal development are known to occur on National Forest System lands in the Blue Mountains, even though there is some potential of occurrence throughout the analysis area. It is unlikely that there would be any effect to the potential for development of geothermal energy from any of the alternatives.

Locatable Minerals

All National Forest System lands are open to mining except those that are specifically withdrawn from mineral entry. The forests each have responsibility for identifying areas with resources values that could be affected by mining activities. A determination that resource values exceed the known or potential mineral value could result in a recommendation to withdraw an area from mineral entry.

For rivers identified as eligible for inclusion in the national Wild and Scenic River system, mineral entry would be subject to the conditions necessary for the protection of the values of each identified river corridor in the event it is subsequently included in the national system. New mineral entry would be prohibited on eligible wild rivers once those rivers are officially designated. The rivers to which this would apply are listed in tables A-27 and A-28 in appendix A.

No change in the status of lands identified as recommended wilderness, or their availability for mineral entry would occur until they are recommended, and officially designated as wilderness by Congress. At that time, the mineral potential of each designated area would be evaluated and withdrawn from mineral entry as directed by Congress.

Saleable Minerals

The disposal of saleable minerals may be allowed on eligible scenic or recreational rivers to protect the values for which individual rivers were deemed eligible, but would be prohibited within ¼ mile of eligible wild rivers once those rivers are officially designated. No eligible rivers are identified for alternative A. The miles of eligible rivers (3.3) are the same for all alternatives on the Malheur (3.3 - wild) and Umatilla (72 – wild; 42 – scenic or recreational) National Forests. On the Wallowa-Whitman National Forest there would be 140 miles of eligible wild rivers and 138 miles of eligible scenic or recreational rivers in alternatives B and C, and 6 miles of eligible wild rivers and 32 miles of eligible scenic rivers in alternatives D, E, and F.

Wind Energy

The suitability for development of wind energy on National Forest System lands varies primarily by management area designation. Because wind energy development would require a special use permit, the effects of a specific development would be evaluated once an application is made and the direct, indirect and cumulative effects would be evaluated in a project-level analysis before any permit would be issued.

Development potential in this analysis primarily based on wind power class as mapped by NREL. The suitability of management areas for wind energy development is displayed in tables A-44 through A-47 in appendix A. Before accounting for suitability of areas for energy development, an estimated 388,500 acres, of which 39,000 acres are within the Malheur National Forest, 168,500 acres are within the Umatilla National Forest, and 181,000 acres are within the Wallowa-Whitman national forest have potential for development based on wind power class alone. A preliminary analysis (Gecy 2010) suggests that as little as 2 percent of National Forest System

lands, or 122,000 acres may be suitable for development based on the resource protection limitations of different management areas. For the most part, these areas are located in areas of high wind exposure, and are often on ridgelines. Forested areas, valley bottoms, and other areas with low wind exposure, by their nature, have low wind energy potential. Additional limitations could reduce the availability of potentially suitable areas further, but would not be determined until a specific project analysis is completed.

Fossil Collection

Collection of invertebrate and plant fossils for personal use is allowed on National Forest System lands, but the collection of vertebrate fossils is not allowed by Federal law. This will not change regardless of the alternative selected. The ability to access potential collection sites by motor vehicle would be most limited under alternative C because it has the highest number of acres of areas in which motor vehicle use would be restricted, but access to sites would otherwise not be limited under any of the alternatives.

Groundwater

Potential effects of the alternatives on groundwater uses are discussed in the “Watershed Function, Water Quality and Water Uses” section of this document.

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United States Department of Agriculture

Draft Environmental Impact Statement

Proposed Revised Land Management Plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests

Volume 3

Forest Service

Pacific Northwest Region

February 2014

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Chapter 4. Consultation and Coordination

The following describes Federal, State, and local agencies, tribes and individuals who were consulted or were involved in the preparation of the EIS during the development of the draft environmental impact statement (DEIS). Public, governmental, and tribal involvement is mandated by CEQ regulations for implementing NEPA. This mandate is reflected in the Forest Service planning rule and handbook. Tribal involvement is mandated by additional policy and law as described below.

Tribal Consultation

The legal responsibilities of the Federal government to American Indian tribes are documented in statutes, executive orders, and case law enacted and interpreted for the protection and benefit of federally recognized American Indian tribes. The Forest Service honors American Indian reserved rights, including hunting, fishing, gathering, and grazing within present-day national forests, through consultation, coordination, and agreements with the affected American Indian tribes. The agency maintains a government-to-government relationship with federally recognized tribal governments. The Forest Service and the tribes meet to gain an understanding of each other's rights, responsibilities, and interests. Through these relationships, the Forest Service and the tribes build and enhance a mutual partnership, as well as pursue cooperative and partnership initiatives and efforts.

Numerous laws, executive orders, and regulations govern the relationship between American Indian tribes and the Federal government, which is represented here by Forest Service staff for the three national forests. In project planning and implementation, the Forest Service complies with these laws and regulations, and, in doing so, meaningfully consults with tribal governments.

In addition, numerous laws, regulations, and policies govern the use and protection of national forest resources that may be of tribal interest or subject to tribal reserved rights. Activities authorized or implemented by the Forest Service must comply with these laws, regulations, and policies, as they are intended to provide general guidance for the implementation of management practices and for the protection of resources, including those of interest to the tribes.

In the Blue Mountains forest plan area, a significant portion of lands ceded by the tribes in the various treaties were designated as part of the National Forest System by the Organic Administration Act of June 4, 1897. Lands were ceded through the Treaties of 1855 by the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation, the Nez Perce Tribe of Idaho, and the Confederated Tribes and Bands of the Yakama Indian Nation of the Yakama Reservation. The Klamath Tribes via the Treaty with the Klamath Nation of 1870 ceded lands extending into the Malheur National Forest. These treaties are known for their specific language recognizing certain reserved rights of the tribes in aboriginal use areas. The Burns Paiute Tribe, the Shoshone-Paiute Tribes of the Duck Valley Reservation, the Fort McDermitt Paiute and Shoshone Tribes, the Fort Bidwell Indian Community of Paiute Indians, and the Chief Joseph Band of the of the Nez Perce (now part of the Confederated Tribes of the Colville Reservation) are federally recognized American Indian tribes that also have interests in the management direction and project planning of the Blue Mountains national forests.

The Forest Service has the requirement to manage lands with full consideration of the Federal trust responsibilities to tribal rights and to the interests and treaty reserved rights and resources of federally recognized American Indian tribes.

The Blue Mountains forest plan revision team has met this responsibility by communicating and collaborating with interested American Indian tribes at the government-to-government and staff-to-staff levels. Details of tribal contacts, including information about letters and staff-to-staff and government-to-government meetings, are available in the project record.

Cooperating Agencies

The three Blue Mountain National Forests have convened a group (referred to as the "co-conveners") of local, state, federal agencies and tribal governments to collaborate with the Forest Service during the development of the revised forest plans. Representatives from these agencies and tribes bring vast knowledge and a broad range of interests to the table and will enhance the ability of the Forest Service to identify important issues and to address them with an appropriate range of alternatives.

This group meets to review and develop content initiated by the Forest Service staff. The Cooperator group plays a key role in refining issue development, formulating alternatives, identifying key publics and implementing a public involvement strategy. Cooperators keep the Forest Service informed of new concerns for their organizations or communities of interest that maybe relevant to the forest plan revision process. In addition to the tribes, with whom the forests have government to government relationships with the following cooperative agencies have signed memorandums of understandings with the forests.

Cooperating agencies (documented with MOUs) include:

- State of Oregon
- Baker County, Oregon
- Grant County, Oregon
- Harney County, Oregon
- Morrow County, Oregon
- Umatilla County, Oregon
- Union County, Oregon
- Wallowa County, Oregon
- Wheeler County, Oregon
- Asotin County, Washington
- Columbia County, Washington
- Garfield County, Washington
- Walla Walla County, Washington

Cooperating agency representatives participated in meetings and briefings; reviewed public comments, helped to identify issues and develop alternatives; and provided analysis and document reviews to the Blue Mountains forest plan revision team.

The Forest Service has coordinated with state and county governments, as well in the development of the alternatives described in this DEIS.

State Government

Several State agencies have jurisdiction over certain activities and resources within the Blue Mountains forest plan revision area. As a result it is important that these agencies be represented in the planning process. The State has engaged in the planning process through the following agencies: Oregon Department of Fish and Wildlife, Oregon Department of Transportation, Oregon Department of Environmental Quality.

Federal Government

Several Federal agencies have resource management responsibilities within the three Blue Mountains national forest plan revision planning area. The US Fish and Wildlife Service and NOAA Fisheries have oversight responsibilities for compliance with the Endangered Species Act. The Forest Service has entered into consultation with the Service under the federal Streamlining Consultation Agreement for compliance with the Endangered Species Act. The Environmental Protection Agency is required to review and evaluate all Environmental Impact Statements for compliance with the Clean Water Act, Clean Air Act. Natural Resource Conservation Service and the Bureau of Land Management are being consulted with relative to adjacent public and private lands in the forest plan revision area.

Public Involvement

A critical element of the forest plan revision process is public involvement. The Forest Service has accomplished this through the following manner:

1. Public scoping and publication of the notice of intent in the federal register
2. Publication of the DEIS and subsequent public meetings

The notice of intent to prepare this DEIS was published in the Federal Register on March 29, 2010 (FR, Vol. 75, No. 59). The NOI asked for public comment (written) on the proposal by May 25, 2010. In addition, the Forest Service held one round of public meetings during the scoping period in several towns in Oregon and Washington (table 393). Numerous collaborative meetings were held throughout the forest plan revision process (prior to the scoping period), which included several field trips. During the scoping period, the Blue Mountains forest plan revision team received 4,174 total responses to the request for comment and included in this total are 110 unique and substantially different comment letters and 4,025 organized form letters. The content analysis report analyzing all the comments received is located in the project record.

Additionally, alternative development meetings were held with representatives of industry and special interests groups, including wilderness advocates, conservation groups, and snowmobile enthusiasts, such as John Day-Snake River Resource Advisory Committee, Wallowa County Natural Resource Advisory Committee, Blue Mountains Forest Partners, Hells Canyon Preservation Council, etc. the details are available in the project record. Chapter 4 provides more information regarding consultation and coordination with the public, federal, state and tribal government entities.

Information Sharing

The Forest Service will continue to use a number of information sharing techniques and tools to give people an opportunity to share new information and to be kept up to date on the planning process. This will include the Blue Mountain forest plan revision Website, Plan updates posted to the website, open houses at selected sites after publication of the DEIS and occasional newsletters and news releases. Lists of all persons, groups, officials and others who were contacted during the forest plan revision and NEPA review process are filed in the project record.

Table 393. Forest Service public meetings held prior to and during scoping period

Year	Type of Meeting	No. of Meetings	Locations
2004	Community Workshops (vision and desired conditions discussions)	20	La Grande, Enterprise, Baker City, Pendleton, Heppner, John Day, Burns, Portland, Oregon; Dayton and Pasco, Washington
	Co-convener Meetings*	5	La Grande and Baker City, Oregon
2005	Community Workshops (special designations, wild and scenic rivers, wilderness areas, and management areas discussion)	11	La Grande, Enterprise, Baker City, Pendleton, Heppner, John Day, Burns, Portland, and Milton-Freewater, Oregon; Dayton, and Pasco, Washington
	Field Trips	3	Malheur, Wallowa-Whitman, Umatilla National Forests
	Co-convener Meetings	6	La Grande and Baker City, Oregon
2006	Economic Workshops	2	La Grande and Baker City, Oregon
	Open Houses (to discuss strategies to achieve desired conditions)	7	La Grande, Enterprise, Pendleton, John Day, Burns, Sandy, Oregon and Dayton, Washington
	Co-convener Meetings	1	La Grande, Oregon
2008	Co-convener Meetings	2	La Grande, Oregon
2009	Co-convener Meetings	1	La Grande, Oregon
2010	Co-convener Meetings	2	La Grande, Oregon
4/6/2010	Public Meeting	1	John Day, OR - Federal Building, Juniper Hall, 431 Patterson
4/7/2010	Public Meeting	1	Burns, OR - Harney County Senior and Community Services Center, 17 S. Alder St.
4/13/2010	Public Meeting	1	Pendleton, OR - Pendleton Convention Center, Rooms 3 and 4, 1601 Westgate
4/14/2010	Public Meeting	1	Heppner, OR - Saint Patrick Senior Center, 182 N. Main St.
4/15/2010	Public Meeting	1	Dayton, WA - Columbia County Fairgrounds
4/20/2010	Public Meeting	1	Baker City, OR - Sunridge Inn, One Sunridge Lane
4/21/2010	Public Meeting	1	La Grande, OR - Eastern Oregon University, One University Blvd, Hoke Hall, Room 309
4/22/2010	Public Meeting	1	Joseph, OR - Civic Center, 102 E 1st St.
4/28/2010	Public Meeting	1	Portland, OR - Red Lion Convention Center, 1021 NE Grande Ave.
4/29/2010	Public Meeting	1	Pasco, WA - Franklin County PUD, 1411 West Clark
2011	Co-convener Meetings	3	La Grande, Oregon
2012	Co-convener Meetings	1	Baker City, Oregon
05/05/2013	Co-convener Meetings	1	Baker City, Oregon

* Co-convener meetings refers to meetings between the Blue Mountains forest plan revision team and representatives of the area counties, resource advisory committee members, tribal representatives, and the State of Oregon.

Preparers and Contributors

List of Preparers

This list of preparers is limited to those people who were members of the interdisciplinary team working on these documents. Their preparation could not have been completed without the support and assistance of employees of the Malheur, Umatilla, Wallowa-Whitman National Forests and our colleagues in the regional office. We also recognize the forest leadership teams as providing guidance during this process.

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Distribution of the Draft Environmental Impact Statement

This environmental impact statement has been distributed to, or made electronically available to, over 2,000 individuals and groups who specifically requested a copy of the document or commented during public involvement opportunities. In addition, copies have been sent (or in some cases made electronically available) to Federal agencies, federally recognized tribes, State and local governments, and organizations that have requested to be involved in the development of this analysis. These entities include the U.S. Environmental Protection Agency; U.S. Army Corps of Engineers; U.S. Department of the Interior; Federal Highway Administration; Advisory Council on Historic Preservation; USDA National Agricultural Library; State wildlife and fisheries management agencies; tribes; county commissions; and local community governments. Due to the number of people, agencies, and organizations, a complete listing has been omitted from this EIS, but is available upon request or on the Blue Mountains plan revision Web site.

Glossary and Acronyms

Many definitions in this glossary are from the following sources. Some definitions are in general use within the Forest Service. Terms adequately defined in general dictionaries are not necessarily included, though some of those that are less well known are included for the convenience of the reader.

Partial Source List

- National Forest Management Act Regulations (36 CFR 219)
- Silviculture Terminology (Powell 2005)
- Dictionary of Forestry Terms (Society of American Forests 1971)
- Wildland Planning Glossary (USDA Forest Service 1976)
- Wildlife Habitats in Managed Forests, the Blue Mountains of Oregon and Washington (Thomas et al. 1979)
- Forest Service Manual or Forest Service Handbook
- A Glossary of Terms Used in Range Management, Second Edition (Society for Range Management 1974)
- Interior Columbia Basin Ecosystem Management Project DEIS (USDA Forest Service 1997)
- Wallowa-Whitman National Forest Land and Resource Management Plan (USDA Forest Service 1990)
- Interior Columbia Basin Ecosystem Management Project SDEIS (USDA Forest Service 2000)
- Interior Columbia Basin Ecosystem Management Project FEIS (USDA Forest Service 2000)
- A Dictionary of Ecology, Evolution, and Systematics (Cambridge University Press 1982)
- Webster's Dictionary
- HCNRA Public Land Use Regulations (36 CFR 292.41)
- HCNRA Private Land Use Regulations (36 CFR 292.21)

A

active management: Planned, intentional actions in an area that are specifically designed to obtain a desired objective or result.

active restoration: Refer to restoration.

administrative site: Areas such as work centers, fire lookouts, permitted ranch headquarters, seed orchards, communication sites, utility corridors, developed campgrounds, and other areas that are occupied or used by the Forest Service during the administration of work associated with national forest lands.

adaptive management: An approach to natural resource management in which decisions are made as part of an ongoing process. Adaptive management involves planning, implementing, monitoring, evaluating, and incorporating new knowledge into management approaches based on scientific findings and the needs of society.

Effects are monitored for the purpose of learning and adjusting future management actions, which improves the efficiency and responsiveness of management.

administrative unit: A management area such as the Wallowa-Whitman National Forest, under the administration of one line officer. Forest Service line officers include district rangers and forest supervisors.

air pollutant: Any substance in air that could, if in high enough concentration, harm humans, animals, vegetation, or material. Air pollutants may include almost any natural or artificial matter capable of being airborne, in the form of solid particles, liquid droplets, gases, or a combination of these.

air quality: The composition of air with respect to quantities of pollution therein, used most frequently in connection with standards of maximum acceptable pollutant concentrations.

allotment (grazing): Area designated for the use of a certain number and kind of livestock grazing for a prescribed period.

allotment management plan (AMP): A document that specifies the actions to be taken to manage and protect the rangeland resources and reach a given set of objectives.

allowable sale quantity (ASQ): The quantity of timber that may be sold from the area of suitable land covered by the forest plan for a time period specified by the plan. This quantity is usually expressed on an annual basis as the average "annual allowable sale quantity."

all-terrain vehicle (ATV): Off-highway-vehicles with less than or equal to a 50 inch wheel base, three or more low-pressured tires, handle bar steering and a seat designed to be straddled.

amenity: Resource use, object, feature, quality, or experience that is pleasing to the mind or senses; typically refers to values for which monetary values are not or cannot be established, such as scenic or wilderness values.

anadromous fish: Fish that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce; for example, salmon and steelhead.

analysis file: A file containing records of the scoping and analysis processes conducted during the preparation of a NEPA document. The file is typically stored at the Forest Service office from which a final decision is issued.

animal unit: One mature cow of approximately 1,000 pounds, either dry or with calf up to 6 months of age, or the equivalent (one horse, five domestic sheep). This concept is based on a standardized amount of forage consumed.

animal unit month (AUM): The amount of forage required by one mature (1,000 lb.) cow or its equivalent for one month (based upon average forage consumption of 26 lb. of dry matter per day). Refer to head month.

annual assessment: Yearly assessment of the degree to which on-the-ground management is maintaining or making progress toward the desired conditions and objectives.

anthropogenic: Caused or produced through the agency of man; the scientific study of the origin of man.

aquatic: Pertaining to water.

Aquatic and Riparian Conservation Strategy (ARCS): A regional strategy designed to restore and maintain the processes that create and maintain conditions in aquatic ecosystems on national forest lands in Oregon and Washington.

aquatic ecosystem: Waters that serve as habitat for interrelated and interacting communities and populations of plants and animals. The stream channel, lake or estuary bed, water, biotic communities and the habitat features that occur therein.

assessment: The collection, integration, examination, and evaluation of information and values.

authorized grazing: Refer to grazing permit.

B

basal area: The cross-sectional area of the trunk of a tree or stand of trees at breast height (4.5 feet).

basalt: A finely or fine grained, dark, dense volcanic rock.

basin (river): (1) In general, the area of land that drains water, sediment, and dissolved materials to a common point along a stream channel. River basins are composed of large river systems; (2) the term refers to the equivalent of a 3rd-field hydrologic unit code, an area of about nine million acres, such as the Snake River Basin.

benches: Mid-elevation flat or gently sloping sites. Grazing and homesteading/ranching activities were concentrated in these areas, which were also used by American Indians for pasturing livestock. Benches from 2,000 to 4,500 feet generally have potential to support the bunchgrass associations described for the lower and mid-position slopes. Cheatgrass brome, Kentucky bluegrass, and an assortment of annual and perennial forbs (including some noxious weeds) dominate much of the benchland, some of which was severely disturbed by early farming and ranching activities.

beneficial uses: Any of the various uses which may be made of the water, including, but not limited to, domestic water supplies, fisheries and other aquatic life, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics.

best management practices (BMPs): Practice or set of practices that enable a planned activity to occur while still protecting the resource managed, normally implemented and applied during the activity rather than after the activity.

best management practices (BMPs) (Watershed): A practice or a combination of practices, that is determined by the state (or designated area-wide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practicable (including technological, economic, and institutional considerations) means of preventing, or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

big game: Those species of large mammals normally managed as a sport hunting resource. Generally includes; elk, moose, white-tailed deer, mule deer, mountain goat, bighorn sheep, black bear and mountain lion.

biological diversity (biodiversity): The variety and variability among living organisms and the ecological complexes in which they occur.

biological soil crust: Thin crust of living organisms on or just below the soil surface composed of dense, low-growing community of various combinations of algae, mosses, liverworts, cyanobacteria (blue-green algae), micro fungi, bacteria, and lichens; and provide important

components of grassland, shrub-steppe, and subalpine habitats. Also referred to as cryptogrammatic or microbiotic crust.

biophysical: The combination or grouping of biological and physical components in an ecosystem.

biotic: Living.

biomass: Dry weight of organic matter in plants and animals in an ecosystem, both above and below ground.

boreal: Pertaining to cool or cold temperature regions of the northern hemisphere; the northern coniferous zone.

broad scale: A large, regional area, such as an entire river basin and typically a multi-state area.

browse: That part of leaf and twig growth of shrubs, woody vines, and trees available for animal consumption.

Bureau of Land Management (BLM): An agency within the U.S. Department of the Interior with land management responsibility for the public domain lands.

C

candidate species: Plant and animal species that may be proposed for listing as endangered or threatened in the future by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NFMS); these species have no legal protection under the Endangered Species Act (ESA).

canopy: In a forest, the branches from the uppermost layer of trees; on rangeland, the vertical projection downward of the aerial portion of vegetation.

canopy cover: The proportion of the forest floor covered by the vertical projection of the tree crowns (Jennings et al. 1999).

capability: The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease.

capital investment: An input that increases the stock of natural or man–made resources (assets) needed to maintain or increase the flow of outputs in the future. Benefits resulting from capital investments are normally recouped in excess of one year; activities that create or improve capital assets to obtain benefits occurring during several planning periods.

carrying capacity: The number of animals or plants that can be maintained over a specific period of time on a specified amount of land without damage to either the organisms or the habitat.

cavity: The hollow excavated in a tree that is used by birds or mammals for roosting and/or reproduction.

ceded lands: Lands that American Indian tribes ceded to the United States by treaty in exchange for reservation of specific land and resource rights, annuities, and other promises in the treaties.

channel (stream): The deepest part of a stream or riverbed through which the main current of water flows.

channel morphology: The dimension (width, depth), shape and pattern (sinuous, meandering, straight) of a stream channel.

class I airshed: Under the Clean Air Act amendments, all international parks, national parks larger than 6,000 acres, and national wilderness areas larger than 5,000 acres which existed on August 7, 1977. This class provides the most protection to pristine lands by severely limiting the amount of additional air pollution that can be added to these areas.

climax: The final or mature seral stage in secondary plant succession that persists for an indefinite period of time if no major disturbances occur.

closed canopy: Greater than or equal to 60 percent canopy cover within the moist and cold upland forest potential vegetation groups; greater than or equal to 40 percent canopy cover within the dry upland forest potential vegetation group.

coarse woody material: Pieces of woody material derived from tree limbs, boles, and roots in various stages of decay, having a diameter of at least three inches.

co-conveners: A group of participating county commissioners from within the planning area that have served as co-meeting managers for the land management plan revision process and assisted in coordinating the public involvement processes and community collaborative workshops.

Code of Federal Regulations (CFR): A codification of the general and permanent rules published in the Federal Register (FR) by the executive departments and agencies of the federal government.

cold forest: High elevation forests dominated by subalpine fir, whitebark pine, spruce, and sometimes lodgepole pine.

collaboration: Working together; to cooperate willingly with an agency or instrumentality with which one is not immediately connected.

community resiliency: The ability of communities to adapt to changing ecological, social, and economic conditions.

compaction: Making soil hard and dense and decreasing its ability to support vegetation because the soil can hold less water and air and because roots have trouble penetrating the soil.

compatible: Capable of existing together in harmony.

comprehensive evaluation: Evaluation of current social, economic, and ecological conditions and trends relative to the desired conditions and objectives, undertaken prior to plan revision and every five years thereafter.

comprehensive management plan (CMP): The document that establishes the array, levels, and manner of resource uses within the Hells Canyon National Recreation Area on the Wallowa-Whitman National Forest. It is incorporated as a part of the 1990 Land and Resource Management Plan.

connectivity: The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. Connectivity is the opposite of fragmentation.

conservation strategy or agreement: Plans to remove or reduce threats to candidate and sensitive species of plants and animals so that a listing as threatened or endangered is unnecessary.

consultation: (1) An active, affirmative process that (a) identifies issues and seeks input from appropriate American Indian governments, community groups, and individuals; and (b) considers their interests as a necessary and integral part of the Forest Service's decision-making process; (2) the federal government has a legal obligation to consult with American Indian tribes. This legal obligation is based in such laws as the Native American Graves Protection and Repatriation Act, the American Indian Religious Freedom Act, and numerous other executive orders and statutes. This legal responsibility is, through consultation, to consider Indian interests and account for those interests in the decision; (3) the term also refers to a requirement under Section 7 of the Endangered Species Act (ESA) for federal agencies to consult with the USFWS and/or NOAA-Fisheries with regard to federal actions that may affect listed threatened and endangered species or critical habitat.

core area: The combination of core habitat (i.e., habitat that could supply all elements for the long-term security of species of conservation concern) and a core population (a group of one or more local populations that exist within core habitat) constitutes the basic unit on which to gauge recovery within a recovery unit. Core areas require both habitat and the species of conservation concern, and the number (replication) and characteristics of local populations inhabiting a core area provide a relative indication of the core area's likelihood to persist. A core area represents the closest approximation of a biologically functioning unit.

corridor: A tract of land forming a passageway. Can refer to areas of wildlife movement, boundaries along rivers, or the present or future location of transportation or utility rights-of-way within its boundaries.

cost efficiency: The usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values but are achieved at specified levels in the least cost manner. Cost efficiency is usually measured using present net value, although use of benefit-cost ratios and rates-of-return may be appropriate.

Council on Environmental Quality (CEQ): An advisory council to the President established by the National Environmental Policy Act (NEPA) of 1969. The council reviews federal programs for their effects on the environment, conducts environmental studies, and advises the President on environmental matters.

cover: (1) Trees, shrubs, rocks, or other landscape features that allow an animal to conceal itself partly or fully for protection from predators, or to ameliorate conditions of weather, or in which to reproduce; (2) the area of ground covered by plants of one or more species.

cover type: A vegetation classification depicting a genus, species, group of species, or life form of tree, shrub, grass, or sedge of an area.

criteria pollutants: Air pollutants designated by the Environmental Protection Agency (EPA) as potentially harmful and for which ambient air standards have been set to protect the public health and welfare. The criteria pollutants are carbon monoxide, sulfur dioxide, particulate matter, nitrogen dioxide, ozone, hydrocarbons, and lead.

crown: The part of a tree containing live foliage; treetops.

cubic feet per second (cfs): A rate of the flow, in streams and rivers, for example. It is equal to a volume of water one foot deep and one foot wide flowing a distance of one foot in one second. One cfs is equal to 7.48 gallons of water flowing each second.

cubic feet per second per square mile (CSM): The rate of streamflow per unit land area.

culture: The ideals, values, and beliefs that members of a society share to interpret experience and generate behavior that is reflected by their work and thought (Haviland 1999).

cultural resources: An object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties. Cultural resources include the entire spectrum of resources for which the Heritage Program is responsible, from artifacts to cultural landscapes, without regard to eligibility for listing on the National Register of Historic Places

cumulative effects or impacts: Cumulative effects or impacts are the impacts on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Effects and impact are synonymous (40 CFR 1508.7).

current direction: The existing direction in approved management plans; continuation of existing policies, standards and guidelines; current budget updated for changing costs over time; and, to the extent possible, production of current levels and mixes of resource outputs.

D

decommission (building): Demolition, dismantling, removal, obliteration and/or disposal of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work. This action eliminates the deferred maintenance needs for the fixed asset. Portions of an asset or component may remain if they do not cause problems nor require maintenance.

decommission (road): Permanently closing a road to vehicular use and left in a hydrological maintenance free condition. Decommissioning will include activities such as water barring, out sloping, recontouring, decompaction of road surface, removal of drainage structures, and road barricades as needed.

defensible space: An area surrounding a home or structure that has vegetation characteristics that minimize the spread of wildland fire and allows for safely defending the home against fire.

deferred maintenance: Maintenance that was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period. When allowed to accumulate without limits or consideration of useful life, deferred maintenance leads to deterioration of performance, increased costs to repair, and decrease in asset value. Deferred maintenance needs may be categorized as critical or noncritical at any point in time. Continued deferral of noncritical maintenance will normally result in an increase in critical deferred maintenance. Code compliance (such as safety, ADA, OSHA, or environmental), plan direction, best management practices, biological evaluations other regulatory or executive order compliance requirements, or applicable standards not met on schedule are considered deferred maintenance.

demography: The statistical study of populations, especially with reference to size and density, distributions, and vital statistics such as births, and deaths.

departure: The difference between an existing condition and the desired condition.

density (stand): The number of trees growing in a given area, usually expressed in terms of trees per acre.

design criteria: Part Three of the land management plan that provides the parameters, including guidelines, for how future site-specific activities can occur within the context of the plan.

designated critical habitat: Specific areas within the geographical area occupied by a species at the time of listing under Endangered Species Act that contain physical or biological features essential to the conservation of the species.

desired condition: A portrayal of the land or resource condition that is expected to result if goals and objectives are fully achieved.

developed recreation: Recreation that requires facilities that in turn result in concentrated use of an area; for example, a campground. Examples of developed recreation areas are campgrounds and ski areas; facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings.

developed site: Facility provided for developed recreation use. Refer to facilities.

diameter at breast height (d.b.h.): Tree diameter measured at 4.5 feet from the ground.

direct effects: Impacts on the environment caused by the action and occur at the same time and place.

disease: A harmful deviation from normal functioning of physiological processes, usually pathogenic or abiotic in origin.

disjunct: Populations that are separated geographically from the main distribution of a species. Many plants with disjunct populations are biologically unique because they are not found again for dozens to over one hundred miles. Disjunct populations are thus rare in this portion of their distribution.

dispersed (recreation): Recreation that does not occur in a developed recreation site; for example, hunting or backpacking.

dispersed campsites: Primitive sites typically used for overnight, dispersed recreation. Usually includes a hardened area around a fire pit, a barren area, and/or user-constructed facility.

displacement: Recreation visits are considered “displaced” or no longer consumed at a site or area when practical maximum capacity thresholds of the site or area are exceeded. Visitors are assumed to completely leave the national forest rather than seek an alternative location for their activity.

disturbance: Events that alter the structure, composition, or function of terrestrial or aquatic habitats. Natural disturbances include, among others, drought, floods, wind, fires, wildlife grazing, and insects and diseases. Human–caused disturbances include, among others, actions such as timber harvest, livestock grazing, roads, and the introduction of exotic species.

disturbance process: Events that alter the structure, function, or composition of aquatic or terrestrial habitats.

disturbance regime: Natural pattern of periodic disturbances, such as fire or flood, followed by a period of recovery from the disturbance such as growth of a forest after fire.

diversity: The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

down woody material: A tree or part of a tree that is dead and laying on the ground.

draft environmental impact statement (DEIS): The draft statement of predicted environmental effects that is required for major federal actions and released to the public and other agencies for comment and review.

dry forest: Low elevation forest dominated by ponderosa pine and sometimes Douglas-fir or grand fir.

E

early seral: Refer to seral stages.

early spring: Early spring is defined as that period when the perennial cool–season forage plants initiate growth and begin shoot elongation. It extends through the period of maximum carbohydrate use and the beginning of carbohydrate storage. The end of this period is determined by soil moisture. It ends prior to the time that soil moisture is expected to become limiting to the extent that essentially full regrowth cannot be ensured.

Eastside Screens: Regional Forester's Amendment 1, Interim management direction establishing riparian, ecosystem, and wildlife standards for timber sales on National Forest System lands in eastern Oregon and Washington (USDA Forest Service 1994).

ecological function: Refer to ecological processes.

ecological integrity: In general, ecological integrity refers to the degree to which all ecological components and their interactions are represented and functioning; the quality of being complete; a sense of wholeness. Absolute measures of integrity do not exist. Proxies provide useful measures to estimate the integrity of major ecosystem components (forestland, rangeland, aquatic, and hydrologic). Estimating these integrity components in a relative sense for an area helps to explain current conditions and to prioritize future management. Thus, areas of high integrity would represent areas where ecological functions and processes are better represented and functioning than areas rated as low integrity.

ecological processes: The flow and cycling of energy, materials, and organisms in an ecosystem. Examples of ecosystem processes include the carbon and hydrologic cycles, terrestrial and aquatic food webs, and plant succession, among others.

ecological status: The degree of departure of current vegetation from the potential natural vegetation, or potential natural community often synonymous with seral stage.

economics: A social science concerned primarily with description, distribution, and consumption of goods and services.

economic well-being: A condition that enables people to work, provide income for their families, and generate economic wealth to local communities, the region, and the nation.

economic efficiency: Producing goods and services in areas best suited for that production based on natural biophysical advantage or an area's ability to best serve regional demands of people.

economic impacts:

direct economic impact: Effects caused directly by forest product harvest or processing or by forest uses.

indirect economic impact: Effects that occur when supporting industries sell goods or services to directly affected industries.

induced economic impact: Effects that occur when employees or owners of directly or indirectly affected industries spend their income within the economy.

economy: System of production, distribution, and consumption of economic goods.

ecosystem: A complete, interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

ecosystem diversity: The variety and relative extent of ecosystem types, including their composition, structure, and processes within all or a part of an area of analysis.

ecosystem management: The use of an ecological approach to achieve multiple-use management of public lands by blending the needs of people and environmental values in such a way that lands represent diverse, healthy, productive, and sustainable ecosystems.

ecosystem function (processes): The major process of ecosystems that regulate or influence the structure, composition, and pattern. These include nutrient cycles, energy flows, trophic levels (food chains), diversity patterns in time/space development and evolution, cybernetics (control), hydrologic cycles and weathering processes.

ecosystem health: A condition where the parts and functions of an ecosystem are sustained over time and where the system's capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met.

ecosystem services: The combined resources and processes of natural ecosystems that provide benefit to humans, including, but not limited to, the production of food and water, the control of climate and disease, cycling of nutrients and crop pollination, spiritual and recreational benefits, and the preservation or maintenance of biodiversity.

ecosystem sustainability: The ability to sustain diversity, productivity, resilience to stress, health, renewability and/or yield of desired values, resource uses, products, or services from an ecosystem, while maintaining the integrity of the ecosystem over time.

edge: An area where plant communities meet or where successional stages or vegetation conditions within the plant communities come together.

effects: Environmental changes resulting from an action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth–inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or healthy effects, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects even if on balance the agency believes that the effects will be beneficial (40 CFR 1508.8, 2).

eligible wild and scenic rivers: River segments that have been identified as eligible for inclusion in the national Wild and Scenic Rivers System under the authority of the Wild and Scenic Rivers Act. The river segment must be free-flowing and it must possess one or more outstandingly remarkable scenic, recreational, geological, fish and wildlife, historical, cultural, ecological or other value.

embeddedness: The degree that larger streambed particles (boulders, rubble, or gravel) are surrounded or covered by finer particle sizes such as fine sediment (Rhodes et al. 1994).

emission: A release of air contaminants into the outdoor atmosphere.

endangered species: Species listed under the Endangered Species Act by either the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range.

endemic: Occurring naturally in a certain region and distribution is relatively limited to a particular locality. Endemism is the occurrence of endemic species in an area.

environmental assessment (EA): A comprehensive evaluation of actions and their predictable short– and long–term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. It is a formal document that must follow the requirements of NEPA, the CEQ, and guidelines and directives of the agency responsible for the project proposal.

environmental impact statement (EIS): A statement of the environmental effects of a proposed action and alternatives to it. It is required for major federal actions under Section 102 of the National Environmental Policy Act (NEPA), and released to the public and other agencies for comment and review. A draft EIS is released to the public and other agencies for review and comment. A final EIS is issued after consideration of public comments. A record of decision is based on the information and analysis in the final EIS.

ephemeral: A channel in which streamflow occurs inconsistently, infrequently, or seasonally and, except during periods of streamflow, does not intersect the local groundwater table.

erosion: The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities; can be accelerated or intensified by human activities that reduce the stability of slopes or soils.

essential fish habitat: Identification by the National Marine Fisheries Service (NMFS) of habitat essential to conserve and enhance federal fishery resources that are fished commercially under the Magnuson-Stevens Fishery Conservation and Management Act.

evaluation: An essential companion activity to monitoring; the tool for translating data gathered by monitoring into useful information that could result in change or adaptive management.

even-aged management: The application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes) throughout the forest area. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

evolutionarily significant units (ESU): The minimal unit of conservation management, the smallest population unit that can receive federal protection under the Endangered Species Act. An ESU is a set of populations that is morphologically and genetically distinct from other similar populations or a set of populations with a distinct evolutionary history.[1]

exotic species: A plant or animal species introduced from a distant place; not native to the area.

[1] http://darwin.eeb.uconn.edu/eeb310/lecture-notes/systematics/systematicsli3.html

extinction: Complete disappearance of a species from the earth.

extirpation: Loss of populations from all or part of a species' range within a specified area.

F

facility: A single or contiguous group of improvements that exists to shelter or to support Forest Service programs. The term may be used in either a broad or narrow context; for example, a facility may be a ranger station compound, lookout tower, leased office, work center, separate housing area, visitor center, research laboratory, recreation complex, utility system, or telecommunications site.

> **upgrade:** Total redesign and construction of a camping facility. Location may change considerably depending on ecological, environmental, or social concerns. The overall goal would be to maintain a rustic appearance but promote designs and materials that would result in lower operation and maintenance costs. Some campground classifications may change to the next higher level but none would exceed a Level 4 site development for this planning period. Accessibility standards would be appropriate to the designated Recreation Opportunity Spectrum (ROS). A change in design standards has the potential to move the ROS to a higher development setting although that is not the intent of upgrading a facility.

facilities maintenance (annual): Work performed to maintain serviceability, or repair failures during the year in which they occur. Includes preventive and/or cyclic maintenance performed in the year in which it is scheduled to occur. Unscheduled or catastrophic failures of components or assets may need repaired as a part of annual maintenance.

> **preventive maintenance:** Scheduled servicing, repairs, inspections, adjustments, and replacement of parts that result in fewer breakdowns and fewer premature replacements, and help achieve the expected life of the fixed asset. Inspections are a critical part of preventive maintenance as they provide the information for scheduling maintenance and evaluating its effectiveness.

facilities maintenance (deferred): Work that was not performed when it should have been or when it was scheduled and has been delayed to a future period. Deferred maintenance includes actions not taken to comply with codes for health and safety, accessibility, environmental factors and other compliance requirements or applicable standards. To reduce or eliminate deferred maintenance, rehabilitation or replacement may be necessary.

> **rehabilitation:** Renovation or restoration of an existing fixed asset or any of its components in order to restore the functionality or life of the asset. Because there is no significant expansion or change of purpose for the fixed asset, the work primarily addresses deferred maintenance.
>
> **replacement:** Substitution or exchange of an existing fixed asset or component with one having essentially the same capacity and purpose.
>
> **custodial:** Replacement of nonfunctional site elements or facilities with in–kind materials or structures. Location, design, and configuration remain constant. Accessibility standards, where possible, are compatible with designated ROS settings.
>
> **decommission:** Demolition, dismantling, removal, obliteration, and/or disposal of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work. This action eliminates the deferred maintenance needs for the fixed asset. Portions of an asset or component may remain if they do not cause problems nor require maintenance.

fauna: The vertebrate and invertebrate animals of an area or region.

fall/winter season: This period basically begins when all key perennial forage plants have achieved dormancy. It runs through the dormant period and ends just before the initiation of new growth on the key cool season perennial forage species in the spring. In very general terms, this often begins in mid to late October and runs through February, March, or April depending on the elevation, aspect and the weather patterns for a given year.

farm/forest/grazing use: Any traditional agricultural, silvicultural, or livestock management use or combination thereof on farm/forest/grazing lands. This includes, but is not limited to, true farming, growing and harvesting timber, grazing of livestock, horticultural use, animal husbandry use, horse, cattle, and sheep ranching, and preparation and storage of the products raised on farm/forest/grazing land for on-site use of for disposal by marketing or otherwise. Farm/forest/grazing uses may also consist of uses related, to, and in furtherance of, the protection of fish and wildlife habitat, and the pursuit of recreational activities.

Federal trust responsibility: The Forest Service shares in the federal government's overall trust responsibility to American Indian tribes where treaty or other legally defined rights apply to national forest lands. In redeeming this shared responsibility, the agency assists in carrying out the intent of the treaty and any subsequent case law or amendments, by operating in a just and responsive way; making efforts to adjust the management of national forest lands in favor of the concerns of the respective American Indian tribe(s), as far as practicable, while still maintaining a responsibility to all the people – the general public. These actions and adjustments need to be carried out through consultations with other tribal officials or their designees, on a government–to–government basis.

federally listed species: Species that are listed under the Endangered Species Act.

fine organic matter: Plant litter, duff, and woody material less than 3 inches in diameter.

fine-scale: A single landscape, such as a watershed or subwatershed.

fire-dependent systems: Forests, grasslands, and other ecosystems historically composed of species of plants that evolved with and are maintained by fire regimes.

fire cycle, fire frequency: Refer to fire return interval.

fire intensity: Areas of relatively homogenous burn effects related as low, moderate, or high as defined in Burned Area Emergency Rehabilitation Handbook, FSM 2509.13 Section 23.31.

low fire intensity: Soil surface litter and humus have not been destroyed by fire. Root crowns and surface roots will resprout. Potential surface erosion has not changed because of fire.

moderate fire intensity: On up to 40 percent of the area, the soil surface litter and humus have been destroyed by fire and the A horizon has had intense heating. Crusting of the soil surface produces accelerated erosion. Intensively burned areas may be water repellent. Root crowns and surface roots of grasses in the intensively burned area are dead and will not resprout.

high fire intensity: On 40 percent or more of the area, the soil surface litter and humus have been destroyed by fire and the A horizon has had intense heating. Crusting of the soil surface produces accelerated erosion. Intensively burned areas may be water repellent. Root crowns and surface roots of grasses in the intensively burned area are dead and will not resprout.

fire intolerant: Species of plants that do not grow well with, or die from, the effects of too much fire. Generally, these are shade-tolerant species.

fire management plan: A plan that identifies and integrates all wildland fire management and related activities within the context of approved land/resource management plans. It defines a program to manage wildland fires (wildfire, prescribed fire, and wildland fire use). The plan is supplemented by operational plans, including but limited to preparedness plans, preplanned dispatch plans, and prevention plans. Fire management plans assure that wildland fire management goals and components are coordinated.

fire regime: The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire. A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention but including the influence of aboriginal burning (Agee 1993; Brown 1995). Coarse-scale definitions for natural fire regimes were developed by Hardy and others (2001) and Schmidt and others (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five natural fire regimes are classified based on the average number of years between fires (fire frequency or Mean Fire Interval [MFI]) combined with the severity of the fire (the amount of vegetation replacement) and its effect on the dominant overstory vegetation. These five natural fire regimes are as follows:

fire regime 1: 0- to 35-year frequency and of low severity (most commonly associated with surface fires) to mixed severity (in which less than 75 percent of the dominant overstory vegetation is replaced).

fire regime 2: 0- to 35-year frequency and of high severity (stand replacement: greater than 75 percent of the dominant overstory vegetation is replaced).

fire regime 3: 35- to 200-year frequency and of mixed severity.

fire regime 4: 35- to 200-year frequency and of high severity.

fire regime 5: 200-year-plus frequency and of high severity.

fire regime condition class (FRCC): A classification of the degree of departure from the natural fire regime. The fire regime condition class classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure can result in changes (or risks) to one, or more, of the following ecological components: vegetation (species composition, structural stages, stand age, canopy cover, and mosaic pattern across the landscape); fuel composition; fire frequency, severity, and pattern; and other associated disturbances.

condition class 1: Fire regimes are within the natural (historical) range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition, structure, and pattern) are intact and functioning within the natural (historical) range.

condition class 2: Fire regimes have been moderately altered from their natural (historical) range. Risk of losing key ecosystem components is moderate. Fire frequencies have departed from natural frequencies by one or more return intervals (either increased or decreased). This result in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation and fuel attributes have been moderately altered from their natural (historical) range.

condition class 3: Fire regimes have been substantially altered from their natural (historical) range. The risk of losing key ecosystem components is high. Fire frequencies have departed from natural frequencies by multiple return intervals. Dramatic changes occur to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been substantially altered from their natural (historical) range.

fire return interval: The average time between fires in a given area.

fire suppression: All work and activities connected with fire-extinguishing operation, beginning with discovery and continuing until the fire is completely extinguished.

fire-tolerant: Species of plants that can withstand a certain frequency and intensity of fire. Generally, these are shade-intolerant species.

fish-producing: Streams, rivers, wetlands, ponds, lakes, and reservoirs that serve as spawning or rearing habitat for fish.

fledgling: A young bird that has acquired the feathers necessary for flight.

floodplain: The lowland and relatively flat areas joining inland and coastal waters including debris cones and flood-prone areas of off-shore islands, including at a minimum, that area subject to a one percent (100-year recurrence) or greater chance of flooding in any given year (Executive Order 11988, Section 6c); or the area of relatively flat land adjacent to streams that is inundated during times of high flow; or an area formed by the deposition of stream-transported sediment.

floodplain function: Collectively, the normal physical and biological processes that are responsible for the formation and maintenance of river floodplains and the biotic communities that inhabit them.

flow regime: The range of magnitude, duration, timing and frequency of streamflows characteristic of a given stream.

focal species: A group of species that serve as an umbrella function in terms of encompassing habitats needed for other species, are sensitive to the changes likely to occur in the area, or otherwise serve as an indicator of ecological sustainability (Lambeck et al. 1997, Noss et al. 2997 and Andelman et al. 2001).

food web: Networks of food chains or feeding relationships by which energy and nutrients are passed from one group of living organisms to another.

forb: Broad-leafed, herbaceous, nongrass-like plant species other than true grasses, sedges, and non–woody plants; fleshy leafed plants; having little or no woody material.

forage: All browse and herbaceous foods that are available to grazing animals. It may be grazed or harvested for feeding. Refer to rangeland vegetation.

forested vegetation treatment: Combination of uneven-aged management methods that may be used to achieve a desired forested structure including single-tree selection, group selection, precommercial thinning, commercial thinning, salvage, and sanitation cutting.

forest fragmentation: Refer to fragmentation.

forest health: The perceived condition of a forest derived from concerns about such factors as its age, structure, composition, function, vigor, presence of unusual levels of insects and disease and resilience to disturbance. Perception and interpretation of forest health are influenced by individual and cultural viewpoints, land management objectives, spatial and temporal scales, the relative health in stands that comprise the forest, and the appearance of the forest at a point in time.

forest land: Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearing and powerline clearing of any width.

forest roads: Any road wholly or partly within, or adjacent to, and serving the national forest and which is necessary for the protection, administration, and utilization of the national forests and the use and development of its resources (23 USC 101).

Forest Service Handbook (FSH): Directives that provide detailed instructions on how to proceed with a specialized phase of a program or activity.

Forest Service Manual (FSM): A system of manuals that provides direction for Forest Service activities.

forest transportation facility: A classified road, designated trail, or designated airfield, including bridges, culverts, parking lots, log transfer facilities, safety devices and other transportation network appurtenances under Forest Service jurisdiction that is wholly or partially within or adjacent to National Forest System lands (36 CFR 212.1).

forest transportation system management: The planning, inventory, analysis, classification, record keeping, scheduling, construction, reconstruction, maintenance, decommissioning, and other operations undertaken to achieve environmentally sound, safe, cost-effective access for use, protection, administration, and management of national forest lands.

fragmentation (habitat): The break-up of a large continuous land area by reducing and dividing into smaller patches isolated by areas converted to a different land type. Habitat can be fragmented by natural events or development activities.

fragmentation (forest): The breakup of a large land forest area into smaller patches isolated by areas converted to a different land type. Opposite of connectivity.

free-flowing: A river or stream that exists or flows in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway (16 U.S.C. §1286).

fuel: Plants, both living and dead, and woody vegetative materials capable of burning.

fuel load: The dry weight of combustible materials per unit area; usually expressed as tons per acre.

fuel treatment: Any manipulation or removal of fuels to reduce the likelihood of ignition or to lessen potential damage and resistance to control.

functioning-at-risk: Riparian-wetland areas that are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation (USDA Forest Service1993).

G

geographic information system (GIS): An information processing technology to input, store, manipulate, analyze, and display data; a system of computer maps with corresponding site-specific information that can be combined electronically to provide reports and maps.

geologic: Based on geology which is the study of the structure, processes, and chronology of the earth.

geological/geomorphic process: The actions or events that shape and control the distribution of materials, their states, and their morphology, within the interior and on the surface of the earth. Examples of geologic processes include: volcanism, glaciation, streamflow, metamorphism (partial melting of rocks), and landsliding.

goal: A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific

date by which it is to be completed. Goal statements form the principal basis from which objectives are developed.

goods and services: The various outputs, including on-site uses, produced from forest and rangeland resources.

government-to-government consultation: The active and continuous process of contacting tribal leadership, soliciting their participation, involvement, comments, concerns, contributions, and traditional knowledge that will assist the agency in making informed decisions in planning, managing and decision-making actions.

graminoid: Grasses and grass-like plants such as sedges and rushes.

grassland: Land on which the vegetation is dominated by grasses, grass-like plants, or forbs.

grazable forestland: Forestland that produces, at least periodically, understory vegetation that can be grazed. In this document, that condition is defined as any forested site with an existing overstory canopy cover less than 60 percent with greater than about 200 pounds of forage production per year per acre.

grazing: The consumption of standing forage by livestock or wildlife.

grazing allotment: Area designated for the use of a certain number and kind of livestock for a prescribed period.

grazing lands: Any vegetated land that is grazed or has the potential to be grazed by animals (domestic or wild). This includes rangeland and grazable forestland.

grazing permit: Document authorizing livestock to use national forest lands or other lands under Forest Service control for livestock production.

ground fire: A fire that burns the organic material in the soil layer and the decayed material or peat below the ground surface.

groundwater: All of the water that has percolated through the surface soil into the bedrock.

Groundwater-dependent ecosystems: Communities of plants, animals, and other organisms whose extent and life processes are dependent on access to or discharge of groundwater. (USDA Forest Service 2011)

guideline: A guideline is a constraint on project and activity decision making that allows for departure from its terms, so long as the intent of the guideline is met. (§ 219.15(d)(3)). Guidelines are established to help achieve a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

H

habitat: A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

harvest: (1) Felling and removal of trees from the forest; and (2) removal of game animals or fish from a population, typically by hunting or fishing.

harvestable/harvestability: With regard to American Indian tribes, refers to a population of plants or animals that is self-sustaining and capable of producing a dependable harvest annually to meet spiritual, cultural, subsistence, and commercial needs.

head month: One month's use and occupancy of the range by one animal. For grazing fee purpose, it is a month's use and occupancy of range by one weaned or adult cow with or without calf, bull, steer, heifer, horse, burro, or mule, or five sheep or goats. Refer to animal unit month.

headwaters: Beginning of a watershed; the uppermost, unbranched tributaries of a stream.

healthy ecosystem: An ecosystem in which structure and functions allow the maintenance of the desired conditions of biological diversity, biotic integrity and ecological processes over time.

Hells Canyon National Recreation Area (HCNRA) Act: The Act of December 31, 1975, as amended (PL 94-199, 89 Statute 117), which established the Hells Canyon National Recreation Area.

herbaceous: Green and leaf-like in appearance or texture; includes grasses, grass-like plants, and forbs, with little, or no woody component.

herbicide: A pesticide used for killing or controlling the growth of plants.

herbivore: An animal that subsists on plants or plant materials, either primarily or entirely.

hibernacula: Habitat niches where certain animals (such as bats) overwinter, such as caves, mines, tree hollows, or loose bark.

hiding cover: Vegetation, primarily trees, capable of hiding 90 percent of a standing adult game animal from the view of a human at a distance equal to or less than 200 feet during all seasons of the year that elk or deer use the area. Generally, any vegetation used for security or to escape from danger.

high-severity fire: Refer to fire intensity.

historical conditions: Range of historical variation; range of the spatial, structural, compositional and temporal characteristics of ecosystem elements during a period specified to represent natural conditions.

historic property: Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register of Historic Places criteria.

Historic Range of Variability (HRV): A means to define the boundaries of ecosystem behavior and patterns that have remained relatively consistent over long periods. HRV is usually defined for centuries to millennia before the period of widespread human population increases and associated ecosystem changes that began in roughly the early to middle 1800s for many regions of western North America.

human capital: An individual's education, skills, culture, and knowledge that enhance their contributions to society (Castle 1998).

human-caused disturbance: Refer to disturbance.

hydroelectric: Of or relating to the production of electricity by waterpower.

hydrologic: Refers to the properties, distribution, and effects of water. Hydrology refers to the broad science of the waters of the earth, their occurrence, circulation, distribution, chemical and physical properties, and their reaction with the environment.

hydrologic function: The behavioral characteristics of a watershed described in terms of ability to sustain favorable conditions of water flow. Favorable conditions of water flow are defined in terms of water quality, quantity, and timing.

hydrological regimes: The spatiotemporal dynamics of water flow and associated fluvial process in an ecosystem. Refer to flow regime.

hydrologic unit: A hydrologic unit is a drainage area delineated to nest in a multi-level, hierarchical drainage system. Its boundaries are defined by hydrographic and topographic criteria that delineate an area of land upstream from a specific point on a river, stream or similar surface waters. A hydrologic unit can accept surface water directly from upstream drainage areas, and indirectly from associated surface areas such as remnant, noncontributing, and diversions to form a drainage area with single or multiple outlet points.

hydrologic unit code (HUC): A hierarchical coding system developed by the U.S. Geological Survey to identify geographic boundaries of watersheds of various sizes (12).

> **4th-code HUC** refers a subbasin generally about 450,000 acres in size.
>
> **5th-code HUC** refers to a watershed. These areas generally range from 40,000 to 250,000 acres in size.
>
> **6th-code HUC** refers to a subwatershed HU that generally ranges from 10,000 to 40,000 acres in size.

I

impacts: Refer to effects.

Impact Analysis for Planning (IMPLAN) Model: A computer–based system used by the Forest Service for constructing input-output models to measure economic input. The system includes a database for all counties in the United States and a set of computer programs to retrieve data and perform the computational tasks for input-output analysis.

implement: To carry out.

indicator species: Refer to management indicator species.

indirect effects: Impacts on the environments that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable.

inert ingredient: An ingredient deficient in active properties, lacking the usual or anticipated chemical or biological action.

infestation: The attack or invasion by parasites or pests.

infiltration: The process by which water seeps into the soil, influenced by soil texture, aspect, and vegetation cover.

infrastructure: The basic facilities, equipment, and installation needed for the functioning of a system; commonly refers to items such as roads, bridges, power facilities, and the like.

INFISH: Regional Forester's Amendment 4, Inland Native Fish Strategy (USDA Forest Service 1995). Interim strategies for managing fish–producing watersheds in Eastern Oregon and Washington, Idaho, Western Montana and portions of Nevada.

insecticide: A pesticide employed against insects.

instream flow: Flow of water in its natural setting (as opposed to waters diverted for off-stream uses such as industry or agriculture). Instream flow levels provided for environmental reasons enhance or maintain the habitat for riparian and aquatic life, with timing and quantities of flow characteristic of the natural setting.

integration: Bringing the values and systems of different disciplines together to address questions with a common framework using consistent techniques and measurement units.

interagency: Involving the Forest Service, Bureau of Land Management, Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, and/or other Federal agencies.

interdisciplinary team: A group of specialists assembled as a cohesive team with frequent interactions to solve a problem or perform a task.

intermittent stream: A stream in which the flow of water on the surface is discontinuous, or that alternates between zones of surface and sub-surface flow.

invasion (plant): The movement of a plant species into a new area outside its former range.

invasive nonnative species: Are those animal and plant species with an extraordinary capacity for multiplication and spread at the expense of other native species. Plants in this category may or may not be designated as noxious weeds.

invasive plant species: Nonnative plant species that invade or are introduced into an environment or ecosystem in which they did not evolve where they have the ability to compete with, and at times overshadow, the existing native plant species. Invasive species are also likely to cause economic or environmental harm or harm to human health. Invasive species include seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem (with respect to a particular ecosystem). Noxious weeds are a specific type of invasive plants that carry a legal designation due to their potential for detrimental impacts to the environment.

Inventoried roadless areas (IRAs): Those areas identified in the Land Management Plan and listed on a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, (USDA Forest Service 2000), which are held at the Washington Office of the Forest Service, or any update, correction, or revision of those maps through the land management planning process.

invertebrate: Small animals that lack a backbone or spinal column. Spiders, insects, and worms are examples of invertebrates.

irretrievable commitment: Applies to losses of production or commitment of renewable natural resources. For example, while an area is used as a ski area, some or all of the timber production there is “irretrievably” lost. If the ski area closes, timber production could resume; therefore, the loss of timber production during the time the area is devoted to skiing is irretrievable but not irreversible, because it is possible for timber production to resume if the area is no longer used as a ski area.

irreversible commitment: Applies to nonrenewable resources, such as minerals and archaeological sites. Losses of these resources cannot be reversed. Irreversible effects can also refer to effects of actions on resources that can be renewed only after a very long period, such as the loss of soil productivity.

issue: A point, matter of controversy, dispute, question of public discussion, or general concern over resource management activities or land uses to be addressed or decided through the planning

process. To be considered a significant environmental impact statement issue, it must be well defined, relevant to the proposed action, and within the ability of the agency to address through alternative management strategies.

K

key habitat: Specific areas within the geographic area occupied by the species on which are found those physical and biological features 1) essential to the conservation of the species, and 2) which may require special management considerations or protection.

keystone species: A species whose presence and role within an ecosystem has a disproportionate on other organisms within the system.

L

ladder fuels: Vegetation located below the crown level of forest trees, which can carry fire from the forest floor to tree crowns. Ladder fuels may be low growing tree branches, shrubs, or smaller trees. Fire can move from surface fuels by convection into the crowns with relative ease.

landform: One of the attributes or features that make up the Earth's surface such as a plain, mountain, or valley, as defined by its particular combination of bedrock and soils, erosion processes, and climatic influences.

land and resource management plan or land management plan: A document that provides broad strategic guidance and information for project and activity decision making in a national forest through plan components (desired conditions, suitable uses, guidelines, special areas, and objectives), as required by the National Forest Management Act and the Planning Rule.

landscape: All the natural features such as grasslands, hills, forest, and water, which distinguish one part of the earth's surface from another part; usually that portion of land which the eye can comprehend in a single view, including all its natural characteristics.

landscape character: Identifiable image made by particular attributes, qualities, and traits of a landscape.

landscape ecology: The study of ecological effects to spatial patterns in ecosystems.

landscape-level/landscape-scale: Refer to broad-scale.

landscape pattern: Number, frequency, size and juxtaposition of landscape elements (stands and patches) that are important to the determination or interpretation of ecological processes.

landscape structure: The mix and distribution of stand or patch sizes across a given area of land. Patch sizes, shapes, and distributions are a reflection of the major disturbance regimes operating on the landscape.

land-use allocation: The commitment of a given area of land or a resource to one or more specific uses--for example, to campgrounds or wilderness.

late/old structure: Forest stands whose structural development incorporates the elements of the late and the old structural stages. The understory species can be found in all canopy layers. Overstory vigor begins to decline, as does tolerance to native pathogens and insects. In the late stage, the understory has become the dominant cover and the overstory is beginning to decline and collapse. In the old stage, stands in which all of the relic (pioneering) trees have died and which consist entirely of trees that grew from beneath. These structural stages may or may not contain the various characteristics sometimes identified with old growth structure.

late seral: Refer to seral stages.

late spring season: Late spring is defined as that period when the key perennial cool season forage plant growth is still occurring but soil moisture is beginning to limit growth. Livestock removal is not planned to occur during the time when assurance can be made that essentially full regrowth would occur.

late successional: The stage of ecological succession and type of vegetation that develops after a long period of time following a stand-replacing disturbance.

legacy tree: Trees that have been spared or have survived stand replacing disturbances (Mazurek and Zielinski, 2004). A legacy tree is any live tree greater than or equal to 21 inches d.b.h. and greater than 150 years old, located in a non-old forest stand.

lethal (stand-replacing) fires: Fires that result in stand replacement of the existing forested vegetation. Mortality levels are very high at all canopy levels within the stand. In forests, fires in which less than 20 percent of the basal area or less than 10 percent of the canopy cover remains; in rangelands, fires in which most of the shrub overstory or encroaching trees are killed.

lichens: Organisms made up of specific algae and fungi, forming identifiable crusts on soil, rocks, tree bark, and other surfaces. Lichens are primary producers in ecosystems; they contribute living material and nutrients, enrich the soil and increase soil moisture-holding capacity, and serve as food sources for certain animals. Lichens are slow growing and sensitive to chemical and physical disturbances.

litter: The uppermost layer of organic debris on the soil surface, which is essentially the freshly fallen or slightly decomposed vegetation material such as stems, leaves, twigs, and fruits.

limits of acceptable change (LAC): Process for establishing acceptable resource and social conditions while defining desired future conditions for wilderness or recreation settings that can be measured and managed (USDA Forest Service 1992).

local population: A group of individuals that spawn or breed in a particular area; the smallest group of individuals that is known to represent an interacting reproductive unit.

loess: Fine grained wind-deposited material predominantly of silt-size particles.

long term: Generally refers to a period longer than 10 years up to 100 years.

long-term sustained-yield timber capacity: The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives.

lower montane: A terrestrial community that generally is found in drier and warmer environments than the montane terrestrial community. The lower montane community supports a unique clustering of wildlife species.

M

mainstem: The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it.

maintain: To continue; or keep ecosystem functions, processes, and/or components (such as soil, air, water, vegetation) in such a condition that the ecosystem's ability to accomplish current and future management objectives is not weakened. Management activities may be compatible with ecosystem maintenance if actions are designed to maintain or improve current ecosystem condition.

major population group: A group of either salmon populations or group of steelhead populations that are geographically and genetically cohesive. The major population group is a level of organization between demographically independent populations and evolutionarily significant units or distinct population segments.

management area: An area with similar management objectives and a common management prescription, as prescribed by the land management plan.

management concern: An issue, problem, or a condition which constrains the range of management practices identified by the Forest Service in the planning process.

management direction: A statement of multiple-use and other goals and objectives, the associated management prescriptions, and standards and guidelines for attaining them.

management indicator species (MIS): In the original forest plans, a species selected because its welfare is presumed to be an indicator of the welfare of other species using the same habitat. A species whose condition can be used to assess the impacts of management actions on a particular area.

management intensity: A management practice or combination of management practices and associated costs designed to obtain different levels of goods and services.

management practice: A specific activity, measure, course of action, or treatment.

management prescription: Management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives.

mechanical equipment: Any contrivance which travels over ground, snow, or water on wheels, tracks, skids, or by flotation that is powered by a living source. This term does not include nonmotorized river craft, wheelchairs, or other similar devices used solely to assist persons with disabilities.

mechanical fuel treatment: Treatment of fuels using mechanical means, such as thinning by chainsaw, crushing down wood, or piling down wood.

mechanized: Wheeled forms of transportation (including nonmotorized carts, wheelbarrows, bicycles and any other nonmotorized, wheeled vehicle.

mesic: Pertaining to conditions of moderate moisture or water supply; used of organisms occupying moist habitats.

metapopulations: A group of conspecific populations coexisting in time but not space.

microclimate: The climatic conditions within a small habitat such as: a tree stump, under a boulder, in the space between grasses, or on the side of a slope.

migration corridor: The habitat pathway an animal uses to move from one place to another.

minerals-locatable: Those hardrock minerals that are mined and processed for the recovery of metals. They also may include certain nonmetallic minerals and uncommon varieties of mineral materials, such as valuable and distinctive deposits of limestone or silica.

minerals-leasable: Coal, oil, gas, phosphate, sodium, potassium, oil shale, sulphur, and geothermal resources.

minerals-materials (salable): A collective term to describe common varieties of sand, gravel, stone, pumice, pumicite, cinders, clay, and other similar materials. Common varieties do not include deposits of those materials that may be locatable.

minimum impact suppression tactics: A set of guidelines prescribing safety, fire line procedures, tools, and equipment that has the least impact on the environment during suppression and mop-up phases of fire (USDA and USDI 2003).

mining: Any activity related to the discovery, extraction, and exploration of minerals under the Mining Act of 1872 and the Mineral Leasing Act of 1920 through the use of, among other things, hydraulic equipment, pans, ground sluicing, sluice boxes, rockers, or suction dredges.

mining claim: A particular parcel of public land, valuable for a specific mineral deposit or deposits, for which an individual has asserted a right of possession. The right is for developing and extracting a discovered mineral deposit.

mining lands: Lands primarily used for mining purposes as of June 13, 1994 and which are assigned to the mining land category in 36 CFR 292.22 of the private land use regulations.

mitigation: Measures designed and implemented to counteract environmental impacts or to make impacts less severe.

mixed-severity fire: These fire regimes will have the greatest toll on thinner barked and/or young age classes within the stand. Low intensity fires within the stand will favor overstory fire-resistant species (ponderosa pine, western larch, and Douglas fir). Crown fire potential does exist depending on stand structures and age classes of different stand cohorts of any available ladder fuels. If it occurs, the result will favor the return to grass and forbs.

moist forest: Area between drier, low elevation forests and higher elevation, cold forests.

monitoring: A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized. Monitoring allows detection of undesirable and desirable changes so that management actions can be modified or designed to achieve desired goals and objectives while avoiding adverse effects to ecosystems.

monitoring program: Prioritized criteria, indicators, and measures that are the means of measuring progress toward the desired conditions when conducting the annual and comprehensive evaluations.

montane: A terrestrial community that generally is found in moderate (ponderosa pine) and subalpine terrestrial communities. Montane communities are generally moister than lower montane and warmer than subalpine communities, and support a unique clustering of wildlife species.

mosaic: A pattern of vegetation in which two or more kinds of communities are interspersed in patches, such as clumps of shrubs with grassland between.

motorized equipment: Any machine powered by a nonliving source. This term does not include motorized river craft or small hand-held devices such as flashlights, shavers, wristwatches, and Geiger counters.

multi-story: More than one canopy layer.

multiple-use management: The management philosophy articulated by the Multiple Use Sustained Yield Act of 1960. This law provides that the renewable resources of the national forests are to be managed in the combination that best meets the needs of the American people. It further stipulates that the Forest Service is to make judicious use of the land for some or all of these resources and related services over areas large enough to ensure that sufficient latitude exists to subsequently adjust management in conformity with changing needs and conditions.

municipal watersheds (public supply watersheds): A watershed that serves a public water system as defined in Public Law 93-523 (Safe Drinking Water Act) or as defined in state safe drinking water regulations. The definition does not include communities served by a well or confined groundwater unaffected by Forest Service activities.

mycorrhizae: The symbiotic relationship between certain fungi and the roots of certain plants, especially trees; important for plants to take nutrients from soil.

N

National Ambient Air Quality Standards (NAAQSs): Standards set by the Federal Environmental Protection Agency for the maximum levels of air pollutants that can exist in the outdoor air without unacceptable effects on human health or the public welfare.

National Environmental Policy Act (NEPA): An act to declare a national policy which will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality.

National Forest Management Act (NFMA): A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of forest plans and the preparation of regulations to guide that development.

National Forest System (NFS): All national forest lands reserved or withdrawn from the public domain of the United States; all national forest lands acquired through purchase, exchange, donation, or other means; the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012); and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system.

National Forest System road: A classified forest road under the jurisdiction of the Forest Service. The term National Forest System roads is synonymous with the term forest development roads as used in 23 USC 205. Generally referred to as a Forest Road (FR).

National Recreation Trail: Trails designated by the Secretary of the Interior or the Secretary of Agriculture as part of the national system of trails authorized by the National Trails System Act. National recreation trails provide a variety of outdoor recreation uses.

National Register of Historic Places: A listing (maintained by the U.S. National Park Service) of areas that have been designated as being of historical significance. The Register includes places of local and state significance as well as those of value to the Nation.

National Wild and Scenic River System: Includes rivers with outstanding scenic, recreational, geological, fish and wildlife, historic, cultural or other similar values designated by Congress under the Wild and Scenic Rivers Act for preservation of their free-flowing condition. Refer to Wild and Scenic River.

native species: Species that normally live and thrive in a particular ecosystem. Animals or plants that have historically occupied a given aquatic or terrestrial area.

natural disturbance: Periodic impact of natural events such as: fire, severe drought, insect or disease attack, or wind.

near natural rates of recovery: Rates not exceeding condition thresholds and meeting standards for forage and browse utilization.

neotropical: Those species of birds that nest in the United States or Canada and winter regularly in the Neotropics (south of the Tropic of Cancer and Capricorn) in Mexico, the Caribbean Islands, or Central or South America. 2).

net public benefits: An expression used to signify the overall long- term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principles of multiple use and sustained yield.

niche: A place or activity for which a thing is best fitted.

no-action alternative: The most likely condition expected to exist in the future if current management direction were to continue unchanged.

nonfunctional: Riparian-wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and not reducing erosion or improving water quality. The absence of certain physical attributes, such as a floodplain where one should be, is an indicator of nonfunctioning conditions (Process for Assessing Proper Functioning Condition, USDI BLM 1993).

nongame species: Those species of animals that are not managed as a sport hunting resource.

nonlethal fire: Fires that consist of low intensity under burns with limited single tree or group torching. Fire related mortality to the dominant-fire resistant species is slow, but occurs because of this type of localized fire behavior. In forests, fires in which more than 70 percent of the basal area or more than 90 percent of the canopy cover survives; in rangelands, fires in which more than 90 percent of the vegetative cover survives (implies that fire is occurring in an herbaceous-dominated community).

nonnative invasive species (NNIS): Plant species that are introduced into an area in which they did not evolve and in which they usually have few or no natural enemies to limit their reproduction and spread. These species can cause environmental harm by significantly changing ecosystem composition, structure, or processes and can cause economic harm or harm to human health.

nonpoint source pollution: Pollution whose source is general rather than specific in location; the sources of the pollutant discharge are dispersed, not well defined or constant. Examples include sediments from logging activities and runoff from agricultural chemicals. It is widely used in reference to agricultural and related pollutants, such as production of sediments by logging operations, agricultural pesticide applications, or automobile exhaust pollution.

nontreaty bands: The five bands of Nez Perce whose traditional homes lay outside the reduced reservation boundaries described in the Treaty of 1863.

noxious weeds: Plants designated as noxious weeds by the Secretary of Agriculture or by the responsible state official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being native or new to or not common to the united states or parts thereof. A noxious weed is one that causes disease or has other adverse effects on the human

environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

nutrient cycling: Ecological processes in which nutrients and elements such as carbon, phosphorous, nitrogen, calcium, and others, circulate among animals, plants, soils, and air.

O

objective: A concise, time-specific statement that describes the incremental progress expected to take place to meet goals (desired conditions) over the planning period with respect to estimated quantities of services and accomplishments. Objectives are projections of outcomes based on certain social, economic, and ecological indicators that measure the plans performance and identify specific opportunities and possible future proposals in terms of ongoing programs and future projects to support the goals for the planning area.

off-channel: Aquatic habitats separated from the main stream or river, such as side-channels, oxbows, ponds, or sloughs, which may or may not be directly connected to a river or stream.

off-highway vehicle (OHV): Any motor vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland, or other natural terrain.

old forest: Old forests are ecosystems distinguished by old trees and related structural attributes. Old forest encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulation of large dead woody material, number of canopy layers, species composition, and ecosystem function.

old forest multistory (OFMS): This structure class includes multiple age classes and vegetation layers, along with large, old trees. Decaying fallen trees may also be present that leave a discontinuous overstory canopy. Overstory diameters are generally greater than 20 inches.

old forest single story (OFSS): This structure class can include multiple age classes, but generally only includes one main overstory strata. Large, old trees are common. Decaying fallen trees may also be present that leave a discontinuous overstory canopy. Overstory diameters are generally greater than 20 inches.

ongoing actions: Those actions that have been implemented, or have contracts awarded or permits issued. Refer to new actions.

openings: Refers to meadows, clearcuts, and other areas of vegetation that do not provide hiding or thermal cover.

operational plan: A document approved by the forest supervisor which specifies at the project level, implementation of the management direction established in the forest plan.

outcome: The long-term results of a program activity compared to its intended purpose (Government Performance and Results Act of 1993 (5 U.S.C. 306)). Outcome is a state of being similar to long-term ecological, social, or economic condition or goal (such as the maintenance of an ecosystem's biodiversity, jobs and income, or the quality of a regions' surface water as measured by indicators).

outdoor recreation activities: Activities such as camping, picnicking, rafting, boating, hiking, rock climbing, fishing, hunting, horseback riding, and the viewing of wildlife or scenery.

outfitting: Providing through rental or livery any saddle or pack animal, vehicle or boat, tents or camping gear, or similar supplies or equipment, for pecuniary remuneration or other gain. The

term guide includes the holder's employees, agents, and instructors. Pecuniary remuneration means monetary reward (Washington Office Amendment 2709.11-95-11, 41-53C).

outputs: A broad term for describing any result, product, service or concern that a system produces by its activities. They are measurable and capable of being used to determine the effectiveness of programs and activities in meeting objectives. The unit of measure should indicate or serve as a proxy for what the recipients get rather than what the agency does in the process of producing the given output. Example: timber sold, recreation use, livestock grazing use, etc. Any good, service, or on-site use that is produced from rural resources.

outslope: Roads that are sloped towards the downhill side of the roadway to better match the natural drainage patterns and minimize the potential for diversion.

outstandingly remarkable values: Term used in the Wild and Scenic Rivers Act of 1968; to qualify as outstandingly remarkable, a resource value must be a unique, rare, or exemplary feature that is significant at a regional or national level.

overgrazing: Consumption of rangeland grass by grazing animals to the point that it cannot be renewed, or can be only slowly renewed, because of damage to the root system.

over-snow vehicle: A self-propelled vehicle intended for travel primarily on snow driven by a track or tracks in contact with the snow, and steered by a ski, ski's or tracks in contact with the snow.

overstory: Portion of the trees, in a forest or in a forested stand of more than one story, forming the upper or uppermost canopy.

overwinter: To keep livestock or plants alive through the winter by sheltering them, or to be kept alive in this way.

P

PACFISH: Regional Forester's Amendment 3, Interim strategies for managing anadromous fish–producing watersheds in Eastern Oregon and Washington, Idaho, and portions of California (USDA and USDI 1995).

paleontological sites: Areas that contain any remains, trace, or imprint of a plant or animal that has been preserved in the earth's crust before the Holocene epoch.

parcel: Contiguous tax lots under one ownership. For the purposes of the Private LURs, rights-of-way do not divide parcels into smaller units.

particulate emissions: Solid particles or liquid droplets that can be suspended or carried in the air, or released as air contaminants into the outdoor atmosphere.

PM_{10} – Particulate matter that measures 10 micrometers in diameter or less, a size considered small enough to invade the alveolar regions of the lung. PM_{10} is one of the six pollutants for which there are National Ambient Air Quality Standards.

$PM_{2.5}$ – Particulate matter that measures 2.5 micrometers in diameter or less.

passive management: Allowing nature to restore (heal) the natural balance between erosion/deposition, hydrologic, and vegetation processes by removing identified adversely affecting agents.

patch: An area of vegetation that is relatively homogeneous internally and differs from surrounding elements.

pathogen: An agent such as a fungus, virus, or bacterium that causes disease.

pattern: The spatial arrangement of landscape elements (patches, corridors, matrix) that determines the function of a landscape as an ecological system.

pesticide: A chemical preparation used to control individuals or populations of injurious organisms.

permittee (livestock): Any entity that has been issued a grazing permit.

phases: Plant communities or seral stages within a steady state connected to each other by community pathways.

plan amendment: The process for making substantive changes to a land management plan for the desired conditions, suitable uses, special areas, objectives and guidelines.

plan component: Parts of a national forest land and resource management plan that cannot be changed without a plan amendment analysis as required by the National Environmental Policy Act and the Planning Rule. The four components of a land management plan are suitable uses, special areas, objectives, and guidelines.

planning area: The area of the National Forest System covered by a regional guide or forest plan.

planning criteria: Criteria prepared to guide the planning process. Criteria applied to collection and use of inventory data and information, analysis of the management situation, and the design, formulation, and evaluation of alternatives.

planning horizon: The overall time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions.

planning record: A written record of the land management plan revision process containing detailed information and analysis used support conclusions and decisions made in the plan.

plant associations: A plant community type based on the land management potential, successional patterns and species composition.

plant communities: Any grouping of plants that have some structural similarity (Johnson and Simon 1987).

plateau: Any comparatively flat area of great extent and elevation; specifically an extensive land region considerably more elevated above the adjacent country; it is commonly limited on at least one side by an abrupt descent.

point source pollution: Pollution that comes from a single identifiable source such as a smokestack, a sewer, or a pipe.

pool: Portion of a stream where the current is slow, often with deeper water than surrounding areas and with a smooth surface texture. Often occur above and below riffles and generally are formed around stream bends or obstructions such as logs, root, wads, or boulders. Pools provide important feeding and resting areas for fish.

potential natural community: The biotic community that would become established if all successional sequences were completed without interference by humans under present environmental conditions. Natural disturbances are inherent in development.

potential vegetation group (PVG): A group of potential vegetation types grouped on the basis of similar general moisture or temperature environment and similar types of life forms.

potential vegetation types (PVT): A kind of physical and biological environment that produces a kind of vegetation; the species that might grow on a specific site I the absence of disturbance; can also refer to vegetation that would grow on a site in the presence of frequent disturbance that is an integral part of the ecosystem and its evolution.

precommercial thinning: The removal of trees not for immediate financial return but to reduce stocking to concentrate growth on the more desirable trees.

prehistoric site: An area that contains important evidence and remains of the life and activities of early societies that did not record their history.

prescribed fire: Any fire ignited by management actions to meet specific objectives. Prescribed fire is intended to mimic natural fire regimes to: 1) reduce the risk of fires burning outside of historic intensities and severities that could substantially reduce long–term productivity; 2) maintain tree species compositions that occur under the natural disturbance regime; 3) reduce competition; 4) increase nutrients; 5) prepare sites for natural regeneration; 6) improve forage resources; 7) enhance/create wildlife habitat; and 8) protect private and public property values. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, prior to ignition.

prescription: A management pathway to achieve a desired objective(s).

present net value (PNV): The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area.

primitive recreation: Those types of recreation activities associated with unroaded land, for example: hiking, backpacking, and cross–country travel.

private land: Land not in federal, state, or local government ownership.

productive capacity: The growth and accumulation of plant biomass (primary productivity) as well as the growth of animal species that use the products (secondary productivity). Key elements of productivity include the physical, chemical, and biological properties of soils which provide for vegetative growth and the accumulation and cycling of nutrients.

productivity: Productivity is based on using natural resources no faster than they are produced or can be replaced and using natural resources without impairment of the long-term productive capacity of the ecosystem from which they are derived.

programmatic agreement (PA): This is a historic preservation document that records the terms and conditions agreed upon to resolve the potential adverse effects of a Federal agency program, complex undertaking or other situations in accordance with the Section 106 review under NHPA [36CFR800.14(b)].

proper functioning condition (PFC): Riparian and wetland areas achieve proper functioning condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This thereby reduces erosion and improves water quality; filters sediment, captures bedload, and aids floodplain development; improve flood–water retention and ground water recharge; develops root masses that stabilize stream banks against cutting action; develops diverse ponding and channel characteristics to provide the habitat and water depths, duration, and temperature necessary for aquatic vertebrate and invertebrate production, waterfowl breeding, and other issues; and supports greater biodiversity. The functioning condition of riparian and wetland areas is a result of the interaction among geology, soil, water and vegetation.

project: An organized effort to achieve an objective identified by location, timing, activities, outputs, effects, and time period and responsibilities for executions.

project-level: Site-specific analysis and planning processes for a specific project or set of projects usually on an individual ranger district.

proposed action: A proposal by a federal agency to authorize, recommend, or implement a management action.

preliminary admistratively recommended wilderness area (PARWA): An area that has been determined to meet the criteria to be designated as wilderness and is proposed in this land management plan by the forest supervisor(s) to be recommended to Congress for inclusion into the National Wilderness Preservation System.

public issue: A subject or question of widespread public interest relating to management of the National Forest System.

public roads: Any road or street under the jurisdiction of and maintained by a public authority and open to public travel (23 U.S.C. §101(a)).

Q

qualitative: Traits or characteristics that relate to quality and cannot be measured with numbers.

quality of life: Refers to the satisfaction people feel for the places where they live (or may visit) and for the places they occupy as part of that experience.

quantitative: Traits or characteristics that can be measured with numbers.

R

range forage condition: The current composition or productivity of rangeland relative to what that rangeland is capable of producing as a potential natural community, and often synonymous with forage condition.

range analysis: The systematic interpretation, analysis, and evaluation of data for rangeland resource management planning. It provides ecological and other information for overall forestland and resource management planning and allotment management planning.

rangeland (range): Lands where the vegetation is predominately grasses, grass-like plants, forbs, or shrubs. Rangelands include natural grasslands, shrublands, savannahs, tundra, most deserts, and riparian and wetland plant communities, including marshes and wet meadows, with greater than about 200 pounds of forage production per year per acre.

rangeland resources: The physical and biotic resources of rangeland ecosystems.

rangeland resource inventory: The systematic acquisition of inventory data that characterizes the vegetation, soil, and other rangeland resources.

rangeland vegetation: Vegetation on all land with rangeland resource objectives or rangeland resource values, including riparian areas. Generally, the focus is on land supporting grass or grass-like plants, forbs, or shrubs during one or more ecological stages. Forested and nonforested sites providing forage and habitat for wild and domestic animal species are included.

rare combinations of aquatic, terrestrial and atmospheric habitats: Principally reflect physical environmental features of the landscape that are produced from a unique combination of soils, climate, precipitation, and aspect. Refer to the analysis files for a complete description.

rare plants: Plants that are federally listed as threatened, endangered, or proposed for federal listing; Forest Service Sensitive for Regions 1, 4, and 6, or disjunct species. This includes plants considered rare both globally (G1, G2, G3) or within states (S1, S2 or S3). Refer to the analysis files for a complete description.

real dollar value: A monetary value which compensates for the effects of inflation.

rearing habitat: Area in rivers or streams where juvenile salmon and trout find food and shelter to live and grow.

receipt shares: The portion of receipts derived from Forest Service resource management that is distributed to State and county governments, such as the Forest Service 25 percent fund payments.

recontour: To move soil back (usually with mechanical or hand tools) to a previous condition thus making an area blend with the natural landscape.

record of decision (ROD): An official document separate from, but associated, with a final environmental impact statement in which a deciding official identifies all alternatives, and specifies which were environmentally preferable, states the decision, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not (40 CFR 1505.2).

recovery plans: A plan for the survival and conservation of species listed under the Endangered Species Act. The Act [Section 4(f)] requires that recovery plans contain: 1) objectives, measurable goals for delisting; 2) a comprehensive list of the actions necessary to achieve the delisting goals; and 3) an estimate of the cost and time required to carry out those actions. In addition, NOAA Recovery Planning Guidelines suggest that recovery plans include an assessment of the factors that led to population declines and/or which are impeding recovery. Finally, it is important that the plans include a comprehensive monitoring and evaluation program for gauging the effectiveness of recovery measures and overall progress toward recovery (USDI 1988).

recreation: Leisure time activity such as swimming, picnicking, boating, hunting, and fishing.

> **developed recreation:** Recreation that requires facilities that, in turn, result in concentrated use of an area. Examples of developed recreation areas are campgrounds and ski areas; facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings.
>
> **dispersed recreation:** A general term referring to recreation use outside developed recreation sites; this includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross–country skiing, and recreation in primitive environments.

recreation opportunity: The availability of choices for users to participate in the recreational activities they prefer within the settings they prefer.

recreation opportunity spectrum: A recreation opportunity setting is the combination of physical, biological, social, and managerial conditions that give value to a place. Thus, an opportunity includes qualities provided by-nature (vegetation; landscape, topography, scenery), qualities associated with recreational use (levels and types of use), and conditions provided by management (developments, roads, regulations). By combining variations of these qualities and conditions, management can provide a variety of opportunities for recreationists. The settings, activities, and opportunities for obtaining experiences have been arranged along a continuum or

spectrum divided into six classes: primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural, and urban (40 CFR 1505.2).

primitive - Area is characterized by an essentially unmodified natural environment of fairly large size Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

semiprimitive nonmotorized – Area is characterized by a predominantly natural or natural appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but would be subtle. Motorized recreation use is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreational experience opportunities.

semiprimitive motorized – Area is characterized by a predominantly natural or natural appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.

roaded natural -Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of man. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities

rural -Area is characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities is designed for use by a large number of people Facilities are often provided for special activities. Moderate densities are provided far away from developed sites Facilities for intensified motorized use and parking are available.

urban - Area is characterized by a substantially urbanized environment, although the background may have natural appearing elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans, on-site, are predominant. Large numbers of users can be expected, both on site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

recreation residences: Privately owned recreation cabins authorized by special use permit on National Forest System land that occupy planned, approved tracts or those groups of tracts established for recreation residence use.

recreation site: Specific places in the forest other than roads and trails that are used for recreational activities. These sites include a wide range of recreational activities and associated development. These sites include highly developed facilities like ski areas, resorts, and campgrounds. It also includes dispersed recreation sites that have few or no improvements but show the effects of repeated recreation use.

recreation visit: An entry of one person to a recreation site or area of land or water for the purpose of participating in one or more recreation activities for an unspecified period.

recreational facilities: Refers to facilities associated with or required for outdoor recreational activities and includes, but are not limited to, parks, campgrounds, hunting and fishing lodges, and interpretive displays.

recreational river: Refer to Wild And Scenic River.

redd: Nest in gravel of stream bottom where a fish deposits eggs.

reforestation: Treatments or activities that help to regenerate stands of trees after disturbances such as timber harvest or wildfire. Typically, reforestation activities include preparing soil, controlling pests, and planting seeds or seedlings.

refugia: Areas that have not been exposed to great environmental changes and disturbances undergone by the region as a whole; refugia provide conditions suitable for survival of species that may be declining elsewhere.

regeneration: The process of establishing new plant seedlings, whether by natural means or artificial measures (planting).

regeneration harvest: A timber harvest by which a new age class is created by using clearcutting, seed tree, shelterwood, or selection methods.

regulations: Generally refers to the CFR, Title 36, chapter II, which covers management of the Forest Service.

rehabilitate: To repair and protect certain aspects of a system so that essential structures and functions are recovered, even though the overall system may not be exactly as it was before.

relic: Persistent remnants of formerly widespread fauna or flora species existing in certain isolated areas or habitats. The existence of an organism or species in an otherwise extinct taxon (phylum, order, family, genus, or species) from an earlier time that has survived in an environment that has undergone considerable change.

renewable energy: Energy derived from natural sources, such as sunlight, wind, rain, tides, or geothermal resources, that does not consume the resource when used.

research natural area (RNA): An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community, primarily for scientific and educational purposes. In Forest Service usage, Research Natural Areas are areas designated to ensure representative samples of as many of the major naturally–occurring plant communities as possible.

resident fish: Fish that spend their entire life in freshwater; examples include bull trout and westslope cutthroat trout.

resource: Anything which is beneficial or useful, be it animal, vegetable, mineral, a location, a labor force, a view, an experience, etc. Resources, in the context of land use planning, thus vary from such commodities as timber and minerals to such amenities as scenery, scenic viewpoints, or recreation opportunities.

Resource Advisory Council (RAC): RACs were established by the BLM, under the Federal Advisory Committee Act to provide a forum for nonfederal partners to engage in discussion with agency managers regarding management of federal lands.

responsible official: The Forest Service employee who has the authority to select and/or carry out a specific planning action.

restoration: Restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. It is an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity, and sustainability. Restoration is an attempt to return an ecosystem to its historic trajectory, but not necessarily to a former state.

resource allocation: The action of apportioning the supply of a resource to specific uses or to particular persons or organizations.

riparian area: An area with distinctive soils and vegetation between a stream, or other body of water, and the adjacent upland area consisting of vegetation that requires free, or unbound, water for survival.

riparian-dependent species: Plant species that rely on free or unbound water for establishment and survival, and animal species that would normally occupy, or rely on, riparian habitats.

riparian management areas (RMAs): Portions of watershed where riparian–dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines. Riparian management areas include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of the streams' water, sediment, woody debris, and nutrient delivery system.

fish-bearing streams: Riparian management areas consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest. In degraded or incised streams, the riparian management area should extend from the edge of the active channel to the outer extent of the former floodplain. It is expected that riparian management area widths along fish-bearing streams will not be less than described here.

permanently flowing non-fish-bearing streams: Riparian management areas consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest. In degraded or incised streams, the riparian management area should extend from the water's edge to the outer extent of the former floodplain.

constructed ponds and reservoirs, and wetlands greater than 1 acre: Riparian management areas consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

lakes and natural ponds: Riparian management areas consist of the body of water and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

seasonally flowing or intermittent streams, wetlands, seeps and springs less than 1 acre, and unstable and potentially unstable areas: This category applies to features with high

variability in size and site-specific characteristics. At a minimum, the riparian management areas should include:

- The extent of unstable and potentially unstable areas (including earthflows).
- The stream channel and extend to the top of the inner gorge, or in incised streams, to the edge of the former floodplain.
- The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation, extending from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest. A site-potential tree height is the average maximum height of the tallest dominant trees for a given site class.
- Intermittent streams are defined as any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria. Including intermittent streams, springs, and wetlands within riparian management areas is important for full implementation of the ARCS. Accurate identification of these features is critical to the correct implementation of the strategy and protection of the intermittent stream and wetland functions and processes. Identification of these features is difficult at times due to the lack of surface water or wet soils during dry periods. Fish-bearing intermittent streams are distinguished from non-fish-bearing intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams or travel routes for fish emigrating from lakes. In these instances, the guidelines for fish-bearing streams would apply to those sections of the intermittent stream used by the fish.

risk factors: Land-use disturbances that are negatively affecting watershed functions and processes and stream-riparian environments.

riverine: On or near the banks of a river; riparian.

road: A motor vehicle route over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary (36 CFR 212.1).

classified roads: Roads wholly or partially within or adjacent to national forest lands that are determined to be needed for long-term motor vehicle access, including state roads, county roads, privately owned roads, forest roads, and other roads authorized by the Forest Service (36 CFR 212.1).

closed road: A road with all use suspended year–long by an active form of facility management utilizing regulations and appropriate enforcement to secure and ensure user compliance with closure.

open road: A road that has no use restrictions or regulations imposed and is available for use by vehicles at any time during the year.

temporary roads: Roads authorized by contract, permit, lease, other written authorization, or emergency operation not intended to be a part of the forest transportation system and not necessary for long-term resource management (36 CFR 212.1).

unclassified roads: Roads on national forest lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travel ways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once

under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).

road construction: Activity that results in the addition of forest classified or temporary road miles (36 CFR 212.1). New construction activities may include vegetation clearing and grubbing, earthwork, drainage installation, instream activities, pit development or expansion, surfacing (including paving), and aggregate placement.

road decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state (36 CFR 212.1, FSM 7703). Road decommissioning activities include revegetation, recontouring, water barring, roadbed scarification or ripping, culvert removal, berm construction, and side cast pullback.

road density: An indicator of the concentration of roads in an area.

road maintenance: The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective.

road maintenance levels (MLs): Maintenance levels define the level of service provided by, and maintenance required for, a specific road. Maintenance levels must be consistent with road management objectives and maintenance criteria. Roads assigned to MLs 2 through 5 are either constant service roads or intermittent service roads during the time they are open to traffic.

Level 1: Assigned to intermittent service roads during the times they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to acceptable levels and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are prohibit and eliminate.

Roads receiving ML 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at ML 1, they are closed to vehicular traffic, subject to prohibitions and restrictions, and may be available and suitable for nonmotorized users.

ML 1 maintenance activities include road condition surveys, evaluation, and monitoring of maintenance needs. Activities include limited equipment operation, opening closed roads, manual cleaning of drainage structures, and vegetation management that stabilizes or reduces erosion. Repairs are scheduled and completed within funding limitations when critical resource damage is reported.

Roadway activities including blading, clearing logs, and noncritical repairs that can be delayed are accomplished when the road is placed in an active status.

Level 2: Assigned to roads open for use by high-clearance vehicles. Providing access for passenger cars is not a consideration. Traffic is normally minor, usually consisting of administrative, permitted, dispersed recreation, and/or other specialized uses. Log hauling may occur. Appropriate traffic management strategies are either to discourage or prohibit passenger cars or to accept or discourage high-clearance vehicles.

ML 2 maintenance activities include roadside brushing, hazard-tree removal, surface blading, drainage maintenance, structure maintenance, clearing logs, slide and slip cleanup and repair, sign maintenance and surface replacement. Drainage function and soil stabilization are of prime importance. Many roads in this category have grass in the travel way. User comfort is not a consideration.

Level 3: Assigned to roads open and maintained for travel by prudent drivers in standard passenger cars. User comfort and convenience are not considered priorities.

Roads in this maintenance level are typically low-speed, single-lane, with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are encourage or accept. Discourage or prohibit strategies may be employed for certain classes of vehicles or users.

ML 3 maintenance activities include roadside brushing, hazard-tree removal, surface blading, drainage maintenance, structure maintenance, clearing logs, slide and slip cleanup and repair, sign maintenance and surface replacement. Drainage function and soil stabilization are of prime importance. Dust abatement and more frequent blading may be needed on segments of multi-purpose roads.

Level 4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double-lane and aggregate-surfaced. However, some roads may be single-lane. Some roads may be paved and/or dust abated. The most appropriate traffic-management strategy is encourage. However, the prohibit strategy may apply to specific classes of vehicles or users at certain times.

ML 4 maintenance activities include roadside brushing, hazard tree removal, surface blading, drainage maintenance, structure maintenance, clearing logs, slide and slip cleanup and repair, sign maintenance and surface replacement. Drainage function and soil stabilization are of prime importance. Dust abatement and more frequent blading may be needed on segments of multi-purpose roads.

Level 5: Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved. Some may be aggregate-surfaced and dust-abated. The appropriate traffic management strategy is encourage.

ML 5 maintenance activities include roadside brushing, hazard-tree removal, surface blading, drainage maintenance, structure maintenance, logging out, slide and slip cleanup and repair, sign maintenance and surfacing replacement. Drainage function and soil stabilization are of prime importance. Dust abatement and more frequent blading may be needed on segments of multi-purpose roads. All of the ML 5 roads within a national forest have a permanent (paved) surface.

road management objectives: Road management objectives define the level of service provided by a National Forest System road consistent with the surrounding recreation opportunity spectrum (ROS) class.

semi–primitive nonmotorized (SPNM): Most semi-primitive nonmotorized areas do not have developed roads. All motorized traffic is prohibited. Semi-primitive nonmotorized roads provide hiking or equestrian trails on closed or decommissioned roads.

semi–primitive motorized (SPM): Semi-primitive motorized roads are generally used for four-wheel drive, logging, or ranching activities. Passenger-car use is discouraged by entrance conditions or signage. Users can expect SPM roads where there are no attractions such as viewpoints or trailheads.

- **low-level SPM:** Native surface roads suitable for high-clearance vehicles but not passenger cars or vehicles towing trailers. Users may need to back vehicles for long distances when meeting oncoming traffic. Maintenance activities occur usually every five years or when resource needs are identified. Roads are allowed to “brush in” and users are responsible for removing trees blocking the road. Ruts and potholes are accepted if

they do not contribute to sediment loading. Corresponds to road ML 2 and Traffic Service Level D (abbreviated: 2-D).

- **high-level SPM:** Single-lane native surface road or road surfaced with spot rock, strip rock or pit run material suitable for high-clearance vehicles. The road may have infrequent turnouts. Pit run material is applied to the road surface, but is not grid rolled, leaving a rough, rocky surface that drains well and discourages passenger car use. User maintenance is the same as for the low-level SPM. This standard meets resource and safety needs and is the minimum standard for accessing attractions such as viewpoints or trailheads. Maintaining current road alignment, road surface type, and corridor width are emphasized. Corresponds to ML 2 and Traffic Service Level C (abbreviated: 2-C).

roaded natural (RN): Roaded natural roads provide safe access for passenger cars. Maintenance activities generally occur annually or every two years, depending on funding and need. Forest Service clears these roads of brush and logs. Surface maintenance increases at higher levels. Because of increased speeds, turnouts are needed more frequently. Open local roads and some collector roads within RN are managed for high-clearance vehicles. In such cases, road-maintenance standards defined for SPM would be used.

- **low-level RN:** Road-surface type of either native or base course. Pit-run material is processed to provide a rough but suitable service for passenger cars. Dust increases during dry conditions, and the road provides good resource protection when wet. Corresponds to road Maintenance Level 3 and Traffic Service Level C (abbreviated: 3-C).
- **medium-level RN:** Road-surface type of crushed aggregate, maintained for passenger cars. Usually maintained annually, surfaces may “washboard” and become dusty with increased use. Corresponds to road Maintenance Level 3 and Traffic Service Level C or B (abbreviated: 3-C or 3-B).
- **high-level RN:** Road-surface type of an aggregate that has been dust-abated or treated with soil or silicone stabilizers, or asphalt emulsions. A dust-free, smooth surface for passenger cars is the desired product. This standard is often applied to provide double-lane access to attractions such as viewpoints or campgrounds. Corresponds to road Maintenance Level 4 and Traffic Service Level B or A (abbreviated: 4-B or 4-A).

rural (R): Rural is generally the highest standard of road. These arterial roads provide the main access to the national forest lands but generally lack the speeds and alignment provided by state highways. Roads are double–lane with a road-surface treatment and generally 24-feet wide. The road has center striping and often stripes marking the shoulders. Corresponds to a road Maintenance Level 5 and Traffic Service Level A (abbreviated: 5-A).

road prism: an area consisting of the road surfaces and any cut slope and road fill.

road reconstruction: Activity that results in improvement or realignment of an existing classified road as defined below. Reconstruction activities may include vegetation clearing and grubbing, earthwork, drainage installation, instream activities, surfacing (including paving), and aggregate placement.

road improvement: Activity that results in an increase of an existing road’s traffic service level, expands its capacity, or changes its original design function.

road realignment: Activity that results in a new location of an existing road or portions of an existing road and treatment of the old roadway (36 CFR 212.1).

road restoration: Road restoration activities are commensurate with the assigned maintenance level and include storm proofing, bridge replacement, installation of drainage dips and water bars, culvert installation and upgrade, surface shaping, and draining, surface material processing. Refer to road maintenance.

road spur: A dead-end road, usually with a length of 0.5 miles or less.

roads subject to the Highway Safety Act: National Forest System roads open to use by the public for standard passenger cars. This includes roads with access restricted on a seasonal basis and roads closed during extreme weather conditions or for emergencies, but which are otherwise open for general public use.

road surface types:

asphalt/concrete: A well-graded aggregate and asphalt cement.

aggregate: Stone, slag, gravel, or any other hard, inert, mineral material meeting certain specified quality requirements for use in a road pavement or surfacing structure.

chip seal: A road surface treatment consisting of one or more spray applications of asphalt followed immediately by an application of aggregate (chips) on a paved surface.

grid–rolled: Aggregate consisting of native materials of a quality that can be taken directly from a given source, without crushing or screening, and broken down to a specified maximum dimension on the road by grid–rolling.

paved: One or more bituminous bound layers of aggregate placed on a prepared road foundation.

pit run: Aggregate consisting of native materials from a given source with a maximum size and grading suitable for placing directly on a road without crushing or screening.

native surface: A road surface consisting of soil or aggregate materials naturally existing at the road location.

spot rock: Aggregate placed on a road as a pavement or surfacing structure in designated areas that are not continuous throughout the entire length of the road.

strip rock: Aggregate placed on a road as a surfacing structure in designated areas or portions of a road greater than 200 feet in length but not continuous throughout the entire length of the road.

surface treated: One or more applications of asphalt or other processed or natural materials to a road surface to provide traction, abate dust, protect, or renew the surface without increasing pavement structural capacity. Surface treatment is commensurate with existing surface.

runoff (surface): Fresh water from precipitation and melting ice that flows on the earth's surface into nearby streams, lakes, wetlands, or reservoirs.

S

sale schedule: The quantity of timber planned for sale by time period from an area of suitable land covered by a forest plan. The first period, usually a decade, of the selected sale schedule provides the allowable sale quantity. Future periods are shown to establish that long-term sustained yield will be achieved and maintained.

salmonids: Fishes of the family Salmonidae, including salmon, trout, chars, whitefish, ciscoes, and grayling.

salvage harvest: Harvest of trees that are dead, dying, or deteriorating due to fire, wind, insect or other damage, or disease.

sanitation harvest: Sanitation cuttings involve the elimination of trees that have been attacked or appear in imminent danger of attack by dangerous insects and fungi in order to prevent these pests from spreading to other trees. Sanitation cuttings differ from other forms of salvage cuttings only to the extent that they are combined with or represent precautions to reduce the spread of damaging organisms to the residual stands. They may also be undertaken in anticipation of attack in attempts to forestall the establishment of damaging organisms. They can be and usually are combined with salvage cuttings.

satisfactory condition: A condition in which the soil is adequately protected and the forage species composition and production meets the land management plan objectives or the trend in forage species composition and production is acceptable.

savannah: The transitional biome between grassland and desert or desert and rainforest, typically having drought resistant vegetation dominated by grasses with scattered tall trees.

scabland: A region characterized by elevated tracts of rocky ground with little or no soil cover.

scale: (1) The level of resolution under consideration (for example, broad-scale or fine-scale); (2) the ratio of length on a map to true length.

scenery management system (SMS): The SMS is the method that was adopted after the forest plan was completed in 1990. The SMS utilizes two indicators to determine desired landscape character: ecological landscape integrity and scenic integrity. Ecological landscape integrity evaluates whether the landscape is managed in a sustainable and ecologically sound manner. Scenic integrity evaluates whether the landscape character is being managed in a way that conserves constituent values in terms of the level of human-caused deviations that are acceptable to the public (USDA Forest Service 1993 SMS HANDBOOK).

scenic area: Places of outstanding or matchless beauty that require special management to preserve these qualities. They may be established under 36 CFR 294.1 whenever lands possessing outstanding or unique natural beauty warrant this classification.

scenic class: Scenic class indicates the importance or value of a particular landscape determined by constituent information.

scenic identity: The scenic image and identity is the landscape character of an area. The landscape character identifies the “ideal” or optimal set of valued scenery attributes and describes the setting provided by these scenery attributes within each biophysical setting. It is important to understanding of the process, structure, and functions that support the valued set of scenery attributes. This understanding helps identify conditions and stressors that put scenery resources at risk.

scenic integrity level: Measures the degree to which a landscape is free from visible disturbances that detract from the natural or socially valued appearance. Scenic integrity objectives establish the desired level of scenic integrity for an area. Scenic stability measures the degree to which the valued landscape character and its scenery attributes can be sustained through time and ecological progression. Scenic stability objectives establish the desired level of scenic stability for a particular area. It is used to describe an existing situation, an objective for management, or desired conditions.

very high scenic integrity: Scenery with fully intact landscape features and scenic compositions presenting the optimal landscape character in complete harmony, with very minute, if any, scenic discordance. Due to the optimal scenic integrity of the physical, biological, and cultural features in these scenic compositions, the landscape character and sense of place are expressed at the highest possible level. Very high scenic integrity is most compatible with wilderness, backcountry, biophysical, or cultural preserves, and other special classification areas.

high scenic integrity: Scenery with whole or nearly intact landscape features and scenic compositions that present the optimal landscape character completely or nearly in full, and contain scenic discordances that are not evident.

moderately high scenic integrity: Scenery with slightly altered landscape features and compositions in which the valued landscape character is the dominant scenic impression, yet minor discordance is apparent, but visually subordinate. The "moderate" level of scenic integrity in the Scenery Management Handbook has been split into two categories to reflect more accurately the scenic conditions on the in the Blue Mountains.

moderately low scenic integrity: Scenery with altered landscape features and compositions that display a beginning dominance of valued landscape character expression and readily noticeable discordance.

low scenic integrity: Scenery with obviously altered landscape features and compositions that dominate yet still express some aspects of valued landscape character. The scenic harmony of the valued landscape character is seriously fragmented and barely restorable within reasonable periods and resource expenditures.

very low scenic integrity: Scenery with extremely altered landscape features and composition that no longer sustains significant aspects of valued landscape character. The scenic harmony of the optimal landscape character does not exist and its restoration may be impossible if not unrealistic.

scenic integrity objective: An established goal for the management of the scenic resource applied to a specific portion of the forest.

scenic river areas: Refer to Wild and Scenic River.

scenic river: Refer to Wild and Scenic River.

science consistency review: Certification that the revised forest plan takes into account the best available science as required by the 2005 Planning Rule.

scoping process: A part of the NEPA process; the early stages of preparation of an environmental impact statement, early and open activities used to solicit public opinion, receive comments and suggestions, and determine the scope and significance of the issues to be considered in the development and analysis of a range of actions, alternatives, and impacts to be considered. Scoping may involve public meetings, telephone conversations, mailings, letters, or other contacts (40 CFR 1501.7).

screening: The reduction or elimination of the visual impact of any structure or land modification as seen from any public travel route within the national forests.

security: An area where wildlife, such as elk, retreat to for safety when disturbance in their usual range is intensified, such as by logging activities or during the hunting season. To qualify as a security area for elk there must be 250 contiguous acres that are more than one-half mile from open roads.

secondary productivity: The growth of animal species that use the products derived from The growth and accumulation of plant biomass (primary productivity).

sediment: Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle to the bottom.

sediment regime: The rate, frequency, magnitude, and duration of sediment movement. Refer to flow regime.

selective cutting: Single-tree or group-selection cutting is the periodic removal of trees individually or in small groups from an uneven-aged forest in order to maintain diverse stands, with the sustainability and improvement of the forest using an ecosystem approach to management being a primary consideration.

self-reliance: Reliance on one's own capabilities, judgment, or resources through application of outdoor skills in an environment that offers a high degree of risk and challenge.

self-sustaining populations: Populations that are sufficiently abundant, interacting, and well-distributed in the plan area, within the bounds of their life history and distribution of the species and the capability of the landscape, to provide for their long-term persistence, resilience and adaptability over multiple generations.

sense of place: A reference for the physical, emotional, cultural, symbolic, and spiritual aspects of people's tangible and intangible relationships with the land and the meanings associated with them.

sensitive soils: Forest land areas that have a moderate to very high hazard for soil compaction. Erosion, displacement, mass wasting, or forest floor displacement.

sensitive species: Plant or animal species identified by a regional forester for which population viability is a concern either: 1) because of significant current or predicted downward trends in population numbers or density; or 2) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on an official state list, or that are recognized by the regional forester as needing special management to prevent placement on federal or state lists.

seral: Refers to the stages that plant communities go through during the progression in structure and composition over time. Development stages have characteristic structure and plant species composition. See succession for definitions of different seral stages.

seral stage: The developmental phase of a forest stand or rangeland with characteristic structure and plant species composition.

shade intolerant: Species of plants that do not grow well in or die from the effects of too much shade. Generally, these are fire-tolerant species.

shade tolerant: Species of plants that can develop and grow in the shade of other plants. Generally, these are fire-intolerant species.

shelterwood: The cutting of most trees, leaving those needed to produce sufficient shade to produce a new age class in a moderated microenvironment.

shrubland: Area of land where the potential vegetation is dominated by shrubs.

short term: Generally refers to a period of 10 years or less.

silvicultural system: A management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified according to the method of carrying out the fellings that remove the mature crop and provide for regeneration and according to the type of forest thereby produced.

single-story: Vegetation with a single canopy layer.

site: (1)A specific location of an activity or project, such as a campground, a lake, or a stand of trees to be harvested; (2) The location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined or vanished, where the location itself maintains historical or archeological value regardless of the value of any existing structure [36CFR65] (historic or archaeological definition).

site-potential tree: The average maximum height of the tallest trees for a given site class.

snag: A standing dead tree usually greater than five feet in height and six inches in diameter at breast height (d.b.h.).

social well-being: A condition that enables citizens, communities, and visitors to contribute to their wellness, values and quality of life.

society: A group of people who have a common homeland, are interdependent, and share a common culture.

soil: The earth material that has been so modified and acted upon by physical, chemical, and biological agents that it will support rooted plants.

soil function: The characteristic physical and biological activity of soils that influences productivity, capability, and resiliency.

soil productivity: The inherent capacity of a soil to produce plant growth, due to the soil's chemical, physical, and biological properties (such as depth, temperature, water-holding capacity, and mineral, nutrient, and organic matter content). It is often expressed by some measure of biomass accumulation.

soil quality: The capacity of a soil to function within ecosystem boundaries to sustain biological productivity, maintain environmental quality, and promote plant and animal health.

soil stability: (1) Mass stability of the soil profile or resistance to mass failure; (2) stability of the soil surface with respect to accelerated sheet, rill, and gully erosion processes.

soil surveys: All soil surveys are made by examining, describing, and classifying soils in the field and delineating their areas on maps. The map scale for field mapping must be large enough to allow areas of minimum size to be delineated legibly. Recognition of the different soil survey levels is helpful for communicating about soil surveys and maps, even though the levels cannot be sharply separated from each other. The order of a survey is consequence of field procedures, the minimum size of delineation, and the kinds of map units that are used.

Order I Surveys: Are for very intensive land uses requiring very detailed information about soils, generally in small areas. The information can be used in planning for irrigation, drainage, truck crops, citrus or other specialty crops, experimental plots, individual building sites, and other uses that require a detailed and very precise knowledge of the soils and their variability.

Order II Surveys: Are for intensive land uses that require detailed information about soil resources for making predictions of suitability for use and of treatment needs. The

information can be used in planning for general agriculture, construction, urban development, and similar uses that require precise knowledge of the soils and their variability.

Order III Surveys: Are for land uses that do not require precise knowledge of small areas or detailed soils information. Such survey areas are usually dominated by a single land use and have few subordinate uses. The information can be used in planning for range, forest, recreational areas, and in community planning.

Order IV Surveys: Are for extensive land uses that need general soil information for broad statements concerning land–use potential and general land management. The information can be used in locating, comparing, and selecting suitable areas for major kinds of land use, in regional land–use planning, and in selecting areas for more intensive study and investigation.

Order V Surveys: Collect soils information in very large areas at a level of detail suitable for planning regional land use and interpreting information at a high level of generalization. The primary use of this information is selection of areas for more intensive study.

solid waste: Discarded solid waste materials resulting from mining, industrial, commercial, agricultural, silvicultural, and community activities. Does not include domestic sewage or pollutants such as silt, or dissolved materials in irrigation return flows.

source habitat: Habitat in such conditions that result in a positive or increasing population growth for a particular species. Those characteristics of vegetation that support long-term wildlife species persistence, or characteristics of vegetation that contribute to stable or positive population growth for a species in a specified area and time. Source habitats are described using dominant vegetation cover type and structural stage combinations that can be estimated reliably at the 247-acre (100-hectare) patch scale. Various combinations of these cover type–structural stages make up the source habitats for the terrestrial species discussed in this FEIS, and provide the range of vegetation conditions required by these species for food, reproduction, and other needs (Wisdom et al. 2000).

spatial: Related to or having the nature of space.

special habitat: A habitat which has a special function not provided by plant communities and successional stages. Includes riparian zones, snags, dead and downed wood, and edges (Thomas 1979).

specially designated areas: Also referred to as special areas and is one of the plan components. Areas designated because of their unique or special characteristics, such as botanical areas or areas designated by stature or administrative processes such as wilderness, wild and scenic rivers, or research natural areas.

special use authorization: A permit, term permit lease, or easement which allows occupancy, use, rights, or privileges of national forest lands (36 CFR 251.51).

special use permit: A special authorization which provides permission without conveying any interest in land, to occupy and use national forest land or facilities for specified purpose, and which is revocable, terminable and noncompensable.

species: A population or series of populations of organisms that can interbreed freely with each other but not with members of other species.

species composition: The species that occur on a site or in a successional stage of a plant community (Thomas 1979).

species diversity: The number of species occurring in a given area.

species of concern: Species for which management actions may be necessary to prevent listing under the Endangered Species Act. Criteria for selection as a species of concern include:

- Identified as candidate and proposed for listing under the Endangered Species Act.
- Has a G1 to G3 NatureServe ranking.
- Intraspecific taxa with NatureServe ranking of T1 to T3.
- Has been petitioned for listing under the Endangered Species Act.

sprouter: Flora capable of vegetative reproduction from roots or stems.

stand: A group of trees in a specific area that re sufficiently alike in composition, age, arrangement, and condition so as to be distinguishable from the forest in adjoining areas.

stand composition: The vegetative species that make up the stand.

stand density: Refers to the number of trees growing in a given area, usually expressed in trees per acre.

stand initiation (SI): Stand conditions that arise following a stand-replacing disturbance such as wildfire or timber harvest. Colonizers disperse seed into disturbed areas, the seed germinates, and new seedlings establish and develop. A single canopy stratum of tree seedlings and saplings is present. Average tree diameters are generally less than five inches.

stand-replacement fire: A fire severity classification where at least 75 percent replacement of the upper layer of vegetation is removed.

stand structure: The mix and distribution of tree sizes, layers, and ages in a forest. Some stands are all one size (single-story) some are two-story, and some are a mix of trees of different ages and sizes.

standard: A standard is a mandatory constraint on project and activity decision making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements.

state and transition model: Nonequilibrium ecological model to describe vegetation dynamics of rangeland sites as adopted by the Natural Resource Conservation Service. Models recognize multiple steady states of vegetation and emphasize disturbance processes.

strategy: Part two of a land management plan that explains the suitable uses and includes the special designated areas, and management categories.

stream channel: Refer to channel.

stream class: Classification of streams based on the present and foreseeable uses made of the water and the potential effects of on-site changes in downstream uses. Four classes are defined as:

> **class I:** Perennial or intermittent streams that provide a source of water for domestic use; are used by large numbers of anadromous fish or significant sports fish for spawning, rearing, or migration; and/or are major tributaries to the other Class I streams.
>
> **class II:** Perennial or intermittent streams that are used by fish for spawning, rearing, or migration; and/or may be tributaries to Class I streams or other Class II streams.
>
> **class III:** Other perennial streams not meeting higher-class criteria.
>
> **class IV:** Other intermittent streams not meeting higher class criteria.

stem exclusion: The stage created when vigorous, fast growing trees occupy the growing space. Establishment of new trees is precluded by a lack of sunlight or moisture. This stage could be maintained by thinning or fire. Stands only have one dominant layer. Average tree diameters range from 5 to 20 inches.

stringers: Relatively narrow areas suitable to be occupied by forested plant associations within a landscape that is otherwise unsuitable due to site or environmental factors.

stronghold: Directly associated with strong populations. For native fish, strong populations have stable numbers or are increasing, and all major life history forms that historically occurred within the watershed are present.

stocking level: The ratio of the current stand density to an assumed ideal level of stand density.

structure: (1) Any permanent building or facility, or part thereof such as barns, outhouses, residences, and storage sheds including transmission line systems, substations, commercial radio transmitters, relays or repeater stations, antennas, and other electronic sites and associated structures; or (2) the size and arrangement of vegetation, both vertically and horizontally.

structural stage: A stage of development of a vegetation community that is classified on the dominant processes of growth, development, competition, and mortality.

subalpine: A terrestrial community that generally is found in harsher environments than the montane terrestrial community. Subalpine communities are generally colder than montane and support a unique clustering of wildlife species.

subbasin: A drainage area of approximately 800,000 to 1,000,000 acres, equivalent to a 4th-field HUC watershed.

subsistence: Customary and traditional uses of wild renewable resources (plants and animals) for food, shelter, fuel, clothing, tools, etc.

subwatershed: A drainage area of approximately 20,000 acres, equivalent to a 6th-field HUC (12 digit). Hierarchically, subwatersheds (6th field HUC) are contained within watersheds (5th field HUC, which in turn are contained within a subbasin (4th field HUC).

succession: The sequential replacement over time of one plant community by another, in the absence of major disturbance. Conditions of the prior plant community or successional stage create conditions that are favorable for the establishment of the next stage. The different stages of succession are often referred to as seral stages. Developmental stages are as follows:

> **early seral:** Communities that occur early in the successional path and generally have less complex structural developmental than other successional communities. Seedling and sapling size classes are an example of early seral forests.
>
> **mid-seral:** Communities that occur in the middle of the successional path. For forests, this usually corresponds to the pole or medium sawtimber growth stages.
>
> **late-seral:** Communities that occur in the later stage of the successional path with mature, generally larger individuals, such as mature forests.

suitable habitat: Habitat that currently has both the fixed and variable stand attributes for a given species habitat requirements. Variable attributes change over time and may include seral stage, cover type and overstory canopy cover.

suitability: The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental

consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

suitable uses: Uses that are compatible with the desired conditions and objectives for a given area which are identified as guidance for project and activity decision making and do not represent a commitment or final decision approving projects or activities.

surface fire: A fire that burns surface litter, dead woody fuels, other loose debris on the forest floor, and some small vegetation without significant movement into the overstory, usually with a flame less than a few feet high.

surface water development: The practice of diverting or impounding surface water sources by the construction of dams, diversions, canals, or ditches for use, such as irrigation, livestock watering, and human consumption.

sustainability: Meeting needs of the present generation without compromising the ability of future generations to meet their needs. Sustainability is composed of desirable social, economic, and ecological conditions or trends interacting at varying spatial and temporal scales, embodying the principles of multiple-use and sustained-yield (FSM 1905).

sustained-yield of products and services: The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land.

sustainability framework: A frame of reference used within this land management plan to organize and integrate social, ecological, and economic parts of the plan with the people and places on the national forests.

T

talus: A slope formed by the accumulation of rock debris at the base of a cliff.

temporal: Related to time.

terrestrial: Pertaining to the land.

terrestrial wildlife: Wildlife species that dwell primarily on land (Thomas 1979).

thermal cover: Cover used by animals to ameliorate effects of weather; for elk, a stand of coniferous trees 40 feet or more tall with an average crown closure of 70 percent or more, for deer, cover may include saplings, shrubs, or trees at least five feet tall with 75 percent crown closure.

thermal regulation: The processes by which many animals actively maintain the temperature of all or parts of their body; the protection against local climatic extremes provided by, for example, shade produced by vegetation, protection from wind or sun, or protection from extreme cold.

thinning: An operation to remove stems from a forest for the purpose of reducing fuel, maintaining stand vigor, regulating stand density/composition, or for other resource benefits. Although thinning can result in commercial products, thinning generally refers to noncommercial operations.

threatened species: Species listed under the Endangered Species Act by either the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. These species are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

tiering: Refers to the coverage of general matters in broader environmental impact statements (such as the land management plan) with subsequent narrower statements or environmental analyses (such as an environmental impact statement or site–specific environmental assessment) incorporating, by reference, the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

timber harvest: The removal of trees for wood fiber utilization and other multiple-use purposes.

timber production: The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For purposes of this subpart, the term timber production does not include production of fuelwood.

timber sale program quantity (TSPQ): The estimated average output of timber from the plan area. It includes projected outputs from lands generally suitable for timber harvest. The projected timber outputs reflect past and projected budget levels and organizational capacity to achieve the desired conditions and objectives in the plan.

total maximum daily load (TMDL): A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. The Clean Water Act, Section 303, establishes the water quality standards and TMDL programs.

traditional cultural areas: Those areas of the forest used by Native American Indian tribes for traditional activities and often referred to as "religious use areas" or "sacred areas." They may include areas traditionally used for gathering of special forest products.

transportation facility jurisdiction: The legal right to control or regulate use of a transportation facility derived from fee title, an easement, an agreement, or other similar method. While jurisdiction requires authority, it does not necessarily reflect ownership.

travel corridors: An area of vegetation that provides completely or partially suitable habitat for animals to travel from one location to another.

travel route: A route, such as a county or national forest road or river or trail, that is open for use by members of the public.

treaty-reserved right: Tribal rights or interests reserved in treaties, by Native American Indian tribes for the use and benefit of their members. The uses include such activities as described in the respective treaty document. Only Congress may abolish or modify treaties or treaty rights.

treaty resource: A resource associated with the language in a specific treaty, usually interpreted to include collections or association of species; not limited to a single species. For example: fish may include all fish species (some treaties included rights to erect temporary houses for curing fish); roots and berries may include a wide variety of plants that will encompass the nature of the plants as they were used historically; grasses are necessarily included for the treaty reserved right to graze cattle or livestock. Hunting rights may include all species of animals hunted in historic and prehistoric times. As these apply to the Forest Service, they are public natural resources on national forest lands, to which American Indian tribes have reserved certain rights for taking or gathering.

tree decadence: Trees per acre with spiked or deformed tops, bole, or root decay.

trend: As used to define range conditions, the direction of change in range or forage condition or in ecological status.

tribe: Term used to designate any native American Indian tribe, band, nation, or other organized group or community which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

trust resource: A resource or property that constitutes a corpus or object of trust that is held in trust status by another (trustee) on behalf of a beneficiary. A trustee is usually a governmental entity (Secretary of the Interior) who is assigned a trust duty to care for resources that are for the exclusive use and benefit of Indian tribes and/or their members. A beneficiary may be an Indian tribe or individual tribal member, who has property being held in trust status, for example: land, money, timber, or any Indian-owned asset.

U

underburn: A type of prescribed fire that burns ground vegetation and ladder fuels on the surface under a live tree overstory to meet specific management and/or resource objectives.

understory: Lower vegetation in a forest, the small trees and other woody species/shrubs growing under a more–or–less continuous cover of branches and foliage formed collectively by the taller adjacent trees and other woody growth.

understory reinitiation (UR): New age classes of trees establish as the overstory trees die or are thinned and no longer occupy all of the growing space. Regrowth of understory vegetation then occurs, and trees begin to develop in vertical layers. This stage contains multiple layers and multiple tree sizes. Average tree diameters range from 5 to 20 inches.

uneven-aged management: The application of a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

> **uneven-aged management (group selection):** The group selection variant of uneven–aged management is designed to facilitate the establishment of shade intolerant species, reduce damage to the residual stand, and lengthen the cyclic entry period. The opening created under the group selection prescription would often be no larger than one to two tree heights (as influenced by aspect and slope) so as not to lose the site protection afforded by the surrounding trees. Size, shape, and location of groups should be designed to achieve landscape character goals and scenic integrity objectives.
>
> **uneven-aged management (single-tree selection):** This silvicultural system is intended to perpetuate uneven–aged stands composed of intermingled trees of differing ages, species, and sizes. Individually selected trees are removed to maintain a desired range of tree sizes over a prescribed distribution. Cyclic entries designed to control the structure and species composition and provide the openings necessary for establishment and growth of the continuously occurring regeneration are a function of the site quality and resource considerations.

ungulates: Hoofed, plant-eating mammals such as elk, deer, and cattle.

upland: The portion of the landscape above the valley floor or stream.

unroaded area: Portion of the national forest that does not contain classified roads. Refer to road.

unsuitable range: Areas of land that should not be used by livestock because of unstable soils.

utility corridor: A parcel of land, without fixed limits or boundaries that is being used as the location for one or more transportation or utility rights-of-way.

V

vascular plants: Plants that have specialized tissues which conduct nutrients, water, and sugars, along with other specialized parts such as roots, stems, and reproductive structures. Vascular plants include flowering plants, ferns, shrubs, grasses, trees, and many others.

vector: An organism that carries or transmits a pathogenic agent from one host to another.

vegetation management: Activities designed primarily to promote the health of forest vegetation in order to achieve desired results. Vegetation management is the practice of manipulating the species mix, age, fuel load, and /or distribution of wildland plant communities within a prescribed or designated area in order to achieve desired results. It includes prescribed burning, grazing, chemical applications, biomass harvesting, and any other economically feasible method of enhancing, retarding, modifying, transplanting, or removing the aboveground parts of plants.

vegetation utilization: Indicates the degree to which vegetation is consumed by animals.

vertebrate: An animal with a backbone; mammals, fishes, birds, reptiles, and amphibians are vertebrates.

viability: In general, viability means the ability of a population of a plant or animal species to persist for some specified time into the future.

viable population: A population that is regarded as having the estimated numbers and distribution of reproductive individuals to ensure that its continued existence is well distributed in the project area.

vision: Part one of a land management plan that describes the roles, contribution, and desired conditions of the national. This section also contains monitoring measures to assess progress toward the desired conditions.

W

water right: A right to use surface water or ground water evidenced by a court decree or by a permit or certificate approved by the state water resources department. Statutory exempt uses of surface water and ground water are not water rights, nor are time-limited licenses. A perfected water right is defined by applicant name, source, purpose, amount (quantity, rate and duty), season of use, priority date, point of diversion, place of use, and certificate number.

water quality: A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

watershed: (1) The region draining into a river, river system or body of water; or (2) subdivisions within a subbasin, which generally range in size from 40,000 to 250,000 acres; the fifth level (10-digit) in the hydrologic hierarchy.

watershed condition classes: Watersheds are rated as Class 1, 2, or 3.

Class 1 Condition: Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Drainage network is generally stable. Physical, chemical, and biological] conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses.

Class 2 Condition: Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.

Class 3 Condition: Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biological conditions suggest that soil, aquatic, and riparian systems do not support beneficial uses.

watershed function: The processes acting on hillslopes and stream channel within a drainage basin that control the movement of water, wood, sediment, and nutrients.

watershed integrity: The degree to which the physical and biological processes affecting the movement of water, sediment, wood, and nutrients are operating within normally expected ranges.

watershed runoff: Refer to runoff.

water yield: The amount of water that flows from a watershed within a specific period of time.

weed: A plant considered undesirable, unattractive, or troublesome, usually introduced and growing without intentional cultivation.

wetlands: Those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances do or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds (Executive Order 11990, Section 7c).

wild and scenic river (WSR): Those rivers or sections of rivers designated as such by congressional action under the Wild and Scenic Rivers Act of 1968, as supplemented and amended. Wild and scenic rivers include all national forest lands within the designated wild and scenic river corridor (15). The following classifications are used:

wild river areas: Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

scenic river areas: Those rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

recreational river areas: Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

study river areas: Those rivers formally designated by Congress to be studied under Sections 5(a) and 5(b) of the Wild and Scenic Rivers Act.

wilderness area: An area designated by congressional action under the Wilderness Act of 1964. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wildernesses are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or a primitive and unconfined type of recreation; are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

The following indented terms and definitions generally relate to the management direction for wilderness areas.

> **authorized riding or harness stock:** Any authorized animal that is ridden or harnessed to pull a wagon, cart, or other wheeled or sled-type vehicle. This includes the Equidae family (horses, mules, donkeys, asses, hinnies), and the Canidae family (dogs).
>
> **authorized pack stock:** Any authorized animal used to pack or retrieve supplies, materials, equipment, or animal parts. This includes the Equidae family (horses, mules, donkeys, asses, hinnies), the Canidae family (dogs), and the Camelidae family (camels, llamas, alpacas, vicunas, gaunacos).
>
> **unauthorized pack and riding stock:** Any animals known or suspected to exchange diseases with state-managed native, introduced, or indigenous wildlife species or animals not included as authorized pack, riding, or harness stock.
>
> **authorized pets:** Any domestic companion animal that is crated, caged, upon a leash, or otherwise under physical restrictive control. Exemptions include seeing-eye dogs, and dogs used by authorized Federal, state and local law enforcement officers in the performance of their official duties.
>
> **unauthorized pets:** Any animals known or suspected to exchange diseases with state-managed native, introduced, or indigenous wildlife species. These include animals from the genus Capra (domestic goats) or any domesticated wildlife species that are currently managed by the state.

Wilderness Recreation Opportunity Spectrum (WROS): The WROS system was developed in conjunction with the Recreation Opportunity System (ROS). The terminology is similar, although settings are described in terms of pristine, primitive, and semi-primitive settings for wilderness. The descriptions of the primitive and semi-primitive settings for WROS differ slightly from the ROS descriptions and, to avoid confusion with ROS settings, are not abbreviated as acronyms.

> **Pristine:** Visitation is very limited. Maintaining a natural and unmodified environment is emphasized. Visitors seldom and only temporarily displace wildlife throughout the year. This is the best opportunity for isolation and solitude, requiring a maximum degree of primitive skills, challenge, and risk. Access is difficult, requiring travel without trails or the use of routes created by animals or previous human visitation.
>
> **Primitive:** Visitation is limited. The environment is essentially unmodified and natural with no long-term changes to the landscape except for facilities or structures that are deemed historically important to the area or experience. Signs of human use are minimal. Visitation does not displace wildlife during critical periods. High opportunity exists for exploring and experiencing considerable isolation and solitude. Primitive recreation skills are required with

a high degree of challenge and risk. Access is via trails maintained to a "most difficult" standard.

Semi-primitive: Visitation is low to moderate. The environment is essentially unmodified and natural, with no long-term changes to the landscape, except for facilities or structures that are historically important to the area or experience. Visitation does not displace wildlife during critical periods. Moderate opportunity exists for exploring and experiencing isolation, independence, and closeness to nature. No-trace camping and primitive skills are required, with a moderate to high degree of challenge and risk. Access is via constructed and maintained trails managed to "more difficult" or "most difficult" standards.

wildfire: An unplanned, unwanted wildland fire, including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fire where the objective is to put the fire out.

wildland: A nonurban, natural area that contains uncultivated land, timber, range, watershed, brush or grassland.

wildland fire: Any nonstructure fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildfires and prescribed natural fires (USDA Forest Service 1998).

wildland fire situation analysis (WFSA): A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economic, political, and resource management objectives (USDA Forest Service 1998).

wildland fire suppression: An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland fire suppression activities provide for firefighter and public safety as the highest consideration, but minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources (USDA Forest Service 1998).

wildland fire use (WFU): Formerly referred to as "prescribed natural fire." The application of the appropriate management response to naturally ignited wildland fires to accomplish specific resource management objectives within a set of predefined conditions of fuels, weather, and topography.

wildland-urban interface (WUI): The area directly adjacent to home and communities.

windthrown: Refers to trees blown over by the wind.

winter range: The area available to and used by wildlife (big game) during the winter season. Generally, lands below 4,000 feet in elevation, on south and west aspects, that provides forage and thermal/snow intercept.

woodland: Dry, low elevation areas with a potential vegetation type of juniper.

X

xeric: Very dry region or climate; tolerating or adapted to dry conditions. Dry soil moisture regime. Some moisture is present but does not occur at optimum levels for plant growth. Irrigation or summer fallow is often necessary for crop production.

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Appendix to the Draft Environmental Impact Statement

Proposed Revised Land Management Plans for the Malheur, Umatilla, and Wallowa-Whitman National Forests

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Appendix A: Blue Mountains Forest Plan Revision Alternatives Analyzed in Detail

The alternatives were developed based on public involvement both during and prior to the scoping period for the proposed action and based on the purpose and need and issues. The alternatives present a range of analysis options, as required by National Environmental Policy Act (NEPA) regulations (40 CFR 1502.14).

NEPA requires an analysis of the no-action alternative (40 CFR 1502.14(d)). No action means that there would be no change in current management (FSH 1909.15(14.2)). Alternative A is the no-action alternative. This alternative would keep in effect the 1990 forest plans as amended and as modified by regulation.

The action alternatives modify elements of the 1990 forest plans to respond to new scientific information, management challenges, changed conditions, and the significant issues developed from public comments.

The alternatives provide a framework for analyzing different ways of meeting the purpose and need of the forest plans and for addressing the issues identified during the scoping period (chapter 1). These alternatives show a range of options for guiding land and resource management activities within the national forests of the Blue Mountains within the life of these plans. According to the National Forest Management Act of 1976, forest plans shall be revised at least every 15 years (P.L. 94-588).

There are six alternatives that will be analyzed in detail in the DEIS. In this document, alternative A, the no-action alternative, is described in Part 1—No-action Alternative Description. Part 2—Comparison of the Action Alternatives contains the description of alternatives B through F, the action alternatives. All alternatives incorporate material into the environmental impact statement by reference when the effect will be to cut down on bulk without impeding agency and public review of the action. The incorporated material shall be cited in the statement and its content briefly described (§1502.21).

Organization of the Forest Plan

The proposed draft revised plan includes “plan decisions” and “other content”. Once approved, any substantive changes to plan decisions will require a plan amendment. A change to other content may be made using an administrative correction process, whereby nonsubstantive errors, such as misspellings or typographical mistakes are corrected, or information (e.g., data and maps) is updated. The public is notified of all plan amendments and administrative corrections before they become effective.

Forest Plan Components

Forest plan component consist of goals and desired conditions, standards, guidelines, objectives, special areas, management areas, suitable uses and activities, and monitoring and evaluation.

The goals create the framework for the plan. Under each goal, there is a set of desired conditions, standards, guidelines and objectives. The goals and desired conditions are a set of interrelated ecological, social, and economic conditions. The Forests will manage the land and resources of the planning area to achieve or maintain the goals and desired conditions; allowing the national forests to contribute to a range of outcomes now and in the future. This emphasis on integration of the goals and desired conditions promotes an adaptive and active management philosophy, including working with partners, to accomplish this vision for the Blue Mountains.

The following goals and desired conditions explain the conditions, processes, and relationships that the Forest Service will seek to achieve. Some conditions may already exist. Some are achievable during the life of the forest plan. Others may take a longer period, possibly decades. Making progress toward achieving the goals and desired conditions will depend on funding and program direction provided by higher levels in the agency and Congress, as well as natural events.

Appendix A does not repeat the background and existing condition information provided in the forest plan. Each desired condition is associated with a brief background description and a brief existing condition description of each indicator, and statement of scale. Provided as information only, the background and existing condition descriptions are not plan direction.

Management actions that cause movement away from achieving goals and desired conditions in the short term are acceptable as long as the forests achieve or maintain the desired conditions in the long term.

Many desired conditions were derived from national fire regime condition class (FRCC) information, vegetation dynamics development tool (VDDT) modeling (ESSA Technologies Ltd. 2005), national Landfire modeling, collaborative workshops, and professional experience informed by estimates of historic range of variability (HRV).

Desired conditions set forth the desired social, economic, and ecological attributes of the three National Forests. They attempt to paint a picture of what we (the public and Forest Service) desire the forests to look like and/or the goods and services we desire them to provide. Desired conditions are broad expressions in general terms and are timeless in that there is no specific date by which they are to be completed. Desired conditions may only be achievable over a long timeframe (in some cases, several hundred years). In some cases, a desired condition matches the current condition, and the goal is to maintain it. Desired conditions are aspirations and are not commitments or final decisions to approve projects.

To be consistent with the desired conditions of the plan in assessing a project or activity, at the appropriate spatial scale described in the plan (e.g., landscape scale), each project or activity must be designed to meet one or more of the following conditions:

- Maintain or make progress toward one or more of the desired conditions of a plan without adversely affecting progress toward, or maintenance of, other desired conditions; or
- Be neutral with regard to progress toward plan desired conditions; or
- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward or maintenance of one or more desired conditions in the short term; or

- Maintain or make progress toward one or more of the desired conditions over the long term, even if the project or activity would adversely affect progress toward other desired conditions in a negligible way over the long term.

The project documentation should explain how the project is consistent with desired conditions and describe any short-term or negligible long-term adverse effects the project may have on the maintenance or attainment of any desired condition.

The desired conditions may apply at a forestwide **scale**, but many apply at a particular **scale**, such as at the subbasin, watershed or subwatershed. A subbasin refers to a 4th level Hydrologic Unit Code (HUC), which is generally about 450,000 acres in size. A watershed refers to a 5th level HUC, which generally range from 40,000 to 250,000 acres in size. A subwatershed refers to a 6th level HUC, which generally ranges from 10,000 to 40,000 acres in size.

Objectives are concise, time-specific statements of measurable planned results that make progress towards or maintain desired conditions (table A-48 through table A-50). An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving desired conditions. The objectives represent just some of the expected outcomes or actions required for the Forest to make progress towards desired conditions. The plan only identifies the primary objectives (actions) that the three National Forests will initiate.

Variation in achieving objectives may occur during the life of the plans because of changes in environmental conditions, available budgets, and other factors. Influences on objectives include recent trends, past experiences, anticipated staffing levels, and budget projections.

A project or activity is consistent with the objectives of the plan if it contributes to or does not prevent the attainment of any desired conditions that apply to it. The project documentation should identify any applicable objective(s) to which the project contributes and document that the project does not prevent the attainment of any objectives. If there are no applicable objectives, the project must be consistent with the objectives identified in the plan, and the project document should state that fact.

Standards are constraints upon project and activity decision-making. The design of projects and activities absolutely must meet the standard requirement. A project or activity is consistent with a standard when its design is in accord with the explicit provisions of the standard; a plan amendment is the only way to vary from a standard. The standards are identified in table A-54.

Guidelines are components with which a project or activity must be consistent, in either of two ways:

- The project or activity is designed exactly in accord with the guideline; or
- The project or activity design varies from the exact words of the guideline, but is as effective in meeting the purpose of the guideline to contribute to the maintenance or attainment of the relevant desired conditions and objectives.

The design of projects and activities must follow guideline requirements; however, modification may occur for a specific project if the intent of the guideline is followed and the deviation is addressed in a decision document with supporting rationale. When deviation from a guideline does not meet the original intent, however, a plan amendment is required. The guidelines are identified in table A-54.

Special areas are lands that have designations by Congress or another delegated authority. Special areas are designated because of their unique or special characteristics. Special areas establishment may occur at the national level either through legislation (Congressional designation) or at the regional or local level through administrative action (administrative designation). The forest plan may recommend the establishment of new special areas. This plan provides direction for the following special areas: scenic byways and All-American roads, national designated trails, eligible and suitable wild and scenic rivers, scenic areas, botanical areas, geological areas, historical areas, Starkey experimental forest and range, research natural areas, and recommended and designated wilderness and wilderness study areas.

Where the plan provides plan decisions specific to a special area, a project or activity must be consistent with those area-specific decisions. The project documentation should describe how the project or activity is consistent with the area-specific decisions of the plan. Special areas are described in the desired conditions. There may be standards or guidelines identified for particular special areas. The acres allocated to each special area are identified in table A-1 and table A-40 through table A-43.

Management areas are spatially distinct areas with a unique set of plan components. The management areas range along a continuum from little development by humans in MA 1A to extensive human development in MA 5 (table A-1 and table A-40 through table A-43). The types of uses and desired settings define the land use that would occur in them under the revised forest plans. They occur across districts, mountain ranges, and ecosystems but have commonalities that make their overarching land uses similar.

Suitability describes the appropriateness of applying certain resource management practices (uses) to a particular area of land (table A-44 through table A-47). A unit of land may be suitable for a variety of individual or combined uses.

A project with the purpose of timber production may only occur in an area identified as suitable for timber production [16 U.S.C. 1604(k)]. The documentation for the project should confirm the project area meets the suitability requirements.

Except for projects with a purpose of timber production, a project or activity can be consistent with plan suitability determinations in either of two ways:

- The project or activity is a use identified in the plan as suitable for the location where the project or activity is to occur; or
- The project or activity is not a use identified in the plan as suitable for the location (the plan is silent on the use or the plan identifies the use as not suitable), but the responsible official determines that the use is appropriate for that location's desired conditions and objectives.

The project documentation should describe that the project or activity is either (1) considered suitable according to the plan, or (2) not considered suitable in the plan but nonetheless appropriate for that location.

Monitoring and evaluation consists of key element monitoring that will occur as implementation of the forest plan progresses (i.e., future site-specific actions; table A-57). Monitoring is part of an adaptive management process that measures the performance of plan implementation against the goals, desired conditions and objectives to which it aspires. It also evaluates whether implementation of standards and guidelines are producing the desired results.

Part 1: No-action Alternative Description

How the Alternative was Developed

The no-action alternative is required by the National Environmental Policy Act (NEPA). It is considered in detail in the environmental analysis in accordance with FSH 1909.15. It provides a baseline for comparison of the alternatives. No action means that management allocations, activities, and management direction described in the existing forest plans (as amended and as modified by regulation) continues for the next 15 years.

The Malheur, Umatilla, and Wallowa-Whitman National Forest Land and Resource Management Plans (forest plans) were signed in 1990. The Ochoco National Forest Land and Resource Management Plan was signed in 1991. There is a portion of the Ochoco is administered by the Malheur as one unit. All of the forest plans initially placed an emphasis on the production of wood products using even-aged regeneration harvest. The assumptions made in the forest plans were that ecological conditions were healthy and would remain so and that disturbances (such as fire, insects, and disease) would not substantially affect planned actions, desired outcomes, or outputs. Significant changes in this direction occurred in 1995 when the following three amendments were incorporated into the forest plans.

PACFISH

The decision supporting the environmental assessment for the “Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California” (USDA and USDI 1995a), commonly referred to as PACFISH, amended the forest plans to include management direction to slow the degradation of and begin the restoration of aquatic and riparian ecosystems for anadromous fish.

Inland Native Fish Strategy

The decision supporting the Environmental Assessment for the “Inland Native Fish Strategy, Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and Portions of Nevada” (USDA and USDI 1995b), commonly referred to as INFISH, amended the forest plans to include management direction, as a companion to the protection provided for anadromous fish by PACFISH, providing interim direction to protect habitat and populations of resident native fish outside of anadromous fish habitat.

These two amendments require the establishment of riparian habitat conservation areas (RHCAs) and riparian management objectives (RMOs), and focus on restoration of aquatic and riparian areas as habitat for native fish species. They provide substantial protection to fish species listed as threatened or endangered under the Endangered Species Act and their habitats by maintaining quality habitat where it exists and reducing risks to habitat and species over the short term.

Eastside Screens

In 1994, the Forest Service Pacific Northwest Region regional forester issued “Interim Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales on Eastside Forests” (USDA Forest Service 1995c), commonly referred to as the Eastside Screens. It amended the 1990 forest plans by establishing riparian, ecosystem, and wildlife standards for timber sales.

The Eastside Screens amendment emphasizes retaining and developing late old forest structures and patch sizes within the historic range of variability; maintaining or developing linkages

between old forests; meeting requirements for snags, downed logs, and green tree replacements; and retaining most trees greater than 21 inches in diameter.

Although these three amendments resulted in substantial changes to the direction in existing plans, objectives for timber harvest and allowable sale quantity (ASQ) were not adjusted. This summary of the no-action alternative updates the ASQ and some objectives for all forest plans using the amended direction.

Lands administered implementing the 1990 forest plans are intended to provide a mix of natural resource-based goods and services. Management direction focuses on providing sustained levels of resource output, including timber and wood products, livestock forage, big game, and minerals in an environmentally sound manner, while also providing other uses and values such as scenery, recreation opportunities, viewable wildlife, and clean air and water. Portions of the landscape are used for commodity production, while some portions are allocated to wilderness areas, scenic areas, and research natural areas, among others.

Management Area Acres

Management areas, such as botanical areas, historical areas, etc., are not consistently described or identified in the three forest plans. While not all national forests have the same types of special areas, in general they have similar management expectations across large areas.

For purposes of comparing acres, the current management areas have been put into the same categories as alternatives B through F. The crosswalk showing how the current management areas were assigned to this scheme is in the analysis file and is available upon request. The tables showing the acres by management area for alternatives B through F are in Part 2—Comparison of the Action Alternatives.

Table A-1 does not include the Hells Canyon National Recreation Area (HCNRA). The HCNRA Comprehensive Management Plan (CMP) is part of the Wallowa-Whitman National Forest Land and Resource Management Plan and guides management of the HCNRA. This plan carries forward in its entirety the HCNRA CMP, which was updated in 2003. Table A-1 displays the portion of the Ochoco administered by the Malheur as part of the Malheur.

The management area acres displayed in Table A-1 are from the 1990 forest plans and have not been recalculated using the most current GIS technology. Adding the acreages in table A-1 will not produce a sum equal to the total acreage for each national forest because of overlapping management areas. The overlapping management areas result in the total acreage of all management areas being greater than the official national forest acreages. For example, several research natural areas (MA 2B) and wild and scenic rivers (MA 2A) overlap into congressionally designated wilderness areas (MA 1A).

Table A-1. Management area designation, name, and acreage by national forest for alternative A (note: 2F and 2G units are miles) based on 1990 forest plan

Management Area Designation and Name	Malheur	Umatilla	Wallowa-Whitman**
1A – Congressionally Designated Wilderness Areas	82,557	304,173	373,676*
1B – Preliminary Administratively Recommended Wilderness Areas	0	0	0
1C – Wilderness Study Area	0	0	2,350
2A – Wild and Scenic River (Includes Designated, Eligible, and Suitable Rivers	10,807	6,926	21,936
2B – Research Natural Areas	3,426	8,396	2,635
2C – Botanical Areas	30	817	0
2D – Geological Areas	40	416	0
2E – Historical Areas	0	1,178	0
2F – Scenic Byways and All-American Roads (miles)	0	0	0
2G – Nationally Designated Trails (miles)	0	0	0
2H – Scenic Areas	14,399	31,109	0
2I – Starkey Experimental Forest and Range	0	0	27,251
2J – Municipal Watersheds	519	12,581	0
3A – Backcountry (nonmotorized use)	47,535	29,760	0
3B – Backcountry (motorized use)	14,652	11,909	119,938
3C – Wildlife Corridor	0	0	0
4A – General Forest/Timber/Range	851,877	296,180	734,500
4A – General Forest/Timber/Range (excludes 4B RHCA)	798,021	255,898	612,820
4B – Riparian Management Areas (no RHCAs)	34,893	25,076	0
4B – RHCA (within 4A)	53,700	44,700	121,683
4B – RHCA (All)	168,545	237,514	360,123
4C – Old Forest	84,232	44,277	60,285
4D – Big Game Winter/Summer Range	293,453	130,215	396,703
4E – General Wildlife/Fish	50,741	430,166	60,326
4F - Visuals	217,328	65,775	4,287
5 – Developed Sites and Administrative Areas	647	4,922	7,111

*Wallowa-Whitman National Forest private inclusions are included in the acre totals for congressionally designated wilderness areas.

**In addition, this table does not include acreage for the HCNRA. This plan carries forward in its entirety the HCNRA CMP which was updated in 2003. The HCNRA CMP is the portion of the Wallowa-Whitman National Forest Land and Resource Management Plan that guides management of the HCNRA.

1990 Forest Plans Management Direction for Specific Resources

The forest plans for the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests are available in their entirety on the Blue Mountains Forest Plan Revision portion of the Wallowa-Whitman National Forest website.[2] The portions of the forest plans described here are highlights of direction for riparian and aquatic resources, old forest, invasive species, wildlife habitat (and more specifically elk habitat), timber, and rangeland management.

Management Direction for Riparian and Aquatic Resources

The current direction for the management of riparian and aquatic resources is found in the following strategies, which were amended to all three forest plans in 1995:

- Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH)
- Interim Strategies for Managing Inland Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (INFISH)

The following section displays PACFISH and INFISH direction.

Many of the PACFISH and INFISH standards and guidelines are procedural, requiring coordination with other agencies, conducting inventories or assessments, or requirements to modify or establish specific permits or operating plans. Standards and guidelines are generally limitations on activities or uses for reasons of environmental protection, public safety and risk reduction, or to achieve goals and desired conditions.

PACFISH and INFISH Management Direction (General)

Objective. Restore watersheds to reverse or arrest adverse impacts to water quality and fish habitat. Areas where fish habitat(s) or water quality has been adversely affected shall be given high priority for corrective treatments that mitigate impacts or rehabilitate these areas.

Objective. Provide and maintain a diverse, well-distributed pattern of fish habitat to increase anadromous and inland native fish runs. For example:

- Meet state water quality standards for stream temperature and streamside vegetation;
- Maintain sufficient large woody debris to provide for continuous long-term supply in all channels;
- Promote bank, floodplain, and channel stability to provide resilience to disturbance and foster aquatic diversity; and
- Provide pools that are large, well distributed and persistent during low flows, and conserve or restore channel morphology appropriate to the climate and landform.

Guideline. Practices that maintain or promote sufficient residual vegetation and appropriate channel morphology and functions can be used to maintain, improve, or restore riparian and wetland functions.

[2] http://www.fs.usda.gov/goto/BlueMtnsPlanRevision

Objective. Achieve riparian and wetland area improvement and maintenance through management of existing uses, wherever feasible.

Objective. Limit or mitigate surface disturbance in floodplains, riparian areas, and aquatic habitats to prevent soil movement, loss, and sedimentation.

PACFISH and INFISH Aquatic Habitat and Watershed Direction

Objective. Manage and provide aquatic habitat to contribute to the maintenance of stocks of anadromous and inland native fish and to ensure consistent, effective, and efficient Endangered Species Act consultation.

Objective. Provide protection for all watersheds containing designated critical habitat for listed anadromous fish (Key Watersheds).

Objective. Provide a pattern of protection across the landscape with an emphasis on federally listed fish. Include watersheds that have strong assemblages, degraded watersheds with a high restoration potential, and watersheds that provide for meta-population objectives (Priority Watersheds).

Objective. Improve current conditions of watersheds by restoring degraded habitat and providing long-term protection to riparian and aquatic resources.

PACFISH and INFISH Livestock Grazing in RHCAs

Standard GM-1. Modify grazing practices (for example, accessibility of riparian areas to livestock, length of grazing season, stocking levels, timing of grazing) that retard or prevent attainment of RMOs or are likely to adversely affect aquatic resources. Suspend grazing if adjusting practices is not effective in meeting RMOs.

Standard GM-2. New livestock handling and/or management facilities shall be located outside of RHCAs. For existing livestock handling facilities inside RHCAs, assure that facilities do not prevent attainment of RMOs. Relocate or close facilities where these objectives cannot be met.

Standard GM-3. Limit livestock trailing, bedding, watering, loading, salting, and other handling efforts to those areas and times that would not retard attainment of RMOs or adversely affect aquatic resources.

Standard GM-4. Adjust wild horse and burro management to avoid impacts that prevent attainment of RMOs or adversely affect aquatic resources.

PACFISH and INFISH Timber Management in RHCAs

Standard TM-1. Prohibit timber harvest, including fuelwood cutting, in Riparian Habitat Conservation Areas (RHCAs), except as described below. Do not include RHCAs in the land base used to determine the Allowable Sale Quantity; however, any volume harvested can contribute to the timber sale program.

a) Where catastrophic events such as fire, flooding, volcano, wind, or insects cause damage that results in degraded riparian conditions, allow salvage and fuel cutting in RHCAs only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other riparian management objectives (RMOs), and where adverse effects can be avoided to aquatic resources. Ecosystem Analysis at the Watershed Scale shall be completed prior to harvest, including salvage and fuel wood cutting, in RHCAs.

b) Apply silvicultural practices for RHCAs to acquire desired vegetation characteristics where needed to attain RMOs. Apply silvicultural practices in a manner that does not retard attainment of RMOs and that avoids adverse effects on aquatic resources.

PACFISH and INFISH Fire Management in RHCAs

Standard FM-1. Design fuel treatment and fire suppression strategies, practices, and actions so as to not prevent attainment of RMOs and to minimize disturbances of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem function or aquatic resources.

Standard FM-2. Locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of RHCAs. If the only suitable location for such activities is within the RHCAs, an exemption may be granted following a review and recommendation by a resource advisor. The advisor would prescribe the location, use conditions, and rehabilitation requirements, with avoidance of adverse effects to aquatic resources a primary goal. Use an interdisciplinary team, including a fishery biologist, to predetermine incident base and helibase locations during pre-suppression planning.

Standard FM-3. Prohibit delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following a review and recommendation by a resource advisor and a fishery biologist, when the action agency determines an escaped fire would cause more long-term damage to fish habitats than chemical delivery to surface waters.

Standard FM-4. Prescribed burn projects and prescriptions should be designed to contribute to the attainment of the RMOs.

Standard FM-5. Immediately establish an emergency team to develop a rehabilitation treatment plan to attain RMOs and avoid adverse effects on aquatic resources whenever RHCAs are significantly damaged by a wildfire or a prescribed fire is burning out of prescription.

PACFISH and INFISH Road Management in RHCAs

Standard RF-1. Cooperate with federal, tribal, state, and county agencies and cost-share partners to achieve consistency in road design, operation, and maintenance necessary to attain RMOs.

Standard RF-2. For each existing or planned road, meet the RMOs and avoid adverse effects on aquatic resources as described below:

a) Ecosystem Analysis at the Watershed Scale shall be completed prior to construction of new roads or landings in RHCAs.

b) Road and landing locations in RHCAs shall be minimized.

c) Initiate development and implementation of a Road Management Plan or a Transportation Management Plan.

   At a minimum, the plan shall address the following items:
   - Road design criteria, elements, and standards that govern construction and reconstruction.
   - Road management objectives for each road.
   - Criteria that govern road operation, maintenance, and management.
   - Requirements for pre-, during-, and post-storm inspections and maintenance.

- Regulation of traffic during wet periods to minimize erosion and sediment delivery and accomplish other objectives.
- Implementation and effectiveness of monitoring plans for road stability, drainage, and erosion control.
- Mitigation plans for road failures.

d) Avoid sediment delivery to streams from the road surface. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is infeasible or unsafe. Route road drainage away from potentially unstable stream channels, fills, and hillslopes.

e) Avoid disruption of natural hydrologic flow paths.

f) Avoid side casting of soils or snow. Side casting of road material is prohibited on road segments within or abutting RHCAs.

Standard RF-3. Determine the influence of each road on RMOs. Meet RMOs and avoid adverse effects on aquatic resources by:

a) Reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards that have been shown to be less effective than designed for controlling sediment delivery, that retard attainment of RMOs, or that do not protect watersheds from increased sedimentation.

b) Prioritizing reconstruction based on the current and potential damage to aquatic resources and their watersheds, the ecological value of the riparian resources affected, and the feasibility of options such as helicopter logging and road relocation out of RHCAs.

c) Closing and stabilizing or obliterating and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to aquatic resources in watersheds and the ecological value of the riparian resources affected.

Standard RF-4. Construct new and improve existing culverts, bridges, and other stream crossings to accommodate a 100-year flood, including associated bedload and debris, where those existing structures would or do pose a substantial risk to riparian conditions. Such improvements should include those structures that do not meet design and operation maintenance criteria that have been shown to be less effective than designed for controlling erosion, or that retard attainment of RMOs. Priority for upgrading shall be based on risks and the ecological value of the riparian resources affected. Construct and maintain crossings to prevent diversion of stream flow out of the channel and down the road in the event of crossing failures.

Standard RF-5. Provide and maintain fish passage at all crossings of existing and potential fish-bearing streams.

Standard RF-6. Develop and implement a road management plan or a transportation management plan that will meet the RMOs.

PACFISH and INFISH Minerals Management in RHCAs

Standard MM-1. Avoid adverse impacts to listed species and designated critical habitat from mineral operations. If the Notice of Intent indicates that a mineral operation would be located in an RHCA and could affect attainment of RMOs or could adversely affect listed anadromous fish, then require a reclamation plan, approved Plan of Operations (or other such governing document), and reclamation bond. For effects that cannot be avoided, such plans and bonds must

address the following items to attain RMOs and avoid adverse effects on listed anadromous fish: the costs of removing facilities, equipment, and materials; recontouring disturbed areas to approximate pre-mining topography; isolating and neutralizing or removing toxic or potentially toxic materials; salvage and replacement of topsoil; and seedbed preparation and re-vegetation. Ensure Reclamation Plan contain measurable attainment and bond release criteria for each reclamation activity.

Standard MM-2. Locate structures, support facilities, and roads outside RHCAs. Where no alternative to siting facilities in RHCAs exists, locate and construct the facilities in ways that avoid impacts to RHCAs and streams and that avoid adverse effects on aquatic resources. Where no alternative to road construction exists, keep roads to the minimum necessary for the approved mineral activity. Close, obliterate, and re-vegetate roads no longer required for mineral or land management activities.

Standard MM-3. Prohibit solid and sanitary waste facilities in RHCAs. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in RHCAs exists, and if releases can be prevented and stability can be ensured, then:

a) Analyze the waste material using the best conventional sampling methods and analytic techniques to determine its chemical and physical stability characteristics.

b) Locate and design the waste facilities using the best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, prohibit such facilities in RHCAs.

c) Monitor waste and waste facilities to confirm predictions of chemical and physical stability, and make adjustments to operations as needed to avoid adverse effects to aquatic resources and to attain RMOs.

d) Reclaim and monitor waste facilities to assure chemical and physical stability and re-vegetation, to avoid adverse effects to aquatic resources, and to attain the RMOs.

e) Require reclamation bonds adequate to ensure long-term chemical and physical stability and successful re-vegetation of mine waste facilities.

Standard MM-4. For leasable minerals, prohibit surface occupancy within RHCAs for oil, gas, and geothermal exploration and development activities where contracts and leases do not already exist, unless there are no other options for location and RMOs can be attained and adverse effects to aquatic resources can be avoided. Adjust the operating plans of existing contracts to (1) eliminate impacts that prevent attainment of RMOs and (2) avoid adverse effects to native aquatic species.

Standard MM-5. Permit sand and gravel mining and extraction within RHCAs only if no alternatives exist, if the action(s) will not retard or prevent attainment of RMOs, and if adverse effects to native aquatic species can be avoided.

Standard MM-6. Develop inspection, monitoring, and reporting requirements for mineral activities. Evaluate and apply the results of inspection and monitoring to modify mineral plans, leases, or permits as needed to avoid adverse effects on native aquatic species and to eliminate impacts that prevent attainment of RMOs.

PACFISH and INFISH Hydro and Surface Water Projects in RHCAs (Lands)

Standard LH-1. For hydroelectric and other surface water development proposals, require instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage, reproduction, and growth. Coordinate this process with the appropriate state agencies. During relicensing of hydroelectric projects, provide to the Federal Energy Regulatory Commission (FERC) written and timely license conditions that require fish passage and flows and habitat conditions that maintain/restore riparian resources and channel integrity. Coordinate relicensing projects with the appropriate state agencies.

Standard LH-2. Locate new hydroelectric ancillary facilities outside RHCAs. For existing ancillary facilities inside the RHCA that are essential to proper management, provide recommendations to FERC to assure that the facilities would not prevent attainment of the RMOs and that adverse effects on aquatic resources are avoided. Where these objectives cannot be met, proved recommendations to FERC that such ancillary facilities should be relocated. Locate, operate, and maintain hydroelectric facilities that must be located in RHCAs to avoid adverse effects on aquatic resources.

Standard LH-4. Use land acquisition, exchange, and conservation easements to meet RMOs and facilitate restoration of fish stocks and other species at risk of extinction.

PACFISH and INFISH Leases and Permits in RHCAs

Standard LH-3. Issue leases, permits, rights-of-way, and easements to avoid adverse effects on aquatic resources and to avoid effects that would be inconsistent with or prevent attainment of RMOs. Where the authority to do so was retained, adjust existing leases, permits, rights-of-way, and easements to eliminate effects that would retard or prevent attainment of the RMOs or adversely affect aquatic resources. If adjustments are not effective, eliminate the activity. Where the authority to adjust was not retained, negotiate to make changes in existing leases, permits, rights-of-way, and easements to eliminate effects that would prevent attainment of the RMOs or adversely affect aquatic resources. Priority for modifying easements would be based on the current and potential adverse effects on aquatic resources and the ecological value of the riparian resources affected.

PACFISH and INFISH Fuel, Pesticides, and Herbicides in RHCAs

Standard RA-3. Apply herbicides, pesticides, and other toxicants and chemicals in a manner that does not retard or prevent attainment of RMOs and that avoids adverse effects on aquatic resources.

Standard RA-4. Prohibit storage of fuels and other toxicants within RHCAs. Prohibit refueling within RHCAs unless there are no other alternatives. Refueling sites within RHCAs shall be approved by the Forest Service or Bureau of Land management and have an approved spill containment plan.

Standard RA-5. Locate water drafting sites to avoid adverse effects on aquatic resources and instream flow and in a manner that does not retard or prevent attainment of RMOs.

PACFISH and INFISH Recreation in RHCAs

Standard RM-1. Design, construct, and operate recreation facilities (including trails) and dispersed sites in a manner that does not retard or prevent attainment of RMOs and avoids effects on aquatic resources.

Complete Ecosystem Analysis at the Watershed Scale prior to construction of new recreation facilities in RHCAs.

For existing recreation facilities inside RHCAs, assure that facilities or use of facilities will not prevent attainment of RMOs or adversely affect native aquatic species. Relocate or close recreation facilities where RMOs cannot be met or adverse effects on aquatic resources cannot be avoided.

Standard RM-2. Adjust dispersed and developed recreation practices that retard or prevent attainment of RMOs or adversely affect aquatic resources. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific sites closures are not effective in meeting RMOs and avoiding adverse effects on aquatic resources, eliminate the practice or occupancy.

PACFISH and INFISH Watershed and Habitat Restoration in RHCAs

Standard WR-1. Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and contributes to attainment of RMOs.

Standard WR-2. Cooperate with Federal, State, local, and Tribal agencies, and private landowners to develop watershed-based Coordinated Resource Management Plans (CRMPs) or other cooperative agreements to meet RMOs.

Standard WR-3. Do not use planned restoration as a substitute for preventing habitat degradation (i.e., use planned restoration only to mitigate existing problems, not to mitigate the effects of proposed activities).

Standard FW-1. Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of the RMOs.

Standard FW-2. Design, construct, and operate fish and wildlife interpretive and other user-enhancement facilities in a manner that does not retard or prevent attainment of RMOs or adversely affect aquatic resources. For existing fish and wildlife interpretive and other user-enhanced facilities inside RHCAs, assure that RMOs are met and adverse effects on aquatic resources are avoided. Where RMOs cannot be met or adverse effects on aquatic resources avoided, relocate or close such facilities.

Standard FW-3. Cooperate with Federal, tribal, and State wildlife management agencies to identify and eliminate wild ungulate impacts that prevent attainment of the RMOs or adversely affect listed anadromous and inland native fish.

Standard FW-4. Cooperate with Federal, tribal, and State wildlife management agencies to identify and eliminate wild adverse effects on native anadromous and inland fish associated with habitat manipulation, fish stocking, fish harvest, and poaching.

Standard RA-1. Identify and cooperate with Federal, tribal, State, and local governments to secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

Standard RA-2. Trees may be felled in RHCAs when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives.

PACFISH and INFISH Riparian Habitat Conservation Area Widths Descriptions

Riparian Area Minimum Widths

Fish-bearing Streams

Interim RHCAs consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.

Permanently-flowing Non-fish Bearing Streams

Interim RHCAs consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.

Constructed Ponds, Reservoirs, and Wetlands Greater than 1 Acre

Interim RHCAs consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs, or from the edge of the wetland, pond or lake, whichever is greatest.

Lakes and Natural Ponds

Same as constructed ponds, reservoirs, and wetlands greater than 1 acre.

RHCAs: Seasonally flowing or intermittent streams, wetlands smaller than 1 acre, landslides, and landslide-prone areas.

RMAs: Seasonally flowing, intermittent and ephemeral streams, wetlands smaller than 1 acre, and unstable areas

This category applies to features with high variability in size and site-specific characteristics. At a minimum, the RHCAs should include:

a) The extent of landslides and landslide-prone areas

b) The intermittent stream channel and the area to the top of the inner gorge.

c) The intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation.

d) For priority watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest.

e) For watersheds not identified as Priority Watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one-half site-potential tree, or 50 feet slope distance, whichever is greatest.

Non-forested Rangeland Ecosystems

The Interim RHCA width for permanently flowing streams in categories 1 and 2 is the extent of the 100-year flood plain.

Table A-2. PACFISH and INFISH interim riparian management objectives

Habitat Feature		Riparian Management Objectives								
Water Temperature		No measurable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period). Maximum water temperatures below 59F within adult holding habitat and below 48F within spawning and rearing habitats.								
Large woody debris (forested systems)		East of Cascade Crest in Oregon, Washington, Idaho: > 20 pieces per mile; > 12 inch diameter; > 35 foot length								
Bank Stability (nonforested systems)		> 80% stable								
Lower Bank Angle (nonforested systems)		> 75% of banks with < 90 degree angle								
Width/Depth Ratio (all systems)		< 10, mean wetted depth divided by mean depth								
Pool Frequency	Wetted width (feet)	10	20	25	50	75	100	125	150	200
	Pools per mile	96	56	47	26	23	18	14	12	9

Management Direction for Old Forest

All three forest plans designate management areas for old growth. None of the 1990 forest plans allow scheduled timber harvest in designated old growth management areas.

For areas outside of designated old growth management areas, the following direction applies.

Current direction for timber sales includes “Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales” (Eastside Screens), which was amended into the three forest plans in 1995 (USDA and USDI 1995b). The Eastside Screens requirements are shown on the following page.

The following activities are not subject to Eastside Screens direction:

- Personal use firewood sales
- Post and pole sales
- Sales to protect health and safety
- Sales to modify vegetation within recreation special use areas

The following sales are not subject to the historic range of variability analysis, but must apply wildlife standards:

- Pre-commercial thinning sales
- Sales of material sold as fiber
- Sales of dead material less than 7 inches d.b.h., with incidental green volume

- Salvage sales, with incidental green volume, located outside currently mapped old-growth
- Commercial thinning and understory removal sales located outside currently mapped old-growth

All other sales are subject to the historic range of variability analysis. The historic range of variability is a way of characterizing the landscape for patterns of stand structure by biophysical environment and comparing them to pre-settlement conditions.

Eastside Screens Requirements

1. DETERMINE the historic range of variability:
   - ♦ describe the dominant historical disturbance regime
   - ♦ characterize the landscape pattern and abundance of structural stages maintained by the disturbance regime
   - ♦ describe spatial pattern and distribution of structural stages under the Historic Range of Variability disturbance regime
   - ♦ map the current pattern of structural stages AND calculate their abundance by biophysical environmental setting
2. CHARACTERIZE the proposed timber sale and its associated watershed for patterns of stand structure by biophysical environment within a watershed and compare to the historic range of variability.

Scenario A: WHERE either late/old structure (LOS), single story, or multi-story falls BELOW HRV, NO NET LOSS of LOS from that biophysical environment. DO NOT ALLOW timber sale harvest activities to occur within LOS stages that are BELOW HRV.

3. Some timber sale activities can occur WITHIN the LOS multi-story stages that are AT or ABOVE the historic range of variability in a manner to MAINTAIN or ENHANCE LOS within that biophysical environment. It is ALLOWABLE to manipulate one type of LOS to move stands into the LOS stage that is DEFICIT (LOS multi to LOS single), if this meets historical conditions.
4. OUTSIDE LOS, many types of timber sale activities are ALLOWED. The intent is still to maintain and/or enhance LOS components in stands subject to timber harvest as much as possible, by adhering to the following standards:
   a. MAINTAIN ALL remnant late and old seral (LOS) and/or structural live trees ≥ 21" d.b.h. that currently exist within stands proposed for harvest activities;
   b. MANIPULATE vegetative structure that does not meet LOS conditions, in a manner that moves it towards these conditions as appropriate to meet the Historic Range of Variability.
   c. MAINTAIN open, park-like stand conditions where this condition occurred historically. Manipulate vegetation in a manner to encourage the development and maintenance of large diameter, open canopy structure.
5. Maintain or enhance the current level of connectivity between LOS stands and between all Forest Plan designated old-growth habitats by maintaining stands between them.
   d. CONNECT these LOS and old-growth habitats with each other in a contiguous network pattern by at least two different directions;

- Connectivity corridors should be as SHORT as possible
- A connectivity corridor stand is one in which MEDIUM diameter or larger trees are COMMON, canopy covers are within the TOP 1/3 of SITE POTENTIAL, and stand WIDTH is at least 400 feet wide at the narrowest point;
- Harvesting within connectivity corridors IS PERMITTED IF, all criteria in the above element can be met (maintained during harvest).

e. Reduce fragmentation of LOS stands, or at least, DO NOT INCREASE it from current levels. Stands that do not currently meet LOS that are located within, or surrounded by, blocks of LOS stands SHOULD NOT be considered for even-aged regeneration harvest, or group selection at this time.

6. All sale activities WILL MAINTAIN snags and GTR trees of > 21" d.b.h., at 100% potential population levels of primary cavity excavators;

- Pre-activity down logs may be removed only when they exceed the quantities listed below:

Species	Pieces/acre	Diameter	Piece size and total feet
Ponderosa pine	3-6	12”	> 6' and 20-40 ft.
Mixed conifer	15-20	12"	> 6' and 100-140 ft.
Lodgepole pine	15-20	8"	> 8' and 120-160 ft.

- These down log criteria are NOT INTENDED TO PRECLUDE the use of prescribed fire. Consumption WILL NOT EXCEED 3 inches total of diameter reduction in the featured large logs.
- Leave logs in current lengths, DO NOT CUT them into pieces. Longer logs may be counted for multiple "pieces" without cutting them.
- For all stands, snags >20 inches dbh are preferred and should be left whenever possible, with snags down to the 15 inch category being left when larger snags are not available.
- Leave pre-activity (currently existing) levels of down logs, unless they exceed the quantities listed below. Harvest activities should supplement pre-activity levels of down logs up to the maximum level. Exceptions can be made where fire protection needs for life and property cannot be accomplished with this quantity of debris left on site.

7. Follow the following goshawk requirements. Protect known active and historically used goshawk nest sites. Harvest is prohibited in the 30 acres surrounding active and historical goshawk nest sites. Establish a 400-acre post fledging area around every active nest site.

Scenario B: If the single story LOS stage is within or exceeds the historic range of variability within a watershed, or if both LOS single and multi-story are within or exceed the historic range of variability, then harvest can occur within these stages as long as LOS conditions do not fall below the Historic Range of Variability. Enhance LOS structure and attributes as possible.

8. Harvest activities can occur in order of the following three priorities:

(a) within stands OTHER THAN LOS

(b) within smaller, isolated LOS stands less than 100 acres in size, and/or at the edges of large blocks of LOS stands (> 100 acres)

(c) Within the interior of large LOS stands (> 100 acres)

9. MAINTAIN connectivity as directed in SCENARIO A.
10. Non-fragmentation Standards - within the interior of large LOS stands > 100 acres, harvest activities ARE LIMITED TO non-fragmenting prescriptions (i.e., thinning, single-tree selection, salvage, understory removal, and other non-regeneration activities). GROUP SELECTION IS ONLY ALLOWED when openings created either mimic the natural forest pattern, and/or DO NOT EXCEED one-half acre in size.
11. ADHERE to the specific wildlife prescriptions for SNAGS, GREEN TREE REPLACEMENTS, and DOWN LOGS, as described in SCENARIO A.
12. Follow SCENARIO A, with the following EXCEPTION for goshawk post fledging areas in 5) (c):
    - A 400-acre "post fledging area" will be established around every active nest site. While harvesting activities can occur within this area, up to 60% of the area should be retained in LOS conditions, (i.e., if 35% of the area is now in LOS stands, then it all needs to be retained; if 75% of the area is now in LOS stands, then some can be harvested, as long as this late and old stand structure does not drop below 60% of the area).

Management Direction for Invasive Species

In 2005, the regional forester amended the 1990 forest plans with the direction displayed below. Many standards and guidelines in the 1990 forest plans were superseded by this new amendment. The numbering is not sequential because the selected alternative adopted no standard for standards 5, 9, 10, and 17.

2005 Preventing and Managing Invasive Plants FEIS ROD Element

Standards and Guidelines

Standard 1. Prevention of invasive plant introduction, establishment and spread will be addressed in watershed analysis; roads analysis; fire and fuels management plans, Burned Area Emergency Recovery Plans; emergency wildland fire situation analysis; wildland fire implementation plans; grazing allotment management plans, recreation management plans, vegetation management plans, and other land management assessments.

Standard 2. Actions conducted or authorized by written permit by the Forest Service that will operate outside the limits of the road prism (including public works and service contracts), require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands.

This standard does not apply to initial attack of wildland fires, and other emergency situations where cleaning would delay response time.

Standard 3. Use weed-free straw and mulch for all projects, conducted or authorized by the Forest Service, on National Forest System Lands. If State certified straw and/or mulch is not available, individual Forests should require sources certified to be weed free using the North American Weed Free Forage Program standards (see Appendix O) or a similar certification process.

Standard 4. Use only pelletized or certified weed free feed on all National Forest System lands. If state certified weed free feed is not available, individual Forests should require feed certified to be weed free using North American Weed Free Forage Program standards or a similar certification process. This standard may need to be phased in as a certification processes are established.

Standard 6. Use available administrative mechanisms to incorporate invasive plant prevention practices into rangeland management. Examples of administrative mechanisms include, but are not limited to, revising permits and grazing allotment management plans, providing annual operating instructions, and adaptive management. Plan and implement practices in cooperation with the grazing permit holder.

Standard 7. Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.

Standard 8. Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with District or Forest-level invasive plant specialists, incorporate invasive plant prevention practices as appropriate.

Standard 11. Prioritize infestations of invasive plants for treatment at the landscape, watershed or larger multiple forest/multiple owner scale.

Standard 12. Develop a long-term site strategy for restoring/re-vegetating invasive plant sites prior to treatment.

Standard 13. Native plant materials are the first choice in re-vegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur. Non-native, noninvasive plant species may be used in any of the following situations: 1) when needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality and to help prevent the establishment of invasive species), 2) as an interim, non-persistent measure designed to aid in the reestablishment of native plants, 3) if native plant materials are not available, or 4) in permanently altered plant communities. Under no circumstances will nonnative invasive plant species be used for re-vegetation.

Standard 14. Use only APHIS and State-approved biological control agents. Agents demonstrated to have direct negative impacts on non-target organisms would not be released.

Standard 15. Application of any herbicides to treat invasive plants will be performed or directly supervised by a State or Federally licensed applicator. All treatment projects that involve the use of herbicides will develop and implement herbicide transportation and handling safety plan.

Standard 16. Select from herbicide formulations containing one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr.

Mixtures of herbicide formulations containing 3 or less of these active ingredients may be applied where the sum of all individual Hazard Quotients for the relevant application scenarios is less than 1.0.

All herbicide application methods are allowed including wicking, wiping, injection, spot, broadcast and aerial, as permitted by the product label. Chlorsulfuron, metsulfuron methyl, and sulfometuron methyl will not be applied aerially. The use of triclopyr is limited to selective application techniques only (e.g., spot spraying, wiping, basal bark, cut stump, injection).

Additional herbicides and herbicide mixtures may be added in the future at either the Forest Plan or project level through appropriate risk analysis and NEPA/ESA procedures. This standard will be applied to invasive plant projects with NEPA decisions signed after March 1, 2006.

Standard 18. Use only adjuvants (e.g. surfactants, dyes) and inert ingredients reviewed in Forest Service hazard and risk assessment documents such as SERA, 1997a, 1997b; Bakke, 2003.

Standard 19. To minimize or eliminate direct or indirect negative effects to non-target plants, terrestrial animals, water quality and aquatic biota (including amphibians) from the application of herbicide, use site-specific soil characteristics, proximity to surface water and local water table depth to determine herbicide formulation, size of buffers needed, if any, and application method and timing. Consider herbicides registered for aquatic use where herbicide is likely to be delivered to surface waters.

Standard 20. Design invasive plant treatments to minimize or eliminate adverse effects to species and critical habitats proposed and/or listed under the Endangered Species Act. This may involve surveying for listed or proposed plants prior to implementing actions within unsurveyed habitat if the action has a reasonable potential to adversely affect the plant species. Use site-specific project design (e.g. application rate and method, timing, wind speed and direction, nozzle type and size, buffers, etc.) to mitigate the potential for adverse disturbance and/or contaminant exposure.

Standard 21. Provide a minimum buffer of 300 feet for aerial application of herbicides near developed campgrounds, recreation residences and private land (unless otherwise authorized by adjacent private landowners).

Standard 22. Prohibit aerial application of herbicides within legally designated municipal watersheds.

Standard 23. Prior to implementation of herbicide treatment projects, National Forest system staff will ensure timely public notification. Treatment areas will be posted to inform the public and forest workers of herbicide application dates and herbicides used. If requested, individuals may be notified in advance of spray dates.

Desired Conditions

In National Forest lands across Region Six, healthy native plant communities remain diverse and resilient, and damaged ecosystems are being restored. High quality habitat is provided for native organisms throughout the region. Invasive plants do not jeopardize the ability of the National Forests to provide goods and services communities expect. The need for invasive plant treatment is reduced due to the effectiveness and habitual nature of preventative actions, and the success of restoration efforts.

Goals and Objectives

Goal 1 Protect ecosystems from the impacts of invasive plants through an integrated approach that emphasizes prevention, early detection, and early treatment. All employees and users of the National Forest recognize that they play an important role in preventing and detecting invasive plants.

Objective 1.1 Implement appropriate invasive plant prevention practices to help reduce the introduction, establishment and spread of invasive plants associated with management actions and land use activities.

Objective 1.2 Educate the workforce and the public to help identify, report, and prevent invasive plants

Objective 1.3 Detect new infestations of invasive plants promptly by creating and maintaining complete, up-to-date inventories of infested areas, and proactively identifying and inspecting susceptible areas not infested with invasive plants.

Objective 1.4 Use an integrated approach to treating areas infested with invasive plants. Utilize a combination of available tools including manual, cultural, mechanical, herbicides, biological control.

Objective 1.5 Control new invasive plant infestations promptly, suppress or contain expansion of infestations where control is not practical, conduct follow up inspection of treated sites to prevent reestablishment.

Goal 2 Minimize the creation of conditions that favor invasive plant introduction, establishment and spread during land management actions and land use activities. Continually review and adjust land management practices to help reduce the creation of conditions that favor invasive plant communities.

Objective 2.1 Reduce soil disturbance while achieving project objectives through timber harvest, fuel treatments, and other activities that potentially produce large amounts of bare ground

Objective 2.2 Retain native vegetation consistent with site capability and integrated resource management objectives to suppress invasive plants and prevent their establishment and growth.

Objective 2.3 Reduce the introduction, establishment and spread of invasive plants during fire suppression and fire rehabilitation activities by minimizing the conditions that promote invasive plant germination and establishment.

Objective 2.4 Incorporate invasive plant prevention as an important consideration in all recreational land use and access decisions. Use Forest-level Access and Travel Management planning to manage both on-highway and off-highway travel and travel routes to reduce the introduction, establishment and spread of invasive plants.

Objective 2.5 Place greater emphasis on managing previously “unmanaged recreation” (OHVs, dispersed recreation, etc.) to help reduce creation of soil conditions that favor invasive plants, and reduce transport of invasive plant seeds and propagules.

Goal 3 Protect the health of people who work, visit, or live in or near National Forests, while effectively treating invasive plants. Identify, avoid, or mitigate potential human health effects from invasive plants and treatments.

Objective 3.1 Avoid or minimize public exposure to herbicides, fertilizer, and smoke.

Objective 3.2 Reduce reliance on herbicide use over time in Region Six

Goal 4 Implement invasive plant treatment strategies that protect sensitive ecosystem components, and maintain biological diversity and function within ecosystems. Reduce loss or degradation of native habitat from invasive plants while minimizing adverse effects from treatment projects.

Objective 4.1 Maintain water quality while implementing invasive plant treatments.

Objective 4.2 Protect non-target plants and animals from negative effects of both invasive plants and applied herbicides. Where herbicide treatment of invasive plants is necessary within the riparian zone, select treatment methods and chemicals so that herbicide application is consistent with riparian management direction contained in PACFISH, INFISH, and the Aquatic Conservation Strategies of the Northwest Forest Plan.

Objective 4.3 Protect threatened, endangered, and sensitive species habitat threatened by invasive plants. Design treatment projects to protect threatened, endangered, and sensitive species and maintain species viability.

Goal 5 Expand collaborative efforts between the Forest Service, our partners, and the public to share learning experiences regarding the prevention and control of invasive plants, and the protection and restoration of native plant communities.

Objective 5.1 Use an adaptive management approach to invasive plant management that emphasizes monitoring, learning, and adjusting management techniques. Evaluate treatment effectiveness and adjust future treatment actions based on the results of these evaluations.

Objective 5.2 Collaborate with tribal, other federal, state, local and private land managers to increase availability and use of appropriate native plants for all land ownerships.

Objective 5.3 Work effectively with neighbors in all aspects of invasive plant management: share information and resources, support cooperative weed management, and work together to reduce the inappropriate use of invasive plants (landscaping, erosion control, etc.).

Management Direction for Wildlife

Open Road Density

Open road density and corresponding human disturbance play a key role in determining whether wildlife remains in an area. Human disturbance associated with open roads can displace individual animals and make them vulnerable to harassment, reduce the amount of suitable habitat, and disturb nests and roosting activities.

Table A-3. Open road density by management area, 1990 forest plans

National Forest	Road Density	Management Area(s)*	Plan Component
MAL	1.5 miles/square mile	MA 4D Wildlife Emphasis	Standard
	2.2 miles/square mile	MA 4D Winter Range	
	3.2 miles/square mile	Summer Range**	
UMA	2 miles/square mile	Forestwide	Desired condition
WAW	1.5 miles/square mile	MA 4E Winter Range MA 4D General Wildlife/Fish	Standard
	2.5 miles/square mile	MA 4A General Forest	

* See crosswalk in project record for more information.

** Includes all areas outside wildlife emphasis, winter range, and designated wilderness areas.

Management Indicator Species

Forest plans are required to identify management indicator species (MIS). These species are selected because their population changes are believed to indicate the effects of management activities. The MIS identified for the 1990 forest plans are displayed in Table A-4.

Table A-4. 1990 forest plans management indicator species identified by national forest and criteria for selection

Management Indicator Species	MAL	UMA	WAW	OCH	Criteria for Selection
Rocky Mountain elk	X	X	X		Commonly hunted; general habitat needs; cover/forage/roads
American marten	X	X	X		Old growth; dead and down tree habitat; mature habitat with large trees
Pileated woodpecker	X	X	X	X	Old growth; mature and old growth stands at high elevations
Northern goshawk			X		Mature to old conifer stands
Northern three-toed woodpecker	X	X			Old growth; dead and down in mature and old lodgepole pine
Lewis' woodpecker	X				Dead and defective habitat
Yellow-bellied sapsucker	X				Dead and defective habitat
Red-breasted sapsucker	X				Dead and defective habitat
Williamson's sapsucker	X				Dead and defective habitat
Downy woodpecker	X				Dead and defective habitat
Hairy woodpecker	X				Dead and defective habitat
White-headed woodpecker	X				Dead and defective habitat
Black-backed woodpecker	X				Dead and defective habitat
Northern flicker	X				Dead and defective habitat; Old growth juniper habitat
Primary cavity excavators[1]		X	X	X	Snag habitat; dead and down tree habitats; standing dead trees
Resident trout[2]			X	X	High quality water and fishery habitat
Rainbow trout (resident)		X			Streams/riparian habitats
Rainbow/redband trout	X				Non-anadromous riparian
Steelhead trout	X	X	X		Anadromous riparian; streams/riparian habitats; high quality water and fishery habitat
Bull trout	X				Non-anadromous riparian
Cutthroat trout	X				Non-anadromous riparian

1. Primary cavity excavator definition or list:
   - Ochoco National Forest: wildlife species that excavate cavities in snags
   - Umatilla National Forest: wildlife species that excavate cavities in snags
   - Wallowa-Whitman National Forest: common flicker, Lewis' woodpecker, yellow-bellied sapsucker, Williamson's sapsucker, hairy woodpecker, downy woodpecker, white-headed woodpecker, black-backed woodpecker three-toed woodpecker, northern three-toed woodpecker, mountain chickadee, white-breasted nuthatch, red-breasted nuthatch and pygmy nuthatch
   - Malheur National Forest: did not use a primary cavity excavators group
2. Resident trout definition:
   - Wallowa-Whitman National Forest: did not define resident trout
   - Other national forests: did not use a resident trout group

Habitat Effectiveness Index for Rocky Mountain elk

The Habitat Effectiveness Index (HEI) model is used to predict the influence of forest management on elk. It predicts how effectively an area supports elk. It is intended to be only a relative measure of habitat effectiveness and does not consider many factors that influence the actual number of elk found in an area. Those factors include hunting, predation, disease, changes in weather and forage production, and competition with other species for forage. Model parameters include open road density, cover-to-forage ratio, and cover quality. Further discussion of the model can be found in the 1990 forest plans.

Table A-5. Comparison of Habitat Effectiveness Index*/cover standards for management areas (the management area identifiers are those used in the 1990 forest plans)

Umatilla National Forest	Malheur National Forest	Wallowa-Whitman National Forest**
A10, C4,F4 – Elk habitat will be managed to achieve an HEI of no less than 60 A10, C4 – 30% of area is cover with minimum of 15% (20% desired) of satisfactory cover. F4 – 30% of summer and winter area as cover with minimum of 10% (15-20% desired) of satisfactory cover C7,E2 – Elk habitat will be managed to achieve an HEI of no less than 45; 30% of area is cover with minimum of 10% (15-20% desired) of satisfactory cover. E1 – Elk habitat will be managed to achieve an HEI of at least 30; cover not mentioned C8 – (grass-tree mosaic) minimum HEI of 70% and 30% of summer and winter area as cover with minimum of 10% (15-20% desired) of satisfactory cover C3 – (winter range) minimum HEI of 70% with 30% of area as cover with minimum of 10% (15-20% desired) of satisfactory cover C3a – (sensitive winter range) minimum HEI of 70% with 30% of area as cover with minimum of 10% (15-20% desired) of satisfactory cover	1-Manage elk summer range to provide 20% cover and an HEI of 0.4. The mix of sat/mar cover can vary by summer range. 4A-Manage winter range to provide 25% cover and an HEI of 0.5. 20A, 20B, 21- Manage wildlife emphasis areas to provide and HEI of 0.7 and 40% cover Ochoco National Forest-No HEI standards and guidelines for management areas	1 – General forest will be managed to obtain an 0.5 HEI 3, 3a, 18 – Manage winter range and selected summer ranges to achieve an HEI of 74% Attempt to achieve an HEI of 0.5 in timber sale planning. *** 1 – Retain at least 30% of the forested area within a project in satisfactory or marginal cover.***

* HEI including discounts for roads open to motor vehicle traffic, as described in Wildlife Habitats in Managed Forests (Thomas et al. 1979). Marginal cover, satisfactory cover, and forage areas will be managed to meet size and spacing criteria as described in Habitat Effectiveness for Elk on Blue Mountain Winter Ranges (Thomas et al. 1988).

** The Wallowa-Whitman National Forest does not have forestwide elk standards. Those listed are from MA 3 Timber/Wildlife Emphasis.

*** From the record of decision.

Management Direction for Timber Harvest

Direction pertaining to timber sales is included in the Eastside Screens as well as in other portions of the 1990 forest plans. Tables A-6 and A-7 are specific to the lands suitable for timber production and the allowable sale quantity.

Table A-6. Lands suitable for timber production (acres) as shown in the 1990 forest plans and adjustments based on 2011 suitable acres, per alternative A (no action)

Year	MAL*	UMA	WAW**	Total
1990	985,000	619,000	837,000	2,441,000
2011 update***	780,000	380,000	590,000	1,750,000

* Includes Ochoco National Forest acres administered by the Malheur National Forest.

** The HCNRA was removed from Wallowa-Whitman National Forest lands suitable for timber production by regulation in 1994.

*** 2011 figures are based on recalculated timber suitability acres accounting for amendments and updated vegetation/soil mapping.

Table A-7. Allowable sale quantity (MMBF) as shown in the 1990 forest plans and 2011 actual outputs, per alternative A (no action)

Year	MAL*	UMA	WAW	Total
1990	234	124	141	499
2011	55	51	46	152

* Includes 34 MMBF from the portion of the Ochoco National Forest administered by the Emigrant Creek Ranger District of the Malheur National Forest.

Management Direction for Rangeland Vegetation and Domestic Livestock Grazing

Table A-8 displays the current upland grazing standards contained in each plan. See Table A-9 for livestock grazing direction in RHCAs. The maximum utilization figures apply regardless of what is consuming the forage. One level of utilization applies when rangeland is satisfactory condition and another when rangeland is in unsatisfactory condition (see glossary for definitions). Different utilization levels are also allowed depending on the level of management within an allotment. Management level is defined as:

Level B Stewardship (minimum level): Livestock use managed within current grazing capacity. Cost-effective improvements used only to maintain stewardship of range.

Level C Extensive: Livestock managed to achieve full utilization of allocated forage.

Level D Intensive: Livestock managed to optimize forage production and utilization. May involve fencing and water development to implement complex grazing systems.

Sat: Satisfactory range condition–Forage condition is at least fair, with stable trend, and allotment is not classified PC (basic resource damage) or PD (other resource damage).

Unsat: Unsatisfactory range condition.

Table A-8. Management direction for the maximum percent utilization of livestock grazing in uplands

National Forest	Management Level	Forested		Grasslands		Shrubland	
		Sat	Unsat	Sat	Unsat	Sat	Unsat
MAL*	Stewardship B	40%	0-30%	50%	0-30%	40%	0-25%
	Extensive C	45%	0-35%	55%	0-35%	50%	0-30%
UMA	Stewardship B	40%	0-30%	50%	0-30%	40%	0-25%
	Extensive C	45%	0-35%	55%	0-35%	45%	0-30%
	Intensive D	50%	0-40%	60%	0-40%	50%	0-35%
WAW	Stewardship B	40%	0-30%	50%	0-30%	40%	0-25%
	Extensive C	45%	0-35%	55%	0-35%	45%	0-30%
	Intensive D	50%	0-40%	60%	0-40%	50%	0-35%
OCH	Stewardship B	40%	0-30%	50%	0-30%	40%	0-25%
	Extensive C	45%	0-35%	55%	0-35%	45%	0-30%
	Intensive D	50%	0-40%	55%	0-40%	50%	0-35%

* Does not mention level D.
Sat=satisfactory, Unsat = unsatisfactory

For the Umatilla National Forest, utilization of transitory range (where timber harvest has occurred during the last 30 years) shall not exceed 60 percent for domestic livestock.

Domestic Sheep Grazing

Wallowa-Whitman and Umatilla National Forests

Standard: Manage the conflict between bighorn sheep and domestic sheep in coordination with state wildlife agencies.

Malheur National Forest

Standard: Do not stock livestock allotments in bighorn sheep range with domestic sheep.

Table A-9. Management direction for maximum percent utilization of livestock grazing in riparian areas

National Forest	Management Level	Grass and grass-like		Shrubs	
		Sat	Unsat	Sat	Unsat
MAL*	Stewardship B	40%	0-30%	30%	0-25%
	Extensive C	45%	0-35%	40%	0-30%
UMA	Stewardship B	40%	0-30%	30%	0-25%
	Extensive C	45%	0-35%	40%	0-30%
	Intensive D	50%	0-40%	50%	0-35%
WAW	Stewardship B	40%	0-30%	30%	0-25%
	Extensive C	45%	0-35%	40%	0-30%
	Intensive D	50%	0-40%	50%	0-35%
OCH	Stewardship B	40%	0-30%	30%	0-25%
	Extensive C	45%	0-35%	40%	0-30%
	Intensive D	50%	0-40%	50%	0-35%

* Does not mention level D.
Sat=satisfactory, Unsat = unsatisfactory

Part 2: Comparison of the Action Alternatives

Introduction

This document describes the components of the action alternatives (alternatives B, C, D, E, and F) in detail and compares the differences. The components of a forest plan include:

- Goals and desired conditions
- Management areas
- Special areas
- Suitable uses and activities
- Objectives
- Monitoring and evaluation
- Standards
- Guidelines

Elements Common to the Action Alternatives

Laws and Regulations

All action alternatives are designed to comply with applicable laws, regulations, and policies that govern the Forest Service and the management of National Forest System lands. This plan revision is guided by the 2000 Planning Rule that includes transition provisions allowing the Forest Service to use the 1982 planning rule provisions to amend or revise plans. Generally, laws and regulations are not repeated in the text of the revised forest plans or in this appendix. A brief description of applicable laws and regulations is included in chapter 1 of the DEIS.

Technical Information

Each action alternative is evaluated using the same set of technical assumptions and data. The same sets of criteria are used to develop calculations of acres in different ecological conditions, available for certain uses such as range, timber production or harvest, wilderness, or other uses, and for production of goods and services.

Special Designations

All of the existing areas protected by special designations during the life of the 1990 forest plans maintain those special designations across the action alternatives. Discussions of any additional special areas or proposed additional special areas are included in the individual action alternative descriptions.

Goals and Desired Conditions (Action Alternatives)

The goals and desired conditions for the action alternatives were developed collaboratively. These goals and desired conditions are common to each of the action alternatives except desired condition 2.7, Roads and Trail Access, although the alternatives are designed to respond to the purpose and need and significant issues in different ways. The rate of achieving desired conditions may vary by alternative due to differences in the suitability of lands for different activities and to differences in management intensity as reflected by differences in objectives.

The three goals for the Malheur, Umatilla and Wallowa-Whitman National Forests Forest Plans are:

- Goal 1: Promote Ecological Integrity
- Goal 2: Promote Social Well-Being
- Goal 3: Promote Economic Well-Being

These three goals are the framework for the plan organization. The desired conditions, objectives, and standards and guidelines each fall under corresponding goals (table A-10).

Table A-10. A list of primary goals and corresponding desired conditions identified to meet the goals

Goal 1: Promote Ecological Integrity	Goal 2: Promote Social Well-Being
1.1 Watershed Function	2.1 Scenery
1.1.1 Hydrologic Function	2.2 Old Forest
1.1.2 Riparian Function	2.3 Recreation
1.1.3 Wetland Function	2.4 Hunting and Fishing
1.1.4 Groundwater-dependent Ecosystem Function	2.5 Rocky Mountain Elk
1.1.5 Stream Channel Function	2.6 Cultural Resources
1.1.6 Aquatic Habitat Function	2.7 Roads and Trails Access
1.2 Species Diversity	2.8 Wildland Urban Interface
1.3 Productive Capacity	2.9 Tribal Rights and Interests
1.4 Disturbance Processes	2.10 Culturally Significant Foods
1.4.1 Wildland Fire (planned and unplanned ignitions)	2.11 Community Resiliency
1.4.2 Insects and Disease	2.12 Wild Horses
1.5 Invasive Species	
1.6 Structural Stages	**Goal 3: Promote Economic Well-Being**
1.7 Plant Species Composition	3.1 Facilities and Infrastructure
1.8 Stand Density	3.2 Land Ownership
1.9 Air Quality	3.3 Goods and Services
1.10 Soil Quality	3.3.1 Forest Products
1.11 Water Quality	3.3.2 Livestock Grazing
1.12 Landscape Patterns	3.3.3 Special Uses
1.13 Special Plant Habitats	3.3.4 Mineral and Geological Resources
1.14 Snags and Down Wood	3.3.5 Water Use

Goal 1: Promote Ecological Integrity

Ecological integrity is a condition that sustains the wholeness or completeness of ecosystem structure, composition, and function. The national forests' contribution to ecological function is described by watershed function, species diversity, productive capacity, disturbance processes, and invasive species. Ecological structure and composition are described by structural stages; plant species composition; stand density; and air, soil, and water quality. Landscape patterns, special plant habitats, and snags and down wood are also indicators of sustainability in the Blue Mountains national forests. Although the primary focus of this section is ecological integrity, this goal and the desired conditions are interrelated with the social and economic components of sustainability.

Desired Conditions

1.1 Watershed Function

The desired conditions for 1.1 Watershed Function are described by Key Watersheds and All Watersheds and in 1.1.1 Hydrologic Function, 1.1.2 Riparian Function, 1.1.3 Wetland Function, 1.1.4 Groundwater Dependent Ecosystem Function, 1.1.5 Stream Channel Function, and 1.1.6 Aquatic Habitat Function. Key watersheds are defined in the glossary.

Key Watersheds

Desired Condition: Networks of watersheds with good habitat and functionally intact ecosystems contribute to and enhance conservation and recovery of specific threatened or endangered fish species and provide high water quality and quantity. The networks contribute to short-term conservation and long-term recovery at the major population group, core area or other appropriate population scale.

Roads in key watersheds do not present substantial risk to aquatic resources.

Key watersheds have high watershed integrity and provide resilient aquatic and riparian ecosystems.

Scale: Subwatershed.

All Watersheds

Desired Condition: The watershed-scale processes that control the routing of water, sediment, wood, and organic material operate at levels that result in self-sustaining riparian and aquatic ecosystems that do not require human intervention or restoration.

Scale: Watershed or subwatershed.

Desired Condition: The distribution, diversity, and complexity of watershed and landscape-scale features, including natural disturbance regimes, provide aquatic and riparian ecosystems to which species, populations, and communities are uniquely adapted.

Scale: Subbasin.

Desired Condition: Connectivity exists within watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact habitat refugia. These network connections provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic, riparian-dependent, and many upland species of plants and animals.

Scale: Connectivity is between watersheds at the subbasin scale for forestwide planning; between subwatersheds at the watershed scale for project planning.

1.1.1 Hydrologic Function

Desired Condition: Instream flows, including water yield, timing, frequency, magnitude, and duration of runoff, are sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of movement of sediment, nutrients, and wood. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows are within the natural range of variability in which the system developed.

Scale: Watershed.

Desired Condition: The species composition and structural diversity of native plant communities in riparian management areas, including wetlands, provides adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and supplies amounts and distributions of coarse woody debris and fine particulate organic matter sufficient to sustain physical complexity and stability.

Scale: Watershed scale for forestwide planning; subwatershed scale for project planning.

Desired Condition: The timing, variability, and duration of floodplain inundation are within the natural range of variability.

Scale: Watershed.

Desired Condition: The sediment regime is within the natural range of variability. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Scale: Watershed.

Desired Condition: The timing, duration, and variability of inundation, or water table elevation, in wetlands, seeps, and springs are within the natural range of variability.

Scale: Subwatershed.

1.1.2 Riparian Function

Desired Condition: Riparian management areas (RMAs) within any given watershed reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area.

Scale: Subwatershed.

Desired Condition: Key riparian processes and conditions (including slope stability and associated vegetative root strength, bank stability, wood delivery to streams, and, within the riparian management areas, input of leafy and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality) are operating consistent with local disturbance regimes.

Scale: Subwatershed.

Desired Condition: Riparian vegetation has the species composition, structural diversity, age class diversity, and extent that is characteristic of the setting in which it occurs and the hydrologic and disturbance regimes in which it developed. The condition and composition of small habitat patches may change over small temporal and spatial scales but remains relatively constant at larger scales.

Scale: Subwatershed to subbasin.

Desired Condition: Riparian shrub communities occupy their historical range and extent. Individual plants are capable of reaching the full potential for a typical individual of a particular species, as defined by plant height, width, and growth form. Individual plants are able to propagate, or reproduce, vegetatively and/or sexually. Plant communities are similar in species composition, age class structure, canopy density, and ground cover to plant associations (Crowe and Clausnitzer 1997) that are representative of a particular setting.

Scale: Subwatershed.

Desired Condition: Riparian areas consist of native assemblages of riparian-dependent plants and animals free of persistent non-native species and provide for dispersal and travel corridors, as well as connectivity, between geographically important areas for both terrestrial and aquatic animals and plant species within the planning area.

Scale: Subwatershed.

1.1.3 Wetland Function

Desired Condition: The extent and diversity of wetland types in the Blue Mountains is maintained or increased.

Scale: Subbasin.

Desired Condition: The surface and subsurface flow paths that support wetland habitats are undisturbed. The timing and duration of inundation of wetlands are within natural ranges. Plant species composition in wetlands is characteristic of the biophysical setting in which they occur.

Scale: Subwatershed.

1.1.4 Groundwater Dependent Ecosystem Function

Desired Condition: Springs, peatlands and groundwater fed wetlands in the Blue Mountains are maintaining or regaining their ecological structure and function.

The aquifer supplying water to groundwater dependent ecosystems is not being affected by groundwater withdrawal or loss of recharge. Soils of groundwater dependent ecosystems are intact and functional; erosion and deposition are within the natural range. Runout channels, if present, are functioning naturally and are not entrenched, eroded, or substantially altered. Vegetation is composed of the anticipated cover of plant species associated with the site environment; hydric species are present and are not replaced by upland species. Livestock herbivory and trampling are not adversely affecting sites.

Scale: Subwatershed.

1.1.5 Stream Channel Function

Desired Condition: The physical integrity of the aquatic system, including shorelines, banks, and bottom configurations, are properly functioning and in dynamic equilibrium with the flow and sediment regimes under which aquatic systems have evolved.

Scale: Subwatershed to watershed.

Desired Condition: Channel morphology, structure, complexity, and diversity are in ranges that are characteristic of the local geology, climate, and geologic processes.

Scale: Subwatershed.

Desired Condition: The sediment regime under which aquatic ecosystems evolved is maintained, including the timing, volume, rate and character of input, storage, and transport.

Scale: Watershed.

1.1.6 Aquatic Habitat Function

Desired Condition: Aquatic habitats contribute to ecological conditions capable of supporting self-sustaining populations of native species diversity of plant, invertebrate, and vertebrate riparian-dependent species.

National forests in the Blue Mountains contribute to the protection of population strongholds for listed or proposed threatened and endangered species, state classified sensitive species, and narrow endemics, as these strongholds provide high quality habitat and support expansion and re-colonization of species to adjacent watersheds. These areas conserve key demographic processes likely to influence the persistence of populations or metapopulations.

Scale: Subwatershed to subbasin.

Desired Condition: Habitat elements (including spawning and rearing habitat, substrate, pool habitat, winter habitat, migration corridors, cover, food, habitat complexity, water quality, refugia, productivity, and connectivity) are in functional condition and are sufficiently distributed to support self-sustaining populations of native resident and anadromous fish.

Native fish species have access to historically occupied aquatic habitats and connectivity between habitats allows for the interaction of local populations.

Scale: Subbasin.

1.2 Species Diversity

Desired Condition: The natural range of habitats for native and desired non-native fish, wildlife, and native plant species, including threatened and endangered species, species identified as regional forester's sensitive species (RFSS), and focal species, is of adequate quality, distribution, and abundance to contribute to maintaining native and desired non-native species diversity. This includes the ability of species and individuals to interact, disperse, and find security within habitats in the planning area. These habitat conditions are resilient and sustainable considering the range of possible climate change scenarios.

Population strongholds for the fish focal species (Table A-11) provide high quality habitat and support expansion and re-colonization of species to adjacent unoccupied habitats. These areas conserve key demographic processes likely to influence the sustainability of aquatic species.

Federally listed species trend towards recovery or are delisted. Management activities improve the conservation status of species identified as being focal species or of local or regional conservation concern. Habitats and populations are managed in accordance with conservation planning documents, recovery plans, best available scientific information, and local knowledge.

Specialized habitat components, such as caves, standing dead trees, seeps, and springs, are found across the landscape in amounts and types commensurate with the natural communities in which they occur.

Scale: The desired condition for species diversity can be applied at a variety of scales (i.e., forestwide, watershed, and subwatershed). During project analysis and implementation, this desired condition should be used concurrently with information outlined in the strategy and design criteria part of this plan and with consideration of the best available climate change projections.

Additional information about focal species and their conservation strategies is available from the project record.

Table A-11. Terrestrial and aquatic focal and management indicator species for the action alternatives

Family	Group	Common Name	Focal Species	Management Indicator Species
Alpine/boreal	Alpine	Gray-crowned rosy-finch	X	
	Boreal forest	Boreal owl	X	
		Water vole	X	
Forest mosaic	All forested communities	Northern goshawk	X	
Medium/large trees	All forested communities	Cassin's finch	X	
	Cool/moist forest	Pileated woodpecker	X	X
		American marten	X	
	Dry forest	White-headed woodpecker	X	X
Open forest	All forested communities	Western bluebird	X	
		Fox sparrow	X	
		Mule deer		MAL only
	Post-fire habitat	Lewis's woodpecker	X	
		Black-backed woodpecker	X	
Upland grassland	Upland grassland	Upland sandpiper	X	
Human disturbance	Habitat generalist	Peregrine falcon	X	
		Wolverine	X	
		Rocky Mountain Elk		WAW/UMA only
Woodland/grass/shrub	Woodland/grass/shrub	Golden eagle	X	
		Lark sparrow	X	
		Pallid bat	X	
	Juniper woodland	Ash-throated flycatcher	X	
	Woodland/shrub	Loggerhead shrike	X	
	Shrub	Sage thrasher	X	
	Grass/shrub	Rocky Mountain bighorn sheep	X	
		California bighorn	X	
	Grassland	Northern harrier	X	
Chambers/caves	Chambers/caves	Townsend's big-eared bat	X	
Riparian	Shrubby/deciduous riparian	Red-naped sapsucker	X	
		MacGillivray's warbler	X	

Family	Group	Common Name	Focal Species	Management Indicator Species
	Conifer riparian	Inland tailed frog	X	
		Black swift	X	
	Marsh with adjacent large trees	Black-crowned night-heron	X	
	Riparian/large tree or snag/open water	Wood duck	X	
		Harlequin Duck	X	
		Bald eagle	X	
Wetland	Pond/small lake/backwater	Columbia spotted frog	X	
		Painted turtle	X	
	Marsh	Marsh wren	X	
	Marsh/wet meadow	Wilson's snipe	X	
	Marsh/open water	Eared grebe	X	
Aquatic habitat		Bull trout	X	
		Redband trout	X	
		Steelhead	X	
		Spring Chinook salmon	X	

1.3 Productive Capacity

Long-term productivity of aquatic, riparian, and terrestrial ecosystems within the national forests are maintained or restored by both ecological processes and through the use of sustainable management practices, as described in the combined ecological desired conditions. The result of maintenance and restoration treatments is that forest and rangeland ecosystems provide goods and services for human consumption without impairing their long-term productive capacity. However, the restoration of some nutrient cycling processes within some ecosystems consistent with their historic disturbance regimes may result in lower levels of productive capacity, in comparison to existing conditions.

Scale: Forestwide.

1.4 Disturbance Processes

1.4.1 Wildland Fire (planned and unplanned ignitions)

Desired Condition: Wildland fire plays an ecological role in creating the resilient forest and rangeland conditions needed to adapt to the conditions that result from climate changes. Table A-12 displays the desired condition ranges for wildland fire within the categories of fire severity, fire frequency, and amount of high severity fire by potential vegetation group. The range of desired conditions displayed allow for variation in the mix of fire severity, frequency, and amount of stand-replacing wildfire (high severity) by potential vegetation group across the landscape to respond to potential changes in climate. Wildland fire may be suitable on all acres, depending on expected fire effects and resource objectives.

Scale: Subwatershed for fire regime condition classes 1 and 2, watershed for fire regime condition class 3, and subbasin for fire regime condition classes 4 and 5.

Table A-12. Desired conditions for wildland fire severity and frequency within each potential vegetation group

Potential Vegetation Group	Fire Regime Condition Class	Fire Severity	Frequency (years)	High Severity Wildfire (percent)
Cold upland forest	IV	mixed-high	100-200	40-80%
Moist upland forest	III	mixed	30-150	20-40%
Dry upland forest	I	low-mixed	5-25	5-15%
Dry upland woodland	III	mixed	80-160	25-45%
Cold upland shrubland	III - IV	mixed-high	30-60	30-100%
Moist upland shrubland	II - III	mixed-high	10-40	30-100%
Dry upland shrubland	II	high	20-40	20-80%
Cold upland herbland	IV	high	30-80	55-100%
Moist upland herbland	II	high	20-40	20-80%
Dry upland herbland	II	high	5-20	40-80%
Cool/Cold riparian forest	III - IV	mixed-high	100-200	40-90%

Desired Condition: Fire regime condition class measures the degree of departure from the historical range of variability for vegetation characteristics, fuel composition, fire frequency, severity and pattern, and other associated disturbances. In landscapes that exhibit a moderate or high degree of departure (condition class II or III), the degree of departure is decreased to low or moderate (condition class I or II). In landscapes that exhibit a low degree of departure (condition class I), conditions are maintained over time. Over the long-term, landscapes exhibit a low degree of departure (condition class I) from the historical range of variability. Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and mimic the natural fire regime. Composition and structure of vegetation and fuels characteristics are similar to the conditions that existed under the historical fire regime condition classes IV and V. Risk of loss of key ecosystem components is reduced.

Scale: Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

1.4.2 Insects and Disease

Desired Condition: Characteristic levels of insect and disease activity contribute to diverse landscape conditions and provide important wildlife habitat components, such as hollow trees, dead wood, and mistletoe brooms. The desired conditions for vegetation structure, stand density, and species composition (displayed in table A-13, table A-14, and table A-15) create stand conditions with low to moderate susceptibility to insects and diseases across the majority of the upland forest potential vegetation groups. These stand conditions result in ecologically resilient forests with composition, structure, and density characteristics that are fully compatible with periodic disturbance occurring at characteristic levels of severity, intensity, size, and spatial distribution.

Scale: Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

1.5 Invasive Species

Desired Condition: Healthy, native and desired non-native animal communities and native plant communities dominate the landscape and are resilient given current and projected climate conditions. Invasive species (aquatic and terrestrial, plant and animal) are absent or occur in small areas. Invasive species do not jeopardize the ability of the national forests to provide the goods and services communities expect or the habitat that plant and animal community diversity depends upon. New invasive species resulting from changes in plant and animal habitats due to changes in climate occur only at low levels.

Scale: Watershed scale.

1.6 Structural Stages

Desired Condition: The distribution and abundance of forested structural stages creates conditions that are ecologically resilient, sustainable, and compatible while maintaining disturbance processes within the desired conditions. Table A-13 displays the desired conditions for the percent of each upland forest or woodland potential vegetation group in each of the forested structural stages. The range of desired conditions allows for variations in the mix of structural stage combinations across the landscape to respond to potential changes in climate.

Within the cold and moist upland forest potential vegetation groups, the desired diameter distribution within the stem exclusion and understory re-initiation stages is to have equal representation in the 5 to 10, 10 to 15, and 15 to 20-inch diameter classes. Figure A-1 describes the forested environment structural stages.

Within the dry upland forest potential vegetation group, the desired diameter distribution within the stem exclusion and understory re-initiation stages is: 25 percent in the 5 to 10 inch diameter class, 25 percent in the 10 to 15 inch diameter class, and 50 percent in the 15 to 20 -inch diameter class.

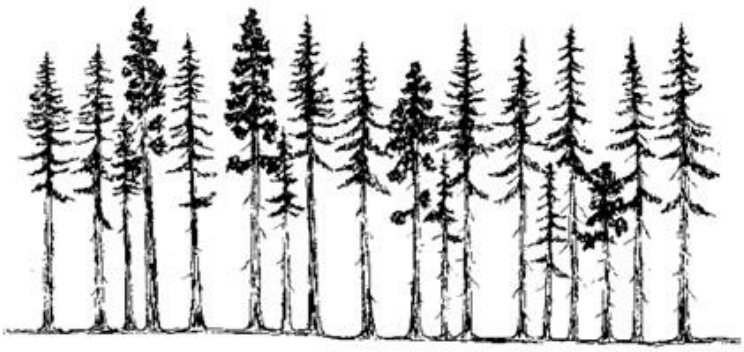
Scale: Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

Table A-13. Desired conditions for forested structural stages, described as a percent of each upland forest or woodland potential vegetation group

Potential Vegetation Group	Stand Initiation	Stem Exclusion	Understory Reinitiation	Old Forest Single story	Old Forest Multi-story
Cold upland forest	20-45	15-30	10-25	5-20	10-25
Moist upland forest	20-30	20-30	15-25	10-20	15-20
Dry upland forest	15-30	10-20	0-5	40-65	1-15
Dry upland woodland	5-10	10-20	1-5	20-40	30-50

Forested Structural Stages

Stand Initiation (SI): Following a stand-replacing disturbance such as wildfire or tree harvest, growing space is occupied rapidly by vegetation that either survives the disturbance, or colonizes the area afterward. Survivors survive the disturbance above ground or they initiate new growth from underground organs or from seeds on the site. Colonizers disperse seed into disturbed areas, it germinates, and then new plants establish and develop. A single canopy stratum of tree seedlings and saplings is present in this stage. This stage generally includes trees less than 5 inches DBH.



Stem Exclusion (SE): In this single-cohort stand structure, trees initially grow fast and quickly occupy all of their growing space, competing strongly for sunlight and moisture. Because trees are tall and reduce subcanopy light levels, understory plants (including smaller trees) are shaded and grow more slowly. Species needing sunlight usually die; shrubs and herbs may go dormant. In this stage, establishment of new trees is precluded by a lack of sunlight (stem exclusion closed canopy) or soil moisture (stem exclusion open canopy). This stage generally consists of a continuous single layer of trees and can vary from small trees up to those approaching 21 inches DBH.

Understory Re-initiation (UR): As the forest develops, a new age class of trees (cohort) eventually gets established after overstory trees begin to die, or because they no longer fully occupy their growing space. Regrowth of understory seedlings and other vegetation then occurs and trees begin to stratify into vertical layers. This stage consists of overstory trees at a low to moderate density, with small trees underneath. Trees can range in size from 5 – 21 inches DBH.

Old Forest Single-story (OFSS) and Multi-story (OFMS): Many age classes and vegetation layers mark these structural stages containing a predominance of old trees generally larger in diameter. The definition of a large tree varies, depending on the productive potential of the site. Snags and decayed fallen trees may also be present, leaving a discontinuous overstory canopy. The drawing shows a single-layer stand of ponderosa pine, reflecting the influence of frequent surface fire on dry-forest sites (old forest single story OFSS). Surface fire is not common on cold or moist sites, so these environments generally have multi-layer stands (2 or more layers) with large trees in the uppermost stratum (old forest multi-story OFMS).

Sources: Based on O'Hara and others (1996), Oliver and Larson (1996), and Spies (1997).

Figure A-1. Forested structural stage descriptions

Desired Condition: The distribution and abundance of herbland and shrubland structural stages create conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes within the desired conditions. The structural diversity of herblands and shrublands are characteristic of the settings in which they occur and the disturbance regimes in which they developed. These conditions support the capacity of the plants to reproduce and persist on the landscape. Variations in the mix of structural stage combinations across the landscape allow herblands and shrublands to respond to potential changes in climate. The desired conditions for structural stages includes shrubland and herbland potential vegetation groups, as well as grass and shrub layers in forested environments.

Scale: Herbland and shrubland desired conditions should apply at the project scale (minimum of 1,000 acres).

1.7 Plant Species Composition

Desired Condition: The mix of species composition tolerance classes across the landscape creates conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes within the desired conditions. Sites having the potential to support forested vegetation now and in the future, given regional climate projections, are occupied by stands of trees within the ranges displayed in table A-14. Table A-14 displays the desired condition ranges for the percent of each upland forest or woodland potential vegetation group in each of the species composition tolerance classes. The range of desired conditions allows for variations in the mix of species composition tolerance classes combinations across the landscape to respond to potential changes in climate.

The mix of species in the grass and shrub layer of forests as well as shrub and herbland vegetation contain a diverse array of native species, distributed across the landscape reflecting historical conditions. Perennial native bunchgrasses dominate many grass and shrublands. Native grasses, grass-like plants (sedges and rushes), forbs and various shrubs characterize the forest understory. Riparian zones consist of meadows with obligate wetland species including native grasses, sedges and rushes, riparian hardwoods, and structurally diverse shrublands.

Scale: Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

Table A-14. Desired conditions for species composition, described as a percent of each upland forest or woodland potential vegetation group

Potential Vegetation Group	Shade-intolerant Species Composition	Mixed-tolerance Species Composition	Shade-tolerant Species Composition
Cold upland forest	40-60	5-20	25-50
Moist upland forest	30-60	20-40	10-30
Dry upland forest	75-90	0	5-20
Dry upland woodland	75-90	0	5-20

1.8 Stand Density

Desired Condition: The range of vegetation densities across the landscape creates conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes within the desired conditions. Table A-15 displays the desired condition ranges for the percent of

each upland forest or woodland potential vegetation group in each of the stand density classes (open canopy or closed canopy). The range of desired conditions allows for variations in the mix of vegetation density combinations across the landscape to respond to potential changes in climate. Low-density vegetation is more likely to survive possible future drought stress, fires, and insects and disease outbreaks.

Table A-15. Desired conditions for stand density, described as a percent of each upland forest or woodland potential vegetation group

Potential Vegetation Group	Open Stand Density	Closed Stand Density
Cold upland forest	20-30	65-80
Moist upland forest	30-40	60-80
Dry upland forest	80-90	5-20
Dry upland woodland	80-90	5-20

Note: Dry upland forest closed stand density is 40 percent canopy cover or greater. Cold and moist upland forest closed stand density is 60 percent canopy cover or greater.

Scale: Minimum scale of subwatershed. Scale may be changed to watershed or subbasin level if justified as more appropriate through project analysis.

Desired Condition: The distribution and abundance of vegetation density within herblands and shrublands create conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes within the desired conditions. These conditions support the capacity of the plants to reproduce and persist on the landscape. Variations in the mix of vegetation density combinations across the landscape allow herblands and shrublands to respond to potential changes in climate. The desired conditions for vegetation density includes shrubland and herbland potential vegetation groups, as well as grass and shrub layers in forested environments.

Scale: Herbland and shrubland desired conditions should be applied at the project scale (minimum of 1,000 acres).

1.9 Air Quality

Desired Condition: National forest air quality and emissions produced from forest activities complies with state ambient air quality standards (Oregon, Idaho, and Washington) and federal air quality and smoke management plans.

Scale: Smoke emissions are relevant at the scale of the Blue Mountains as well as the local airsheds surrounding local communities and the broader areas that encompass designated wilderness areas.

1.10 Soil Quality

Desired Condition: The productive potential of forest and range soils is maintained at levels that contribute to long-term sustainability of ecosystems considering the range of possible climate change scenarios. Soil physical and chemical properties (texture, porosity, strength, coarse fragment content, and fertility) and organic matter (surface woody debris, humus) are at levels that maintain soil productive potential and hydrologic function (infiltration, percolation, and runoff).

Surface erosion rates and sediment deposition are within the natural range of variability for each biophysical setting.

Scale: Subwatershed to watershed depending on the severity of the disturbance.

1.11 Water Quality

Desired Condition: Water quality of surface and groundwater is sufficient to support healthy riparian, aquatic, and wetland ecosystems. It is within the range that maintains the biological, physical, and chemical integrity of the system and is capable of benefiting the survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

The quality of water emanating from the national forests is sufficient to provide for state-designated beneficial uses, including human uses.

Water quality in streams within the national forests is sufficient to meet applicable state, local, and tribal water quality criteria.

Scale: Forestwide.

1.12 Landscape Patterns

Desired Condition: Landscape patterns are spatially and temporally diverse and have a positive influence on overall ecological function and scenic integrity. Landscape patterns provide a connectivity, allowing animals to move across landscapes. Landscape patterns are resilient and sustainable considering the range of possible climate change scenarios.

Scale: Forestwide.

1.13 Special Plant Habitats

Desired Condition: Desired Condition: special plant habitats include mountain mahogany, aspen, cottonwood, sagebrush steppe, and whitebark pine. They provide high quality habitat for associated species. The distribution and abundance of structural stages and vegetation density classes within these special plant habitats are consistent with their HRV and create conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes within the desired conditions. Variations in the mix of structural stages and vegetation density combinations across the landscape allow special plant habitats to respond to potential changes in climate.

Whitebark Pine

Desired Condition: There is no net loss in whitebark pine habitat on National Forest System lands. Genetic diversity is conserved across the landscape. Degraded habitat and connectivity are restored wherever necessary, including in designated wilderness. Populations exhibit an increase in age class diversity. The risk of mortality from mountain pine beetle and stand-replacing fire is reduced. Resistance to white pine blister rust is increased (Aubry et al. 2008, Keane et al. 2012).

Fire may be used as one tool to achieve these desired conditions. Minimize negative impacts to whitebark pine resulting from fire suppression activities.

Scale: The identification and protection of whitebark pine special plant habitats are primarily accomplished at project level planning. The sustainability of special plant habitats is best addressed at the forestwide scale utilizing consideration of the best available climate projections.

Aspen

Desired Condition: The amount of aspen forest area is increased across the landscape. Genetic diversity is maintained through preservation of existing clones. The distribution and abundance of age and structural classes are consistent with the HRV and create conditions that are ecologically resilient, sustainable, and compatible with maintaining disturbance processes within the desired conditions (see table A-16). Aspen clones older than 80 years old that are healthy and adequately stocked would generally not be regenerated to achieve the desired conditions for the percent of aspen forest area in age classes less than 80 years old. Fire may be used as a tool to achieve these desired conditions. Protection of suckers from ungulate browsing is critical for survival of aspen regeneration, generally for a minimum of 10 years.

Table A-16. Desired Conditions for age and structural composition of aspen

Age (Years)	Structural Class	Percent of aspen forest area
0-40	SI	45-50
40-80	SE, UR	45-50
80+	OFMS, OFSS	5-10

Source: Swanson et al. 2010

Scale: The identification and protection of aspen special plant habitats are primarily accomplished at project level planning. The sustainability of special plant habitats is best addressed at the forestwide scale utilizing consideration of the best available climate projections.

Sagebrush Steppe Special Habitat

Desired Condition: There is no net loss of sagebrush steppe habitat on National Forest System lands and 70 percent of the existing sagebrush rangelands are in later structural stages (sagebrush classes 3, 4, and 5). The remaining 30 percent of the landscape includes areas of juniper encroachment, non-sagebrush shrub lands, annual grasslands, and nonnative perennial grasslands that potentially could be re-habilitated and enhanced as sagebrush habitat. The understory is comprised of native species, resulting in conditions that are sustainable and resilient to disturbance, i.e., they are capable of recovering to their potential community without intervention after a disturbance.

Scale: The identification and protection of sagebrush steppe special habitat is primarily accomplished at project level planning. The sustainability of special plant habitats is best addressed at the forestwide scale utilizing consideration of the best available climate projections.

1.14 Snags and Down Wood

Desired Condition: Snags and down wood occur within all of the potential vegetation groups and vegetation cover types (lodgepole) at levels identified within table A-17, table A-18, and table A-19. Snags and down wood persist across the landscape either singularly or in patches. Snags and down wood density will be highest following disturbance events, such as wildfire, wind events, and insects and disease outbreaks. Snags and down wood density will tend to be higher in riparian areas. Snags are the major source of down wood in both upland and riparian areas.

Snags and down wood provide habitat for the following focal species: boreal owl, pileated woodpecker, American marten, white-headed woodpecker, western bluebird, fringed myotis, Lewis's woodpecker, black-backed woodpecker, wood duck, bald eagle, and red-naped sapsucker.

Scale: The desired condition and the levels of snags and down wood presented within table A-17, table A-18, and table A-19 can be applied at a variety of scales: forestwide, watershed, and subwatershed. During project analysis and implementation, the desired condition, along with the snag and down wood levels presented in the tables, will be used concurrently with information outlined in Part Two: Strategy and Part Three: Design Criteria within the forest plan.

Table A-17. Ranges of down wood (desired percentage range of tons per acre across the forested landscape)

Potential Vegetation Group	0-10 tons	10-20 tons	20-45 tons	45-65 tons	65-90 tons	90-plus tons	Desired Residual Tons Comprised of Material Greater than 12 Inches Diameter*
Cold upland forest	0-5%	70-80%	5-20%	2-4%	1-2%	1-2%	40-50%
Moist upland forest	0-5%	70-80%	5-20%	1-2%	1-2%	1-2%	50-60%
Dry upland forest	60-80%	5-15%	2-4%	1-2%	1-2%	1-2%	60-80%
Lodgepole pine forest	0-5%	80-95%	1-10%	1-10%	1-2%	1-2%	10-20%

* The intent of the 12-inch down wood portion of the desired condition is not that 12 inches exactly is needed, but instead that retention of the largest potential size class based on the size of the existing overstory trees is emphasized.

Table A-18. Desired percentage ranges across the landscape of snags (dead trees) per acre 10 inches d.b.h. and greater and less than 20 inches d.b.h.

Potential Vegetation Group	1-2 dead trees	2-6 dead trees	6-10 dead trees	10-14 dead trees	14-18 dead trees	more than 18 dead trees
Cold upland forest	45-55%	5-10%	0-1%	5-10%	1-5%	20-30%
Moist upland forest	35-45%	10-20%	0-1%	5-10%	2-5%	25-35%
Dry upland forest	65-75%	10-15%	0-1%	5-10%	1-5%	5-15%
Lodgepole pine forest	60-70%	5-10%	0-1%	5-10%	2-5%	20-30%

Table A-19. Desired percentage ranges across the landscape of snags (dead trees) per acre 20 inches d.b.h. and greater

Potential Vegetation Group	1-2 dead trees	2-6 dead trees	6-10 dead trees	10-14 dead trees	14-18 dead trees	more than 18 dead trees
Cold upland forest	70-80%	10-20%	1-3%	1-10%	2-4%	1-3%
Moist upland forest	55-65%	15-25%	2-6%	5-9%	2-6%	1-5%
Dry upland forest	75-85%	10-20%	1-3%	2-4%	1-2%	1-2%
Lodgepole pine forest	NA	NA	NA	NA	NA	NA

Goal 2: Promote Social Well-being

Social well-being contributes to national forest resilience by fostering public use patterns and restoration strategies that support human communities, livelihoods, cultures, and social values. National forests contribute to community resilience by providing jobs, ecosystem services, scenery, and recreational opportunities. Each individual's ties to the land, traditional cultures, and communities help characterize social well-being (Pierce Coffer and Byron 2001).

Attachments to places in and adjacent to the national forests reflect core values that shape and define social, economic, and ecological sustainability within the Blue Mountains and elsewhere (Endter-Wada et al. 1998). Examples include the values different people place on biodiversity, scenery, economic opportunities, self-reliance, tradition, and ecological integrity (Brown and Reed 2000). These and a suite of other values form the basis for collaborative discussions about national forest management and, ultimately, how it affects social well-being.

A diverse and complex set of values that contribute to one's social well-being can be tied to natural resources-related work, including restoration, ranching, and recreation. This work allows people to live in communities that are adjacent to the national forests. These values may include viewing or hunting wildlife, being able to do natural resource-related work, knowing that restoration efforts are supporting fish populations, and being part of an environment where human traditions and cultures can be maintained.

2.1 Scenery

Description: Scenery is a highly valued forest resource and is quantified through the use of the scenery management system. The scenery management system provides the framework to effectively integrate scenic values and ecological considerations, to achieve a scenic integrity and scenic stability for future generations. Although the scenic resources vary by location, all activities that forest visitors experience are performed in a scenic environment composed of the natural and constructed features within the landscape. The scenery management system process involves identifying scenic components as they relate to people, mapping these components and assigning a value to aesthetics. These components are inventoried and provided guidance for the development of the desired scenic integrity and stability levels.

The following components have been inventoried for the Blue Mountains national forests:

- Landscape character descriptions
- Scenic attractiveness
- Existing scenic integrity
- Existing scenic stability
- Concern levels
- Landscape visibility
- Distance zones
- Scenic class

Scenic integrity and stability objectives are associated with public observation points such as travel routes, use areas and waterbodies.

Table A-20. Scenic integrity levels and scenic stability levels (desired condition)

Scenic Class	Scenic Integrity Levels					Scenic Stability				
	Very High	High	Moderate	Low	Very Low	Very High	High	Moderate	Low	Very Low
1	x	x				x	x			
2	x	x	x			x	x	x	x	
3	x	x	x			x	x	x	x	
4		x	x	x		x	x	x	x	
5		x	x	x		x	x	x	x	
6		x	x	x		x	x	x	x	
7		x	x	x		x	x	x	x	

Scenic Class 1

Desired Condition: In Scenic Class 1, the scenery is highly valued, distinctive, and viewed frequently for a continuous duration. The view is highly intact with no utility corridors or other energy developments present and with minimal management disturbances. High to very high scenic integrity is present. All naturally occurring or historically valued dominant attributes of the scenic character are present. The ecological condition maintains a high to very high level of scenic stability.

Scale: Forestwide.

Scenic Classes 2 and 3

Desired Condition: In Scenic Classes 2 and 3 the scenery is valued, typical, and viewed frequently, but not continuously. The view is predominately intact, with alterations compatible with valued scenic attributes. Utility corridors and other energy developments are not present. Moderate to very high scenic integrity is maintained. Most dominant scenery attributes are present and are likely to be sustained. Ecological conditions may pose a threat to the valued scenic attributes. Low to very high scenic stability can be maintained.

Scale: Forestwide.

Scenic Classes 4, 5, 6, and 7

Desired Condition: In Scenic Classes 4, 5, 6, and 7, the scenery is not distinct in form, line, texture and color, viewing frequency is low, and durations are short. The scenery is usually visually intact and disturbances do not dominate the view. Disturbances are shaped and blended with the natural terrain. Visible utility corridors are linear features with feathered and undulating edges. Corridor floors are contoured to blend into natural contours and have groupings of low growing shrubs and boulders that break up the unnatural appearance of a cleared forest floor. Other energy developments are also blended into the natural surroundings. Low to high scenic integrity is maintained. The dominant scenery attributes of the valued landscape character are present and likely to be sustained. Low to very high scenic stability is maintained.

Scale: Forestwide.

2.2 Old Forest and Individual Large Diameter and/or Old Trees

2.2.1 Old Forest

Desired Condition: Old forest (OFMS and OFSS) is a forested structural stage that has an abundance of physiologically old trees (for the species and site conditions) that are dominant in the overstory and are usually larger in diameter. Old forest stands are maintained and restored across the landscape to provide a wide variety of ecological and social values. See the ecological desired conditions for specific ranges for the percent of each upland forest or woodland potential vegetation group in old forest structural stages. Like other forested structural stages, the management of old forest is also guided by other ecological desired conditions, such as stand density (see desired condition Stand Density1.8), plant species composition (see desired condition Plant Species Composition 1.7), fire regime condition classes (see desired condition 1.4.1 Wildland Fire), and landscape patterns (see desired condition 1.12 Landscape Patterns).

Scale: See the ecological desired conditions for forested structural stages.

2.2.2 Individual Old Trees

Desired Condition: Individual live old trees are maintained both within and outside of old forest stands to meet a wide variety of ecological and social values. For most tree species, certain physical tree characteristics can be used to infer old age. Old age for most tree species is generally considered to be greater than 150 years in age. However, old tree characteristics and old age may vary by species and site. A description of these characteristics and age should be further developed on a site-specific project basis.

Scale: Forestwide

2.3 Recreation

Desired Condition: Outdoor recreation and relaxation in natural environments enrich the lifestyle and mental and physical condition of national forest visitors. Recreation user satisfaction is maintained or improved over time. Valued recreation activities continue to be provided as traditional uses and generational activities. Providers include Forest Service, other agencies, and private operators. National forest visitors have opportunities to learn environmental ethics, develop outdoor recreation skills, respect other outdoors users, and take on appropriate challenges and risks. Recreation use creates minimal amounts of resource damage. Recreation facilities are properly maintained and meet all health, safety and accessibility requirements. Facility structures are of consistent design and character. Facilities complement the natural environment by using materials that fit with the surrounding landscape. Scenic integrity is commensurate with the inventoried scenic class.

Scale: Forestwide.

2.3.1 Developed Recreation

Desired Condition: Developed facilities, such as campgrounds, restrooms, picnic areas, trailheads, snow parks, and boating and fishing sites, are well maintained, fully functional, provide for visitor safety, and are accessible to people with disabilities. Potable water and sanitary systems provided at the sites meet required health standards. Areas of highly concentrated use provide a full suite of amenities that provide for people of all ages, ethnicities, and abilities. The facilities are fully utilized with occupancy rates approaching 90 to 100 percent during peak use periods and occupancy rates of 25 to 40 percent during non-peak

summer and fall periods. Facilities provide some comfort for the user as well as site protection. New construction and reconstruction projects utilize a contemporary/rustic design based on the use of native or durable materials (i.e., naturally found materials or materials that appear natural). Facility structures are of consistent design and character. Facilities complement the natural environment by using materials that fit with the surrounding landscape. Impacts to natural resources from concentrated visitor use are minimal. Partnerships with private providers are encouraged and sustained at high-end developed areas, such as ski areas, trams, lodges, and concessionaire-operated campgrounds. Some special use permits, such as recreation residences, are retained and provide for recreation opportunities not available to the general public. Scenic integrity is commensurate with the inventoried scenic class.

Scale: Recreational setting.

2.3.2 Dispersed Recreation

Desired Condition: Dispersed recreation allows national forest visitors opportunities to recreate independent of developed recreation facilities. Encounters with other visitors are common along travel routes; however, activities away from developed facilities provide for fewer encounters. Recreation activities and access are readily available in this setting. Areas and facilities accommodate a variety of motorized and nonmotorized uses and are primarily used by visitors to begin and end recreational experiences with a majority of the time spent away from developed facilities. The rustic amenities provided are well maintained and fully functional. Rustic facilities are provided for site protection and sanitary purposes and fit in with the surrounding area. Partnerships with private providers are encouraged and sustained for specialty services, such as big game outfitting and guiding, horseback riding, shuttle services, and bicycle touring. Some special use permits, such as for members only events and limited entry contests, are retained and provide for recreation opportunities not available to the general public. Scenic integrity is commensurate with the inventoried scenic class.

Scale: Recreational setting.

2.3.3 Backcountry Recreation

Desired Condition: Backcountry recreation allows national forest visitors opportunities to recreate independent of developed recreation sites with the exception of trails that facilitate access. Encounters with other people are uncommon or rare, and motorized uses are uncommon except near main portals. Recreation activities that require minimal amenities are available. The setting presents visitors with opportunities to be alone, and backcountry skills and abilities are required. The rustic amenities provided are well maintained and functional. Rustic and rudimentary facilities are provided primarily for site protection, information, and sanitary purposes. Materials used are rustic and minimal. Partnerships with private providers are encouraged and sustained for specialty services, such as backcountry skiing, jet boat and raft trips, and big game outfitting and guiding services.

Scale: Recreational setting.

2.4 Hunting and Fishing

Desired Condition: Opportunities for hunting and fishing are available in a variety of settings. The national forests provide a mix of opportunities that foster hunting and fishing visitor activities, support Oregon and Washington Departments of Fish and Wildlife management objectives, and contribute to local, tribal, and regional economies and lifestyles.

Scale: Forestwide.

2.5 Rocky Mountain Elk

Desired Condition: In landscapes where elk use is promoted, as identified in coordination with state wildlife agencies, there is a mosaic of forage and cover areas, with minimal or no motor vehicle access through forage areas. There is an emphasis on maintaining existing cover areas in most winter range, which often compose smaller portions of the landscape, motor vehicle access and uses on winter range is minimized or eliminated during winter. Maintaining adequate forage areas close to cover and far from roads and trails open to motor vehicle uses is emphasized for most spring, summer, and fall range. For landscapes where hunting occurs, motor vehicle access is restricted so that elk can effectively use cover and topography as security. During hunting seasons, emphasis is placed on closing roads and trails to motor vehicles within landscapes that are flat and open; however, less emphasis is placed on closing roads and trails to motor vehicles within landscapes that are steep and have more cover, as identified in coordination with state wildlife agencies.

Maintaining a mosaic of elk forage and cover areas for a given season and landscape varies based on the biophysical potential of each landscape to sustain cover areas and based on the capability to maintain or enhance adequate forage areas that provide higher nutritional resources far from motor vehicle access. In areas where elk have the potential to damage adjacent private lands or there is a need to meet other goals of management across mixed land ownerships, the quantity of forage and cover areas may be reduced, such as in the wildland-urban interface where the goal may be to reduce the risk of wildfire, in these locations, forage and cover may not be optimal for elk.

Scale: A variety of spatial extents and boundaries (administrative, hydrologic, or ecological) ranging from individual projects to areas as large as state wildlife areas or other administrative or jurisdictional boundaries. In general, monitoring change in habitat conditions for elk requires evaluation at smaller spatial extents, such as areas the size of subwatersheds (5,000 to 20,000 acres), but typically not as small as individual projects. Monitoring change in habitat condition or compliance in management direction for elk is appropriate when considering all management activities that occur or that are proposed over longer time periods of 5 to 15 years, as opposed to individual project activities over shorter time periods.

2.6 Cultural Resources

Desired Condition: Significant prehistoric and historic sites and traditional cultural properties are protected and are managed to standard as part of the Heritage Program. Traditional cultural properties are available for appropriate use. Knowledge of cultural resources is enhanced by scientific study, and public understanding of cultural history is enhanced through interpretation and education.

Scale: Forestwide.

2.7 Roads and Trails Access

Desired Condition: Road systems are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal effect on aquatic and terrestrial systems, and are in balance with available funding. Road density is at a level appropriate to avoid causing resource concerns. Administrative use supports Forest Service management objectives. Conflicts between user groups are minimized, and users take on appropriate challenges and risks.

Roads needed for the long term are identified and investments are made to minimize their effect on the ecosystem and to meet the mobility requirements anticipated in the future.

A system of roads, trails, and areas designated for nonmotorized and motor vehicle use is identified and is available for public use. Motor vehicle use that can cause ground disturbance occurs only on designated routes and in designated motor vehicle use areas as documented on the motor vehicle use map (MVUM). Trails designated for motor vehicle use provide a variety of recreational experiences, including various difficulty levels and trail lengths, access to scenic areas, and routes through assorted ecosystems. Loop trails, closed road systems, and trailhead developments meet the needs of increased recreation use. Snowmobile use is managed to provide varying challenges and distances while respecting ecological systems and other users.

Opportunities for trails where motor vehicle use is prohibited are emphasized in backcountry and wilderness areas. Trails where motor vehicle use is prohibited provide a range of difficulty for a variety of recreational experiences, including mechanized transportation (except in wilderness areas), foot travel, and pack or riding stock. Trails are located to provide experiences in different ecosystem types and scenic settings and do not contribute to resource damage.

Rights-of-way and easements provide adequate and legal access to National Forest System lands. Jurisdiction of county, state, and local access roads is appropriate to assure management objectives are met for both private and state lands.

The need for tribal access to traditional sites is acknowledged and supported.

Access and Open Motor Vehicle Route Density for Alternative B

The desired condition for open motor vehicle route density within watersheds in MA 3B is 1.5 miles of per square mile or less.

The desired condition for open motor vehicle route density within watersheds in MA 4A is 2.4 miles per square mile or less. Within subwatersheds, an exception is made for winter elk habitat, where the route density is 1.5 miles per square mile or less. This applies to each management area within a subwatershed.

Access and Open Motor Vehicle Route Density for Alternative C

The desired condition for open motor vehicle route density within watersheds in MA 3C is 1 mile per square mile or less. In addition, all cross-country over-the-snow vehicle travel is prohibited within MA3C, and over-the-snow vehicle travel permitted only on routes designated open to summer motor vehicle travel.

For alternative C, no National Forest System lands would be allocated to MA 3B.

The desired condition for open motor vehicle route density within watersheds in MA 4A is 2.4 miles per square mile or less. Within subwatersheds, an exception is made for winter elk habitat, where the open motor vehicle route density is 1.5 miles per square mile or less. This applies to each management area within a subwatershed.

Access and Open Motor Vehicle Route Density for Alternative D

The desired condition for open motor vehicle route density within watersheds in MA 4A is 3 miles per square mile or less. Within subwatersheds, an exception is made for winter elk habitat, where the open motor vehicle route density is 1.5 miles per square mile or less.

Access and Open Motor Vehicle Route Density for Alternatives E and F

The desired condition for open motor vehicle route density within watersheds in MA 3C is 1 mile per square mile or less. In addition, all cross-country over-the-snow vehicle travel is prohibited within MA 3C, and over-the-snow vehicle travel permitted only on routes designated open to summer motor vehicle travel.

The desired condition for open motor vehicle route density within watersheds within MA 3B is to minimize the number of miles per square mile as determined by a roads analysis.

The open motor vehicle route density in winter elk habitat is 1.5 miles square mile or less.

The desired condition is to reduce road-related sedimentation by reducing road density and reducing hydrologic connectivity of the road system.

Scale: Forestwide.

2.8 Wildland-urban Interface

Desired Condition: Vegetation treatments within the wildland-urban interface (WUI) areas are based on wildfire protection objectives, which may over-ride ecological desired conditions. Vegetative structure would result in fire intensity that allows for safe and effective suppression actions within wildland-urban interface areas. In general, vegetation density would be more open, with lighter fuel loadings, in comparison to areas outside wildland-urban interface. Fire risk within wildland-urban interface areas would be managed so as not to limit the ability to use fire for resource restoration in areas adjacent to wildland-urban interface areas.

Scale: Forestwide.

2.9 Tribal Rights and Interests

Desired Condition: National Forest System lands administered by the Malheur, Umatilla, and Wallowa-Whitman National Forests are available for tribal members to exercise their reserved rights. The ability to utilize trust resources contributes to the exercise of tribal rights, interests, and cultures in a manner that promotes sustainability of the ecosystem.

Scale: Forestwide.

2.10 Culturally Significant Foods

Desired Condition: Culturally significant foods are available and accessible and are sustained by the ecological and cultural processes under which they historically developed.

Scale: Forestwide.

2.11 Community Resilience

Desired Condition: The management of the Blue Mountains national forests contributes to outputs and opportunities that support community infrastructure. The national forests foster healthy and resilient communities and American Indian tribes by providing sustainable ecological services or products. In turn, communities use their infrastructure (which includes manufacturing facilities, local knowledge, skilled workers, and social networks/relationships) to support natural resource management and restoration activities. Local communities and tribes that rely on the resources of the Blue Mountains national forests are resilient and adapt well to changing conditions. Climate change scenarios may foreclose some opportunities while providing others.

Being able to adapt to multiple potential scenarios is important to maintaining resilient communities. They have the capacity to collectively create and pursue ecological and economic opportunities that foster sustainability.

Scale: Forestwide.

2.12 Wild Horses

Desired Condition: A viable, free-roaming wild horse herd (consistent with the desire of the herd management plan in effect at the time of project level planning) that is genetically diverse and is in ecological balance with other approved multiple uses is present within the Murderers Creek Wild Horse Territory. In concert, this leads towards stable or improving habitat conditions.

Scale: The Murderers Creek Wild Horse Territory/Herd Management Area.

Goal 3: Promote Economic Well-being

Economic well-being is a condition that enables people to work, provide income for their families, and support the economies of local communities, American Indian tribes, the region, and the Nation. The contributions of the national forests to economic well-being are described for capital and wealth and for the economic production of goods and services.

There are many other values, benefits, and costs not addressed in the following discussion of economic well-being. They include the multitude of benefits and costs not traded in the marketplace and values that are difficult to express in monetary terms or other quantitative measures. These values, benefits, and costs are an important part of social and economic sustainability. They are addressed in the social well-being section.

Local economic conditions are interrelated with changes in the economies of Oregon, Idaho, and Washington, as well as with changes in regional, national, and global economies. Recognizing the interdependency between the Forest Service's need for forest management work and the degree to which local industries, infrastructure, employment (including youth), skilled workforce, and other factors provide for this need is important to sustaining and restoring the ecological integrity of the national forests and social and economic conditions of the communities.

Historically, the national forests of the Blue Mountains made significant contributions to area communities, both socially and economically. These national forests still contribute in vital ways to community resilience by providing jobs and quality of life. However, they are not the sole providers of economic stability for communities in the area. Recognizing mutual benefits of the relationships between local communities and the national forests is critical to understanding the contributions to the maintenance and enhancement of other desired conditions, such as healthy forests, clean water and air, scenery, cultural and historic resources, skilled workforce, and manufacturing infrastructure in the context of other local, regional, and national conditions.

3.1 Facilities and Infrastructure

Desired Condition: Administrative facilities are safe, efficient, cost-effective, and are maintained at a function and use level that meets management needs. Facilities meet all applicable health and safety standards. Impacts to natural resources are minimal. Administrative facilities complement and harmonize with natural settings. The form of structures is derived by the function and from the landscape setting. For example, structures in mountainous, timbered landscapes have steep rooflines and broad eaves and use durable indigenous materials, such as stone and heavy timbers, with the appearance derived from the local environment. Structures, signage, and other built

environment elements reflect the style and character inherent in the local environment (USDA Forest Service 2001).

Scale: Forestwide.

3.2 Land Ownership

Desired Condition: Property boundaries are marked to standard. Encroachments, title claims, and trespasses are identified and resolved. Property boundaries are maintained to reduce the likelihood of future encroachments, title claims, and trespass. Road and trail easements are prioritized and obtained to continue access across private lands and reduce re-routing costs.

Landownership adjustment by purchase, exchange, or other authority simplifies and improves management of the Blue Mountains national forests. Priorities for land acquisition include congressionally designated areas and lands that support known populations of threatened, endangered, proposed, or sensitive species.

Scale: Forestwide.

3.3 Goods and Services

The desired conditions for 3.3 Goods and Services are described in 3.3.1 Forest Products, 3.3.2 Livestock Grazing, 3.3.3 Special Uses, 3.3.4 Mineral and Geological Resources, and 3.3.5 Water Use.

3.3.1 Forest Products

Desired Condition: Land classified as suitable for timber production has a regularly scheduled timber harvest program that provides social and economic benefits while contributing to ecosystem health and sustainability. Land classified as unsuitable for timber production, but where timber harvesting can occur for other multiple-use purposes, has an irregular timber harvest program that contributes to ecosystem health and sustainability while providing benefits to people.

A predictable supply of timber outputs, known as the allowable sale quantity, contributes to a local forest products industry.

Small diameter biomass provides a variety of forest products, such as hog fuel, fuel chips, pulp, small diameter roundwood, and firewood.

Non-timber forest products, such as berries and mushrooms, continue to be available for gathering in sustainable amounts for general public, commercial, and tribal use.

Scale: Forestwide.

3.3.2 Livestock Grazing

Desired Condition: Grazing allotments contribute to a predictable supply of livestock forage that contributes to local ranching operation sustainability and local community growth while maintaining or achieving ecological desired conditions.

Scale: Forestwide.

3.3.3 Special Uses

Desired Condition: Special uses are authorized for uses that the national forests have a unique niche to provide. These authorizations are managed to protect natural resources values consistent with the ecological, social, and economic desired conditions.

Scale: Forestwide.

3.3.4 Mineral and Geological Resources

Desired Condition: Exploration, development, and production of mineral and energy resources contribute to the social and economic needs of the Nation as well as local communities, and are conducted so as to minimize adverse environmental effects on national forest surface resources.

3.3.5 Water Use

Desired Condition: Water is available in sufficient quantity downstream to meet human needs as well as the needs of aquatic species considering the range of possible climate change scenarios.

Water quality and quantity of groundwater resources, including seeps, springs, fens, and other groundwater-dependent ecosystems, is sufficient to provide for the extent and diversity of species normally associated with these habitats.

Scale: Watershed to subbasin.

Alternative Elements (Alternatives B through F)

As discussed in the introduction to Part 2—Comparison of the Action Alternatives, the alternative elements will include discussion and comparison of some of the forest plan components, including management areas, suitability determinations, objectives, standards, and guidelines. Most forest plan management direction will be common to each of the three national forests. Only where specifically noted will management direction be specific to only one of the national forests.

Management Areas

Management areas broadly describe areas where general management intent is similar. The purpose of management areas is to provide consistent guidance for similar portions of the national forest landscape when implementing or continuing management activities. The management areas generally range along a continuum from little development by humans in MA 1A to extensive human development in MA 5.

Management area descriptions and intent do not vary by alternative except for MA 4B. Not all management areas occur in all alternatives. Table A-40 to Table A-43 list the management areas by national forest for each of the alternatives. Management areas are the same for alternatives E and F. The tables do not include the Hells Canyon National Recreation Area, but they do display the portion of the Ochoco administered by the Malheur as part of the Malheur.

MA 1A Congressionally Designated Wilderness Areas

Description: As defined by the 1964 Wilderness Act, a wilderness area is undeveloped Federal land retaining its primitive character without permanent improvements or human habitation and is managed to preserve its natural conditions.

There are six designated wilderness areas within the Blue Mountains national forests that were established through a number of legislative acts, including the Oregon Wilderness Act (1984) and the Washington Wilderness Act (1984). These areas are displayed in table A-21.

Table A-21. Designated wilderness areas for each national forest

Wilderness Area Name	Acres*
Malheur National Forest Designated Wilderness Areas	
Strawberry Mountain	69,509
Monument Rock	13,047
Total	**82,556**
Umatilla National Forest Designated Wilderness Areas	
Wenaha-Tucannon	176,753
North Fork John Day	107,158
North Fork Umatilla	20,255
Total	**304,166**
Wallowa-Whitman National Forest Designated Wilderness Areas**	
Eagle Cap	351,859
Monument Rock	7,188
North Fork John Day	13,897
Total	**372,944**
Total All	**759,666**

* The management area acres displayed above are taken from the 1990 forest plans and have not been recalculated using the most current GIS technology.

** Wilderness area acres within the HCNRA are not included in this table.

Desired Condition: Designated wilderness areas exhibit primitive qualities. Opportunities for research, exploration, solitude, risk, challenge, and primitive recreation are widespread. On the trail system, opportunities for solitude are moderate to high, with few human encounters expected. Opportunities for solitude are high when traveling cross-country with almost no human encounters expected. Campsites may be visible at popular destinations along water features and at major trail junctions. These sites accommodate moderate use. Directional and regulatory signs are primarily found at trailheads outside of this management area but some signs may be present within these areas along trails and junctions. Buildings are rare within this management area; however, the preservation of historical features or retention of facilities for administrative use may occur. Ecosystems are influenced by natural processes with little or no human intervention. Geological and ecological processes, such as wildfire and insects and disease, operate relatively free from the influence of humans. Any influences upon these processes by humans is intended to protect human life; protect adjacent private property or private in-holdings; and reduce impacts to Federal facilities, historic or cultural structures, and threatened and endangered plant or animal species or species included in the regional forester's sensitive species list. Predominately diverse, native vegetation results from natural succession and disturbance processes, while nonnative vegetation is rare. The recreation opportunity spectrum is primitive.

MA 1B Preliminary Administratively Recommended Wilderness Areas (PARWA)

Description: The areas in MA 1B have been determined to meet the criteria established to qualify for designation as wilderness areas. These areas are recommended for designation and inclusion in the National Wilderness Preservation System (table A-22 to table A-25). Until a decision is made by Congress, these areas will be managed to protect the wilderness characteristics that meet the criteria for designation of these lands as designated wilderness areas.

Desired Condition: Recommended wilderness areas exhibit primitive qualities. Opportunities for research, exploration, solitude, risk, challenge, and primitive recreation are widespread. On the trail system, opportunities for solitude are moderate to high, with few human encounters expected. Opportunities for solitude are high when traveling cross-country with almost no human encounters expected. Ecosystems are influenced by natural processes with little or no human intervention. Geological and ecological processes, such as wildfire and insects and disease disturbances, operate relatively free from the influence of humans. Predominately diverse, native vegetation results from natural succession and disturbance processes, while nonnative vegetation is rare. Uses are conducive to maintaining the wilderness characteristics of the areas. The recreation opportunity spectrum is primitive.

Table A-22. Recommended wilderness areas for each alternative for the Malheur National Forest

PARWA	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
Aldrich Mountain	NA	NA	4,870	NA	NA
Cedar Grove	NA	NA	5,650	NA	NA
Dry Cabin	NA	NA	12,140	NA	NA
Greenhorn	NA	NA	12,630	NA	6,139
Jumpoff Joe	NA	NA	2,130	NA	NA
McClellan Mountain	NA	NA	23,150	NA	23,145
Myrtle Silvies	NA	NA	10,930	NA	NA
Shaketable	NA	NA	7,652	NA	NA
Strawberry Mountain Wilderness Area Additions	NA	1,160	3,983	NA	1,160
Totals	NA	1,160	83,810	NA	30,447

Table A-23. Recommended wilderness areas for each alternative for the Umatilla National Forest

PARWA	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
Asotin Creek	NA	NA	16,180	NA	NA
Greenhorn Mountain	NA	NA	11,275	NA	7,733
Hellhole	NA	NA	67,071	NA	21,980
Horseshoe Ridge	NA	NA	6,270	NA	NA
Jumpoff Joe	NA	NA	5,240	NA	NA
Meadow Creek	NA	NA	1,780	NA	NA
Mount Emily	NA	NA	5	NA	NA
North Fork John Day Wilderness Area Additions	NA	1,170	3,830	NA	1,241
North Fork Umatilla Wilderness Area Additions	NA	270	970	NA	235
North Mount Emily	NA	NA	4,616	NA	NA

PARWA	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
Owsley	NA	NA	7,620	NA	NA
Potomas	NA	NA	6,286	NA	NA
Skookum	NA	NA	9,440	NA	NA
South Fork Tower	NA	NA	15,840	NA	NA
Spangler	NA	NA	5,710	NA	NA
Squaw	NA	NA	2,580	NA	NA
Tiger Creek	NA	NA	5,566	NA	NA
Upper Tucannon	NA	NA	13,194	NA	8,880
W-T Three	NA	NA	1,865	NA	NA
Walla Walla River	NA	NA	34,790	NA	NA
Wenatchee Creek	NA	NA	18,910	NA	NA
Willow Springs	NA	NA	9,490	NA	NA
Totals	NA	1,440	248,535	NA	40,074

Table A-24. Recommended wilderness areas for each alternative for the Wallowa-Whitman National Forest

PARWA	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
Boulder Park	NA	NA	12,930	NA	NA
Castle Ridge	NA	NA	8,780	NA	NA
Dunns Bluff	NA	NA	760	NA	NA
Homestead	NA	NA	2,409	NA	NA
Huckleberry	NA	10,770	10,770	NA	10,770
Hurricane Creek	NA	NA	1,720	NA	NA
Joseph Canyon	NA	NA	6,750	NA	NA
Lake Fork	NA	NA	15,720	NA	NA
Little Creek	NA	NA	2,590	NA	NA
Little Eagle Meadow	NA	NA	6,840	NA	NA
Little Sheep	NA	NA	5,490	NA	NA
Marble Point	NA	NA	3,100	NA	NA
Monument Rock	NA	NA	5,850	NA	NA
Reservoir	NA	NA	15,300	NA	NA
Squaw	NA	NA	3,543	NA	NA
Twin Mountain	NA	NA	57,640	NA	9530
Upper Catherine Creek	NA	NA	7,020	NA	NA
Wildhorse	NA	NA	289	NA	NA
Totals	NA	10,770	172,749	NA	20,306

Table A-25. MA 1B acreage for each alternative for each national forest

National Forest	Alt. A	Alt. B	Alt. C	Alt. D	Alts. E and F
MAL	0	1,200	83,800	0	30,400
UMA	0	1,400	248,500	0	40,100
WAW	0	10,800	172,800	0	20,300

MA 1C Wilderness Study Area

Description: The Homestead Wilderness Study Area, including the neighboring Federal lands managed by the Bureau of Land Management, contains about 14,000 acres of public land.

Inventoried roadless areas were reviewed, and the portion of this roadless area managed by the Wallowa-Whitman National Forest increased from about 5,700 acres to about 9,000 acres. Most of the area is within the HCNRA, and the remainder of the roadless area is within the Whitman Ranger District. The 1991 Bureau of Land Management wilderness study process included the national forest acres and did not propose to recommend this roadless area for wilderness designation. Congress has not yet accepted the study, so these acres remain in the wilderness study area category. Wilderness values and resources will be protected until Congress either designates the area as part of the National Wilderness Preservation System or releases the area from consideration.

Desired Condition: The Homestead Wilderness Study Area provides opportunities for primitive recreation where natural processes dominate the landscape. The recreation opportunity spectrum is primitive.

MA 2A Wild and Scenic Rivers (Includes Designated, Eligible, and Suitable Rivers)

Description: This management area applies to river segments that have been designated as part of the Wild and Scenic Rivers System under the authority of the Wild and Scenic Rivers Act, as amended (1968) and the Oregon Omnibus River Act (1988) (see table A-26). Depending on the alternative, it also applies to rivers identified as eligible or suitable for designation (table A-27 and table A-28). The act requires that a detailed study report be prepared for all rivers mandated for study under section 5(a) of the Wild and Scenic Rivers Act, as amended, and for all other rivers identified by the Forest Service as eligible for inclusion in the National Wild and Scenic Rivers System (sec. 5(d)(1) of the act). Section 5(d)(1) study rivers found eligible are to be protected pending a suitability determination. Land management agencies must protect section 5(d)(1) study rivers found suitable for inclusion in the National Wild and Scenic Rivers System for their free-flowing condition, water quality, and outstandingly remarkable values. The existence of low dams, diversion works, or other minor structures at the time any river is proposed for inclusion in the National System does not automatically disqualify it for designation, but future construction of such structures is not allowed.

Across the Blue Mountains national forests, there are 11 rivers designated by Congress as wild and scenic. On those 11 rivers, about 142 miles are classified as wild, 68 miles as scenic, and 35 miles as recreational.

Desired Condition: Eligible, suitable and designated wild and scenic rivers are free flowing, without impoundment, diversion, straightening, rip-rapping or other modification of the waterways. Water quality and outstandingly remarkable values for each are protected and enhanced. Development and access levels are consistent with the classification of the stream or stream segment as designated (or deemed suitable or eligible in the case of river segments that are not designated).

Wild Rivers

Wild river segments are free flowing and are generally inaccessible except by trail and/or water; the shorelines are essentially natural appearing. Signs of human activity, including structures or evidence of resource use, are minimal. Visitors have the opportunity to interact with a natural environment with minimal sights and sounds of other people. Wild rivers within designated

wilderness areas meet the desired condition for MA 1A. The recreation opportunity spectrum is primitive to semiprimitive nonmotorized.

Table A-26. Miles of designated wild and scenic rivers for each national forest

River Name	Wild	Scenic	Recreational
Malheur National Forest			
Malheur River	6.0	6.0	0.0
North Fork Malheur River	0.0	25.5	0.0
Totals	**6.0**	**31.5**	**0.0**
Umatilla National Forest			
Wenaha River	18.7	2.7	0.2
Grande Ronde River*	17.4	0.0	1.5
North Fork John Day River*	24.3	10.5	8.9
Totals	**60.4**	**13.2**	**10.6**
Wallowa-Whitman National Forest**			
Eagle Creek	4.0	6.0	17.0
Grande Ronde River*	17.4	0.0	1.5
Joseph Creek	8.6	0.0	0.0
Imnaha River	15.0	0.0	0.0
Lostine River	5.0	11.0	0.0
Minam River	39.0	0.0	0.0
North Fork John Day River*	3.5	0.0	6.9
North Powder River	0.0	6.0	0.0
Totals	**92.5**	**23.0**	**25.4**
Total All*	**141.5***	**67.7**	**34.5***

* The Grande Ronde and North Fork John Day rivers are listed above for both the Umatilla and Wallowa-Whitman National Forests as administration is shared. Mileage for the North Fork John Day River is divided within the table to reflect the mileage within and administered by each national forest. The Grande Ronde River is part of the administrative boundary between the Umatilla and Wallowa-Whitman National Forests, and the mileage is displayed equally for each of the national forests and is only counted once in the overall total.

** Designated wild and scenic rivers (Rapid and Snake rivers and part of the Imnaha River) within the HCNRA are not included in this table.

Scenic Rivers

Scenic river segments are free flowing. Shorelines and viewing areas are largely natural appearing but are accessible by roads in some places. Some recreation structures, evidence of timber harvest roads, and other evidence of human activity may be present but do not detract from the near natural appearance and scenic qualities of the immediate environment. A variety of water related recreational opportunities are available. The recreation opportunity spectrum is semiprimitive nonmotorized to semiprimitive motorized.

Recreational Rivers

Recreational river segments are free flowing and are readily accessible from roads. Some major public use facilities, such as developed campgrounds, administrative buildings, bridges, private residences, and commercial businesses, may be within the corridor. Considerable development and silvicultural treatments may have occurred and may be evident near the river. A range of recreational opportunities is available in settings where visitors are likely to share their

recreational experience with other individuals or groups. The recreation opportunity spectrum is semiprimitive motorized to roaded natural.

Table A-27. Miles of eligible wild and scenic rivers for each national forest*

River Name	Wild	Scenic	Recreational	Potential Outstandingly Remarkable Values
Malheur National Forest				
Lake Creek	3.3	0.0	0.0	Scenery
Umatilla National Forest				
Bear Creek	4.6	0.0	0.0	Fisheries
Butte-West Fork Creek	13.9	0.0	0.0	Scenery, fisheries
Desolation Creek	0.0	0.0	21.4	Recreation, botanical
Lookingglass Creek	8.7	0.0	0.0	Fisheries, hydrological
North Fork Desolation Creek	0.0	0.0	6.8	Botanical
North and South Fork Wenaha River	26.3	0.0	0.0	Scenery, fisheries, botanical
Sheep Creek (in Washington)	0.0	0.0	0.5	Scenery, fisheries, botanical
South Fork Desolation Creek	8.9	0.0	0.0	Fisheries, botanical
Tucannon River	9.1	4.6	8.7	Recreation, fisheries, cultural, botanical
Totals	**71.5**	**4.6**	**37.4**	
Wallowa-Whitman National Forest				
Big Sheep Creek	10.0		39.1	Recreation, fisheries, cultural
Dutch Flat Creek/Van Patton Creek*	5.3	0	0	Scenery, recreation, geological, hydrological, botanical
East Eagle Creek*	9	2.1	4.5	Scenery, recreation, fisheries, hydrological, geological, cultural
Five Points Creek*	0	12.1	0	Scenery, fisheries, wildlife
Killamacue/Rock Creek	10.2	8.6	0	Scenery, recreation, geologic, botanical
North Fork Catherine Creek	11.1	0	2.6	Scenery, recreation, fisheries, wildlife
Swamp Creek	7.6	0	9.2	Fisheries, wildlife, cultural
Upper Grande Ronde River	11.7	0	18	Recreation, fisheries, wildlife, cultural
Totals	**64.9**	**22.8**	**73.4**	
Total All*	**139.7**	**27.4**	**110.8**	

* All of the eligible wild and scenic rivers remain eligible on the Malheur and Umatilla National Forests. In alternative B, C and D, all of the eligible wild and scenic rivers remain eligible on the Wallowa-Whitman National Forest.

Table A-28. Miles of suitable wild and scenic rivers for alternatives D, E, and F for the Wallowa-Whitman National Forest

River Name	Wild	Scenic	Recreational	Outstandingly Remarkable Values
Wallowa-Whitman National Forest*				
Dutch Flat Creek	5.3	0.0	0.0	Scenery, recreation, geological, hydrological, botanical
East Eagle Creek	9.0	2.1	4.5	Scenery, recreation, fisheries, hydrological, geological, cultural
Five Points Creek	0.0	12.1	0.0	Scenery, fisheries, wildlife
Totals	**6.0**	**31.5**	**0.0**	

* These rivers were determined suitable. Analysis is documented in the Dutch Flat Creek, Killamacue Creek, and Rock Creek Wild and Scenic River Study Report (1996) and Wild and Scenic River Study Report and Final Legislative EIS for Eight Rivers (1997).

MA 2B Research Natural Areas

Description: Research natural areas (RNAs) form a network of ecological reserves established for research and education purposes and for the maintenance of biodiversity. They are established to conserve unique ecological communities and are intended to promote and protect natural diversity. Research natural areas typify important vegetative, aquatic, and geological types, as well as other natural situations that have special and unique characteristics of scientific interest and importance.

Research, study, observation, monitoring, and educational activities that are nondestructive and nonmanipulative are generally allowed within research natural areas. While research natural areas are generally not suitable for livestock grazing, some incidental use by livestock could occur within these areas as administrative boundaries are typically not fenced. The network of established or proposed research natural areas within the national forests of the Blue Mountains is displayed in table A-29.

Desired Condition: Research natural areas and proposed research natural areas exhibit natural conditions with minimal human intervention, and ecological processes prevail. Under some circumstances (i.e., when there is an approved establishment report that includes a management plan), deliberate manipulation may occur to maintain the ecosystem or the unique feature for which the research natural area was established, except in wilderness areas. The recreation opportunity spectrum depends on the surrounding management areas.

Table A-29. Acres, status and change to research natural areas for each national forest with each alternative

Area Name	Alt. A	Alts. B, C, D, E, and F	Status	Change
Malheur National Forest				
Baldy Mountain	2,591	3,861	Proposed	Boundary update
Canyon Creek	738	738	Established	NA
Dixie Butte	86	335	Proposed	Boundary update
Dry Mountain	2,260	2,260	Established	NA
Dugout Creek[1]	908	908	Established	NA
Shaketable	375	385	Established	Boundary update
Silver Creek	802	802	Proposed	NA
Stinger Creek	354	1,663	Proposed	Boundary update
Strawberry Mountain	0	107	Proposed	New
Total	**8,114**	**11,059**		
Umatilla National Forest				
Birch Creek Cove	411	411	Proposed	NA
Kahler Creek Butte (formerly Kelly Creek Butte)	84	84	Proposed	NA
Mill Creek	7,702	7,486	Proposed	Boundary update[2]
Pataha Bunchgrass	63	63	Established	NA
Rainbow Creek	570	570	Established	NA
Vinegar Hill	424	424	Proposed	NA
Wenaha Breaks (formerly Elk Flats-Wenaha Breaks)	1,970	1,970	Established	Boundary update
Total	**11,224**	**11,008**		
Wallowa-Whitman National Forest*				
Clear Creek Ridge	0	637	Proposed	New
Craig Mountain Lake	172	172	Proposed	NA
Glacier Lake	102	102	Proposed	NA
Haystack Rock	425	425	Proposed	NA
Horse Pasture Ridge	338	338	Proposed	NA
Indian Creek	1,003	1,003	Established	NA
Johnson (formerly Cougar Meadow)	131	131	Proposed	Name change
Lake Fork[1]	224	224	Proposed	Boundary update
Mount Joseph	705	705	Proposed	NA
Nebo[1]	0	1,695	Proposed	New
Point Prominence	365	365	Proposed	NA
Standley	0	742	Proposed	New
Gerald S. Strickler (formerly Government Meadow)	195	195	Established	Name change
Sturgill	0	139	Proposed	New
Tenderfoot Basin	0	891	Proposed	New
Vance Knoll	190	190	Established	NA
West Razz Lake	47	47	Proposed	NA
Totals	**3,897**	**8,001**		

1. Acres within the HCNRA are not included in this table.
2. This research natural area is also a designated municipal watershed

MA 2C Botanical Areas

Description: Botanical areas have special values and unique natural characteristics. Botanical areas contain specimens, groups of plant colonies, or plant communities that are significant because of form, color occurrence, habitat location, life history, ecology, variety, or other features. While botanical areas are generally not suitable for livestock grazing, some incidental use by livestock could occur within these areas as administrative boundaries typically are not fenced. The network of established or proposed botanical areas within the national forests of the Blue Mountains is displayed in table A-30.

Desired Condition: Botanical areas exhibit the natural composition, structure, and function of each area's unique ecosystem. The recreation opportunity spectrum depends on the surrounding management areas.

Table A-30. Botanical areas for each national forest

Area Name	Current Acres	Proposed Acres	Change
Malheur National Forest			
Fergy Spruce Grove	29	29	No changes proposed
Cedar Grove	94	116	Updated calculation from current mapping
Totals	**123**	**145**	
Umatilla National Forest			
Charley Creek	50	111	Increased acres to protect unique values
Ruckel Junction	5	5	No changes proposed
Karl Urban	500	500	Name changed from Sheep Creek Falls Botanical Area
Shimmiehorn Canyon	197	197	No changes proposed
Sourdough	0	1,511	Proposed
Farr Meadows	0	12	Proposed
Elk Flats Meadow	0	97	Proposed
Totals	**695**	**2,437**	
Wallowa-Whitman National Forest			
None	NA	NA	NA
Total All	**818**	**2,582**	

MA 2D Geological Areas

Description: Geological areas have outstanding formations or unique geological features of the earth's development, such as caves, fossils, dikes, cliffs, or faults. These areas are protected or enhanced, and where appropriate, public use and enjoyment is fostered. The network of established geological areas within the Malheur and Umatilla National Forests is displayed in table A-31.

Desired Condition: Geological areas display unusual formations and significant events. Developments provide public enjoyment and interpretation opportunities with high scenic, recreational, and historic value. Access within the areas is by nonmotorized trails. The recreation opportunity spectrum depends on the surrounding management areas.

Table A-31. Geological areas for the Malheur and Umatilla National Forests

Area Name	Acres
Malheur National Forest	
Magone Lake	185
Tex Bridge	1
Total	**186**
Umatilla National Forest	
Big Sink	416
Wallowa-Whitman National Forest	
None	NA
Total All	**788**

MA 2E Historical Areas

Description: These areas are protected or enhanced, and, where appropriate, public use and enjoyment is fostered. These areas are usually small (generally less than 1,000 acres). Historical areas have historic sites, buildings, or objects of significance. The network of established historical areas within the Malheur and Umatilla National Forests is displayed in in table A-32.

Desired Condition: Historical areas demonstrate legacies unique to the area. Developments exist to enhance public enjoyment and interpretation. Their high historic value is maintained. The recreation opportunity spectrum depends on the surrounding management areas.

Table A-32. Historical areas for the Malheur and Umatilla National Forests

Area Name	Acres
Malheur National Forest	
Sumpter Valley Railroad	13
Depression ERA CCC Buildings	11
Early and Intermediate Period Buildings	4
Historic Lookouts	7
Malheur Headwaters National Register District	4,950
Camas Oven Site	10
Pre-Mazama Site	10
Arch Rock Site	2
Historic Mining Districts	598
Obsidian Source Archaeological Complex	28,000
Total	**33,605**
Umatilla National Forest	
Greenhorn	90
Olive Lake-Fremont Powerhouse	1,000
Target Meadows	83
Total	**1,173**
Wallowa-Whitman National Forest	**NA**
None	
Total All	**34,778**

MA 2F Scenic Byways and All-American Roads

Description: The National Scenic Byways Program is a part of the U.S. Department of Transportation. The program is a grassroots, collaborative effort established to help recognize, preserve, and enhance selected roads throughout the United States. The U.S. Secretary of Transportation recognizes certain roads as all-American roads or national scenic byways based on one or more archeological, cultural, historic, natural, recreational, or scenic quality.

The purpose of the scenic byways program is to create a distinctive collection of designated roads, their stories, and treasured places by creating a unique travel experience and enhanced local quality of life through efforts to preserve, protect, interpret, and promote the intrinsic qualities of designated byways. Table A-33 displays the miles of designated national and state scenic byways and designated routes within the Blue Mountains national forests. Each of the scenic byways has additional mileage outside of national forest boundaries.

Desired Condition: The scenic integrity of scenic byways is high. Scenic byways connect communities with the surrounding natural environment. Constructed features contribute to the attractiveness of the landscape and/or theme. The recreation opportunity spectrum depends on the surrounding management areas.

Table A-33. Scenic byways within each national forest

Scenic Byway Name	Length (miles)	Designation
Malheur National Forest		
Journey Through Time Scenic Byway	13	State
Umatilla National Forest		
Blue Mountain Scenic Byway	48	State
Elkhorn Scenic Byway	3	State
Total	**51**	
Wallowa-Whitman National Forest		
Blue Mountain Scenic Byway	2	State
Hells Canyon Scenic Byway*	10	National
Journey Through Time Scenic Byway	21	State
Elkhorn Scenic Byway	52	State
Total	**85**	
Total All	**149**	

* A portion of the Hells Canyon Scenic Byway, an All-American Road, is within the HCNRA and is not included in this table.

MA 2G Nationally Designated Trails

Description: The National Trail System Act (1968) authorized the creation of a national trail system comprised of National Recreation Trails, National Scenic Trails, and National Historic Trails. These trails are included in the listing of specially designated areas because of their scenic, recreational, and historic value. Table A-34 displays the trails that are designated within the Malheur, Umatilla, and Wallowa-Whitman National Forests.

Desired Condition: Nationally designated trails meet standards commensurate with the significance of each trail. They are well maintained and are upgraded where necessary to minimize resource problems while providing a safe, consistent surface. Signage is adequate or is

improved. Their high scenic, recreational, and historic value is evident. The recreation opportunity spectrum depends on the surrounding management areas.

Table A-34. Nationally designated trails within each national forest

Trail Name	Length (miles)
Malheur National Forest	
Arch Rock National Recreation Trail	0.3
Cedar Grove National Recreation Trail	1.0
Malheur River National Recreation Trail	8.0
Total	**9.3**
Umatilla National Forest	
Jubilee Lake National Recreation Trail	3.0
North Fork John Day National Recreation Trail	22.9
South Winom Creek National Recreation Trail	4.0
Total	**29.9**
Wallowa-Whitman National Forest*	
Elkhorn Crest National Recreation Trail	23.0
High Wallowa National Recreation Trail	2.0
Oregon Trail National Historic Trail	8.3
Total	**33.3**
Total All	**72.5**

* The following designated trails are within the HCNRA and are not included in this table: Nez Perce-Nee Me Poo National Historic Trail and the Western Rim/Summit Ridge, Heaven's Gate, and Snake River National Recreation Trails.

MA 2H Scenic Areas

Description: Scenic areas are places of natural variety where unique physical characteristics provide pleasing views and dispersed recreational opportunities. Scenic areas are designated to protect or enhance, and, where appropriate, foster public use and enjoyment of areas with special landscapes noted for their natural beauty. There are three designated scenic areas within the national forests of the Blue Mountains. The network of established scenic areas within the Malheur and Umatilla National Forests is displayed in table A-35.

Desired Condition: Scenic areas provide a variety of recreational opportunities for public use and enjoyment while remaining mostly natural in appearance. While roads provide motor vehicle access to the unique natural beauty and sense of vastness of these areas, the supply and visibility of existing roads is subordinate to the overall scenic character of the landscape. The scenic integrity of these areas is high to very high. The recreation opportunity spectrum depends on the surrounding management areas.

Table A-35. Scenic areas within the Malheur and Umatilla National Forests

Name	Acres	Establishment
Malheur National Forests		
Vinegar Hill-Indian Rock Scenic Area	12,835	Established in 1966 by Regional Forester
Silver Creek Scenic Area	1,572	Proposed
Total	**14,407**	
Umatilla National Forest		
Vinegar Hill-Indian Rock Scenic Area	21,956	Established in 1966 by Regional Forester and amended in 1978 by adding the Desolation Unit
Grande Ronde Scenic Area	9,158	Established in 1979 by Regional Forester
Total	**31,114**	
Total All	**45,521**	

MA 2I Starkey Experimental Forest and Range

Description: The Starkey Experimental Forest and Range (Starkey) was established in 1940. It is managed to support existing research projects and to provide for future research needs. Experimental forests and ranges (EFRs) were established explicitly to conduct research benefitting and supporting National Forest System management. Management treatments on EFRs generally are integrated with and support research projects. The national network of EFRs, a land base authorized by Congress and designated by the Chiefs of the Forest Service over the last 100 years, provides sites where long-term ecological research can be maintained. Experimental forests and ranges are living laboratories where scientists not only make discoveries but also demonstrate relevant research results for cooperators and stakeholders. They provide opportunities to conduct the innovative research that will be required for sound management of future landscapes.

Starkey is a world-class research facility and a primary field location for long-term, operational scale scientific studies of the effects of management activities on ungulates and other wildlife, as well as effects of deer, elk and cattle on ecosystem process and function. Scientists conducting research at Starkey have generated numerous publications that have been instrumental in providing managers with defensible options and best management practices for managing roads and traffic, including off-road recreation, livestock grazing, and fuel treatments in relation to ungulates. Significant, long-term research on interactions between livestock and wild ungulates began in 1989, through a joint wildlife research project conducted by the Oregon Department of Fish and Wildlife, Oregon State University, and the U.S. Forest Service.

The Station Director will review and concur with management activities proposed within this Experimental Forest and Range.

Desired Condition: The Starkey provides opportunities to study deer, elk, cattle, and other wildlife, as well as other aspects of intensive forest and rangeland management including disturbance ecology (e.g., fire, insects and disease, large mammal grazing). A wide variety of land uses and human activities will continue to be included in management of Starkey including: active silviculture, fuels reduction, biofuel management, fire suppression, cattle grazing, public access, public uses of motorized and nonmotorized roads and trails, firewood cutting, camping and other nonconsumptive recreation, and protection of all research facilities. Public access and activities are managed to protect the facilities and meet research needs.

Depending on research objectives, studies range from nonmanipulative studies at very small scales, to experiments involving commercial timber harvesting across multiple stands. Typical forest practices, such as fuels reduction, prescribed fire, and timber harvest, are conducted as part of research direction and may result in a higher level of uncertainty of effects than is expected in other management areas, because research within experimental areas can include testing of novel prescriptions and management approaches. Timber harvest is allowed to meet specific resource objectives for Starkey. Timber harvest is not scheduled and does not contribute towards the allowable sale quantity.

Enclosures, exclosures, and long-term vegetation plots are maintained and protected to provide a continuous data stream to meet research objectives. However, future research may dictate treatment within these areas. Livestock management systems include 1) use of novel cattle grazing systems to facilitate habitat recovery in riparian systems, 2) manipulative ungulate treatments to evaluate cattle versus elk and deer herbivory effects on vegetation development, and 3) evaluating effects of ungulates on a wide variety of other resources (e.g., water quality, hydrology, nutrient cycling, forest productivity, and wildlife). The number of animals, as well as the allocation of this number between cattle, deer and elk, may be manipulated as part of the research conducted on the Starkey Experimental Forest and Range.

The recreation opportunity spectrum is roaded natural.

MA 2J Municipal Watersheds

Description: A municipal watershed is an area that serves a public water system as defined by the Safe Drinking Water Act. The act applies to systems that provide water for human consumption, have at least 15 service connections, or regularly provide water to at least 25 people. The act was amended in 1996 to require source water protection zones for groundwater wells that provide water for public use. The act regulates both community and non-community water systems.

Six communities in the Blue Mountains have water systems that derive water supplies directly from National Forest System lands (see table A-36).

The definition of municipal watershed in current Forest Service regulations does not include communities served by a well or confined groundwater unaffected by Forest Service activities. However, the Safe Drinking Water Act of 1974 was amended in 1996 to require source water protection zones for groundwater wells that provide water for municipal use. Designation of municipal watersheds recognizes the need to protect public water supplies. Municipal watersheds may be managed for multiple uses so long as management activities do not degrade water quality.

Management of some municipal water supply watersheds is subject to the terms of existing agreements between the Secretary of Agriculture and the respective cities.

In general, management of the municipal watersheds displayed in table A-36 is guided by existing agreements between the individual cities and either the Secretary of Agriculture or the Forest Service. Actions that could degrade water quality are either prohibited or are subject to approval by the respective city. For some communities, wells outside the national forest are the primary water source, but well-head protection zones may extend onto National Forest System lands.

Table A-36. Designated municipal watersheds for each national forest

Watershed	Acres	City	Establishment
Malheur National Forest			
Long Creek Municipal Watershed	256	Long Creek, OR	1937 Special Use Permit
Byram Gulch Municipal Watershed	279	Canyon City, OR	1926 Special Use Permit
Total	**535**		
Umatilla National Forest			
Mill Creek Municipal Watershed	20,300	Walla Walla, WA	1918 Agreement between Secretary of Agriculture and City of Walla Walla
Total	**20,300**		
Wallowa-Whitman National Forest			
Baker City Municipal Watershed (multiple streams)	9,322	Baker City, OR	1912 Agreement with Department of Agriculture
La Grande City Municipal Watershed (Beaver Creek)	15,161	La Grande, OR	1935 Agreement with Department of Agriculture
Total	**24,483**		
Total All	**45,318**		

In addition to the municipal watersheds listed in table A-36, nine communities in Oregon have watersheds or water sources located on or adjacent to National Forest System lands that should be protected in order to meet state source-water protection guidelines.

Within the Malheur National Forest

The town of Seneca uses two groundwater wells for its public water supply. The well-head protection zones for these wells may include National Forest System lands and require protection under the Safe Drinking Water Act. Prairie City obtains its water supply from Dixie Creek, which originates on National Forest System lands.

Twelve additional sites, including campgrounds and administrative sites and one privately owned site, provide water for public use and are regulated by provisions of the Safe Drinking Water Act as non-community water systems.

Within the Umatilla National Forest

The North Fork Umatilla River was designated as the municipal water supply for the city of Pendleton by the Oregon State Legislature in 1941. In 1984, the area was designated as a wilderness area and the city has since transferred its water intake to a point on the Umatilla River near the city of Pendleton.

Within the Wallowa-Whitman National Forest

The town of Granite has a water intake on National Forest System lands operating under special use permit. A wellhead protection zone for a groundwater well extends onto National Forest System lands.

The town of Halfway has municipal water rights on National Forest System lands but has converted the water system to groundwater sources on city-owned lands.

The upper Wallowa River, including Wallowa Lake, is designated by the Oregon Department of Environmental Quality as the municipal water supply for the city of Joseph. The city water intake is located near the outlet of Wallowa Lake and is not on National Forest System lands.

The city of Sumpter has a water intake operating under special use permit on National Forest System lands. The watershed is designated by Oregon Department of Environmental Quality as a municipal water supply.

The city of Wallowa owns municipal water rights on National Forest System lands (Bear Creek) but has converted its water system to groundwater sources on city-owned lands.

The communities of Richland and Greenhorn obtain their water from surface sources originating on National Forest System lands.

Fifteen additional sites within the Wallowa-Whitman National Forest, primarily campgrounds and administrative sites, provide water for human consumption and are regulated under the authority of the Safe Drinking Water Act as non-community water systems.

Desired Condition: With appropriate treatment, the quality of water used for human consumption meets or exceeds all associated state water quality criteria. The recreation opportunity spectrum is semi-primitive motorized.

MA 3A Backcountry (Nonmotorized Use)

Description: Use in MA 3A Backcountry (nonmotorized use) is nonmotorized year-round and is essentially primitive. Lands in this management area often provide high quality or undisturbed soil, water, and air; sources of public drinking water; diversity of plant and animal communities; habitat for species listed under the Endangered Species Act and other species that depend on large, undisturbed areas of land; primitive and semi-primitive nonmotorized dispersed recreation opportunities; natural appearing landscapes with high scenic quality, natural integrity, apparent naturalness, solitude and remoteness; and traditional cultural properties and sacred sites.

Desired Condition: Generally, natural ecological processes predominate.

The social setting is one of moderate to high challenge and risk, where people using these areas experience some isolation from the sights and sounds of others. Mechanized uses, such as bicycles, chainsaws, and generators, are allowed. Trail systems are constructed and maintained for use by hikers, equestrians, and cyclists. The scenic integrity of these areas is high. The recreation opportunity spectrum in MA 3A is semi-primitive or primitive nonmotorized.

MA 3B Backcountry (motorized use)

Description: Use in MA 3B Backcountry (motorized use) includes both motor vehicle use and nonmotorized use. These areas are relatively remote but may show signs of past activities. Motor vehicle access to these areas may be restricted seasonally, by route designations, or by area restrictions. These areas are characterized by semi-primitive nonmotorized and motorized dispersed recreation opportunities and modified appearing landscapes with moderate scenic quality.

Desired Condition: Generally, natural ecological processes predominate.

The social setting is one of moderate challenge and risk, where people using these areas experience some isolation from the sights and sounds of others. Motorized and mechanized uses,

such as motorcycles, OHVs, snowmobiles, bicycles, and motorized equipment such as chainsaws and generators are allowed. Trails and primitive developments are constructed and maintained for both motor vehicle and nonmotorized users. The open motor vehicle route density within HUC5 watersheds in this management area is no greater than 1.5 miles of open motor vehicle routes per square mile. The recreation opportunity spectrum in MA 3B is semi-primitive or motorized.

MA 3C Wildlife Corridor (alternatives C, E, and F)

Description: Wildlife corridors are areas designed to maintain habitat linkages between wilderness areas. Although disagreement exists regarding the utility of corridors, this management area emphasizes management for landscape connectivity, which is "the degree to which the landscape facilitates or impedes movement among resource patches," (Taylor et al. 1993) or "the functional relationship among habitat patches, owing to the spatial contagion of habitat and the movement responses of organisms to landscape structure," (With et al. 1997). A wide variety of vegetation structure and composition is present, with some showing evidence of past human disturbance and others showing affects primarily from natural disturbances, such as wildfires. Both summer and winter motor vehicle travel is restricted to designated routes. Recreation users can expect to find evidence of human activity in the form of vegetation management, mining, and road building. However, many of the roads that are closed to motor vehicle travel occur in these areas.

Desired Condition: Wildlife species using these areas experience minimal human disturbance. Thinning forested vegetation results in variable densities, with greater than 40 percent canopy cover, over greater than 75 percent of the area, during the life of the plan.

The social setting is one of little challenge and risk. The area's many routes may not be available for motor vehicle travel. Within HUC5 watersheds in this management area, year round open motor vehicle route density is less than 1 mile per square mile, including over-the-snow motor vehicle routes. Over-the-snow motor vehicle travel is restricted to designated routes. Major travelways (i.e., state, county, and paved roads) remain open year round, and may be groomed for over-the-snow motor vehicle use in winter. The recreation opportunity spectrum in MA3C is semi-primitive motorized.

MA 4A General Forest

Description: General forest areas are managed to meet a variety of ecological and human needs. A wide variety of vegetative structure and composition is present, with some showing the effects of past management activities and others showing the effects of predominantly natural forces, such as wildfire and insects and disease. These lands often display high levels of management activity and associated roads. Visitors expect to see other people and evidence of human activities.

Desired Condition: General Forest contributes to the variety of native plant communities and the composition, structure, and patterns defined in the desired conditions. While the landscape is predominantly natural in appearance, there are some locations where the vegetation composition, structure, density and/or pattern is altered to meet short- or long-term management objectives that move the landscape towards the desired conditions. The area is maintained through ecological processes, as well as management activities. This management area contributes important habitat for aquatic, plant and wildlife species that benefit from functional habitat. Additionally, the area supplies a variety of dispersed or developed summer and winter recreational activities. Recreational use is generally dispersed and/or located at recreation developments, such as campgrounds with higher use levels. Facilities (whether Forest Service or permitted) are those

necessary to provide public or resource benefit, or provide for safety. This area has Forest Service system and other authorized routes. A wide spectrum of travelway types are present, ranging from maintenance level 1 through 5 roads (closed or primitive roads to highways) to trails that serve as recreational features themselves. The recreation opportunity spectrum in MA4A is roaded natural.

MA 4B Riparian Management Areas

Description: Riparian management areas (RMAs) are areas that include portions of watersheds where aquatic and riparian-dependent resources receive primary emphasis and where special management direction applies. Riparian management areas encompass lands adjacent to permanently flowing streams, ponds, lakes, wetlands, seeps, springs, and intermittent streams, including geologically unstable sites that may influence these lands. Riparian management areas will generally have minimum widths (displayed in table A-37, table A-38, and table A-39) but are designed to extend to the outer edge of riparian vegetation or to the outer extent of the 100-year floodplain, whichever is greater. Riparian management areas are managed to maintain and restore the riparian structure and function of intermittent and perennial streams, confer benefits to riparian-dependent plant and animal species, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, and provide for greater connectivity within and between watersheds for both riparian and upland species.

Table A-37. Riparian management area widths for alternatives B, E, and F

Category	Minimum Riparian Management Area Width*
Fish-bearing streams	300 feet slope distance on either side of stream or to outer edge of 100-year floodplain, whichever is greatest
Permanently-flowing non-fish-bearing streams	150 feet slope distance on either side of stream or to outer edge of 100-year floodplain, whichever is greatest
Constructed ponds, reservoirs and wetlands greater than 1 acre	150 feet slope distance from the outer edge of wetland or from the maximum pool elevation, whichever is greatest
Lakes and natural ponds	300 feet slope distance
Seasonally-flowing, intermittent and ephemeral streams, wetlands smaller than 1 acre, and unstable areas	100 feet slope distance

* Additional delineation criteria apply, as described in the glossary.

Table A-38. Riparian management area widths for alternative C

Category	Minimum Riparian Management Area Width*
Fish-bearing streams	300 feet slope distance on either side of stream
Permanently-flowing non-fish-bearing streams	300 feet slope distance on either side of stream
Constructed ponds, reservoirs and wetlands greater than 1 acre	300 feet slope distance
Lakes and natural ponds	300 feet slope distance
Seasonally-flowing, intermittent and ephemeral streams, wetlands smaller than 1 acre, and unstable areas	300 feet slope distance

* Additional delineation criteria apply, as described in the glossary.

Table A-39. Riparian management area widths for alternative D

Category	Minimum Riparian Management Area Width*
Fish-bearing streams	100 feet slope distance on either side of stream or to outer edge of 100-year floodplain, whichever is greatest
Permanently-flowing non-fish-bearing streams	70 feet slope distance on either side of stream or to outer edge of 100-year floodplain, whichever is greatest
Constructed ponds, reservoirs and wetlands greater than 1 acre	50 feet slope distance from the outer edge of wetland or from the maximum pool elevation, whichever is greatest
Lakes and natural ponds	50 feet slope distance
Seasonally-flowing, intermittent and ephemeral streams, wetlands smaller than 1 acre, and unstable areas	50 feet slope distance

* Additional delineation criteria apply, as described in the glossary.

Riparian vegetation performs numerous key functions for stream ecosystems, including the provision of shade, bank stability, nutrient transfer, retention of organic material, and the supply of woody material.

Because riparian plant species vary in their establishment mechanisms, water requirements, and tolerance to flooding, differences in channel and floodplain morphology result in high spatial and temporal variability in species composition and age class structure within and along riparian zones. This makes riparian areas among the most biologically diverse and productive habitats on the landscape.

Healthy riparian areas are important for the protection of the water quality upon which aquatic species depend and are also used by approximately 75 percent of terrestrial vertebrate species in the Blue Mountains (Raedeke 1989, Thomas 1979). In addition, riparian areas provide critical habitat for numerous sensitive, rare, or uncommon plant and lichen species. Management activities within riparian management areas are designed to maintain, enhance, or restore the ecological processes responsible for the diversity, productivity, and sustainability of riparian habitats.

Management of riparian management areas focuses on the ecological processes and conditions within the riparian management areas and contributes to the value of the aquatic and riparian habitats they contain.

The glossary describes the full definition and criteria for delineating riparian management areas.

Desired Condition: Riparian management areas within any given watershed reflect a natural composition of native and desired nonnative plant and animal species and a distribution of physical and vegetative conditions appropriate to natural disturbance regimes affecting the area.

Key riparian processes and conditions, including slope stability and associated vegetative root strength; wood delivery to streams; input of leafy and organic matter to aquatic and terrestrial systems; solar shading; microclimate; and water quality, are within ranges typical of the biophysical setting and the corresponding disturbance regime. The recreation opportunity spectrum in MA 4B is semiprimitive to primitive.

Acres associated with MA 4B are only those acres within MA 4A General Forest. However, the desired conditions and standards and guidelines that apply to MA 4B apply to all riparian management areas.

MA 4C Old Forest

Description: Old forest is a late stage of stand development that develops over a relatively long period of time. Old forest has an abundance of physiologically old trees (for the species and site conditions) that are dominant in the overstory and are usually larger in diameter (see glossary for definition by potential vegetation group). Old forest is valued as wildlife habitat, contributions to riparian habitat, for recreation, and for aesthetic and cultural values.

Desired Condition: Old forest is maintained and restored to meet a wide variety of ecological and social values. Old forest provides habitat for wildlife, preserves aesthetic values, and contributes to landscape diversity. The amount of old forest is consistent with the HRV. See the ecological desired conditions for specific ranges for the percent of each upland forest or woodland potential vegetation group in old forest structural stages. The management of old forest is also guided by other ecological desired conditions, such as stand density, species composition, fire regime condition class, snags, and downed wood. The recreation opportunity spectrum in MA4C is semi-primitive motorized or nonmotorized.

MA 5 Developed Sites and Administrative Areas

Description: Developed sites, administrative areas, and permitted uses such as ski areas, developed campgrounds, recreation residences, administrative sites, communication sites, and utility corridors, are generally limited in extent to meet their designated purpose and occur as a place or feature on the landscape. Ecological values are conserved while protecting the health and safety of humans. Livestock grazing within developed and administrative sites is generally unsuitable, although some administrative sites are used to pasture Forest Service administrative stock. Transportation and motor vehicle access varies. Roads and trails typically are limited and provide access to the main site features, such as buildings, permit areas, and campsites. Some of these areas are used for administrative purposes such as employee housing, storage, and long-term condition and trend studies and conifer seed orchards. Though small, these areas are important data collection points that assist with understanding ecosystem function and resilience.

Desired Condition: Infrastructure design promotes employee, permit holder, and visitor safety. The appearance is neat, orderly, and complementary to the surrounding landscape setting. Facilities, structures, and other built elements blend with the natural landscape where possible and are consistent with landscape architecture principles found in the Forest Service Built Environment Image Guidelines (USDA Forest Service 2001). The scenic integrity of these areas is commensurate with the inventoried scenic class. Snags and down wood levels are generally less than in other management areas or are absent due to safety concerns. Administrative studies and seed orchards are maintained. The level of development of buildings and ancillary structures, such as water and power systems, is commensurate to support the objective of the developed site, permit area, or administrative area without exceeding the desired condition for scenic integrity in the area.

Vegetation treatments may include consideration of wildfire protection objectives, which may over-ride ecological desired conditions. In these instances, vegetative structure would result in fire intensity that allows for safe and effective suppression actions.

The recreation opportunity spectrum in MA5 is roaded natural to rural. The following descriptions further explain the desired conditions for specific facility types within the three national forests.

Communication Sites

Desired Condition: Communication facilities and ancillary features are designed to be consistent with the designated purpose while maintaining human health and safety values and inventoried scenic class. New facilities are designed to minimize impairing scenic, natural, and cultural resource values and to blend with the natural appearing landscape, repeating the form, line, color, and texture of the surrounding valued landscape character. Existing sites and facilities are improved to mitigate affects to on-site values and visual appearance, and to be consistent with the inventoried scenic class.

Utility Corridors

Desired Condition: Utility corridors and ancillary features are designed to be consistent with the designated purpose of providing power and telecommunication services to communities. Human health and safety values are maintained. Proposed new facilities are evaluated for compatibility with existing corridors and scenic, natural, and cultural resource values. Horizontal lines are softened through feathering and scalloping the edges of the corridors commensurate with vegetative and other resource needs. Proposals for new corridors are designed to minimize the visibility of the corridors and repeat the form, line, color and texture of the surrounding valued landscape character.

Developed Recreation Sites and Facilities

Desired Condition: Developed public facilities are operated by Forest Service personnel or permit holders. Sites such as campgrounds, picnic areas, trailheads, snow-parks, and boating and interpretive sites, are well maintained, fully functional, provide for visitor safety, and are accessible to people with disabilities. Potable water and sanitary systems are limited yet are provided at some sites and meet required health standards. Areas of highly concentrated use provide a full suite of amenities that provide for diversity of users. The facilities are fully utilized with occupancy rates approaching full capacity during peak use periods and moderate occupancy rates during non-peak summer and fall periods. Facilities provide some comfort for the user as well as site protection. New construction and reconstruction projects utilize a contemporary/rustic design based on the use of native or durable materials. Impacts to natural resources from concentrated visitor use are minimal. Partnerships with permit holders are encouraged and sustained at high-end public developed areas, such concessionaire-operated campgrounds.

Permitted Recreation Facilities

Desired Condition: Special use permit holders operate private facilities within the terms and conditions of the permit. Public uses are allowed at permitted sites such as lodges, organization camps, and trams. Private users are permitted at facilities such as recreation residences. No new recreation residence tracts or unoccupied lots are permitted.

Ski Areas

Desired Condition: Facilities and structures are designed to blend with the natural environment, using the principles in the Built Environment Image Guide for the National Forests and Grasslands (USDA Forest Service 2001). Removal of vegetation for ski runs is designed to blend with the natural patterns of the surrounding valued landscape character. Activities are consistent with the approved master development plan.

Administrative Site

Desired Condition: Administrative facilities include guard stations, administrative sites, pastures and airstrips and are safe, efficient, cost-effective, and are maintained at a function and use level that meets management needs and provide for universal accessibility. Facilities meet all applicable health and safety standards. Impacts to natural resources are minimal. Administrative facilities complement natural settings. The form of structures is derived by the function and from the landscape setting. For example, structures in mountainous, timbered landscapes have steep rooflines and broad eaves and use durable indigenous materials, such as stone and heavy timbers, with the appearance derived from the local environment. Structures, signage, and other built environment elements reflect the style and character inherent in the local environment (USDA Forest Service 2001).

Management Area Acreages (Action Alternatives)

The following tables display the management area designations and allocations for the action alternatives. All management areas are displayed in full. Overlap occurs between most management areas but is not accounted for in these tables. The overlapping management areas result in the total acreage of all management areas being greater than the official national forest acreages. For example, several research natural areas (MA 2B) and wild and scenic rivers (MA 2A) overlap into congressionally designated wilderness areas (MA 1A).

Wilderness area acres have been recalculated using the most current GIS technology. No additions or subtractions to any wilderness areas have been made since the 1990 forest plans were signed. Acres of private land inclusions are not included in any wilderness area acre calculations.

Scenic byways and national designated trails within the HCNRA are not included in these tables. The figures in the tables are rounded to the nearest hundred acres and to the nearest whole mile. In addition, these tables do not include acreage for the HCNRA. The HCNRA CMP, which was updated and approved in 2003, will be carried forward in its entirety. The HCNRA CMP is the portion of the Wallowa-Whitman National Forest Land and Resource Management Plan that guides management of the HCNRA. The tables display the portion of the Ochoco administered by the Malheur as part of the Malheur.

Alternative B, Modified Proposed Ac*tion*

Table A-40. Management area designation, name, and acreage for each national forest (2F and 2G show miles) in alternative B

Management Area Designation and Name	Malheur	Umatilla	Wallowa-Whitman
1A – Congressionally Designated Wilderness Areas	82,600	304,200	372,900
1B – Recommended Wilderness Areas	1,200	1,400	10,800
1C – Wilderness Study Area	0	0	2,400
2A – Wild and Scenic River (Includes Designated, Eligible, and Suitable Rivers)	12,100	44,600	84,400
2B – Research Natural Areas	11,100	11,000	8,000
2C – Botanical Areas	100	2,400	0
2D – Geological Areas	200	400	0
2E – Historical Areas	34,000	1,200	24,700
2F – Scenic Byways and All-American Roads	13 miles	51 miles	85 miles
2G – Nationally Designated Trails	9.3 miles	29.9 miles	25.4 miles
2H – Scenic Areas	14,400	31,100	0
2I – Starkey Experimental Forest and Range	0	0	30,453
2J – Municipal Watersheds	500	20,200	24,500
3A – Backcountry (nonmotorized use)	59,300	19,300	0
3B – Backcountry (motorized use)	129,100	240,900	248,900
3C – Wildlife Corridor	0	0	0
4A – General Forest	1,252,000	640,300	848,000
4B – Riparian Management Areas (300/150/100 foot buffer)	192,900	237,500	362,500
4B – Riparian Management Areas (within 4A)	149,900	118,700	184,600
4C – Old Forest	0	0	0
5 – Developed Sites and Administrative Areas	2,200	3,700	7,700

Alternative C

Table A-41. Management area designation, name, and acreage for each national forest (2F and 2G show miles) in alternative C

Management Area Designation and Name	Malheur	Umatilla	Wallowa-Whitman
1A – Congressionally Designated Wilderness Areas	82,600	304,200	372,900
1B – Recommended Wilderness Areas	83,800	248,500	172,700
1C – Wilderness Study Area	0	0	2,400
2A – Wild and Scenic River (Includes Designated, Eligible, and Suitable Rivers)	12,100	44,600	84,400
2B – Research Natural Areas	11,100	11,000	8,000
2C – Botanical Areas	100	2,400	0
2D – Geological Areas	200	400	0
2E – Historical Areas	34,000	1,200	0
2F – Scenic Byways and All-American Roads	13 miles	51 miles	85 miles
2G – Nationally Designated Trails	9 miles	30 miles	25 miles
2H – Scenic Areas	14,400	31,100	0
2I – Starkey Experimental Forest and Range	0	0	30,500
2J – Municipal Watersheds	500	20,200	24,500
3A – Backcountry (nonmotorized use)	270,400	105,800	210,100
3B – Backcountry (motorized use)	0	0	0
3C – Wildlife Corridor	167,700	91,900	242,600
4A – General Forest/Timber/Range	702,500	329,000	397,200
4B – Riparian Management Areas (300-foot buffers)	369,000	499,800	727,500
4B – Riparian Management Areas (within 4A)	172,400	178,100	200,900
4C – Old Forest	205,100	94,800	91,000
5 – Developed Sites and Administrative Areas	2,200	3,700	7,700

Please read the explanatory information in the preceding paragraphs.

Alternative D

Table A-42. Management area designation, name, and acreage for each national forest (2F and 2G show miles) in alternative D

Management Area Designation and Name	Malheur	Umatilla	Wallowa-Whitman
1A – Congressionally Designated Wilderness Areas	82,600	304,200	372,900
1B – Recommended Wilderness Areas	0	0	0
1C – Wilderness Study Area	0	0	2,400
2A – Wild and Scenic River (Includes Designated, Eligible, and Suitable Rivers)	12,100	44,600	52,900
2B – Research Natural Areas	11,100	11,000	8,000
2C – Botanical Areas	100	2,400	0
2D – Geological Areas	200	400	0
2E – Historical Areas	34,000	1,200	24,700
2F – Scenic Byways and All-American Roads	13 miles	51 miles	85 miles
2G – Nationally Designated Trails	9 miles	30 miles	25 miles
2H – Scenic Areas	14,400	31,100	0
2I – Starkey Experimental Forest and Range	0	0	30,500
2J – Municipal Watersheds	500	20,200	24,500
3A – Backcountry (nonmotorized use)	0	0	0
3B – Backcountry (motorized use)	165,800	218,700	219,500
3C – Wildlife Corridor	0	0	0
4A – General Forest	1,359,800	742,300	998,700
4B – Riparian Management Areas (100/70/50 foot buffers)	83,100	106,900	162,900
4B – Riparian Management Areas (within 4A)	66,000	58,100	87,100
4C – Old Forest	0	0	0
5 – Developed Sites and Administrative Areas	2,200	3,700	7,700

Please read the explanatory information in the preceding paragraphs.

Alternatives E and F

Table A-43. Management area designation, name, and acreage for each national forest (2F and 2G show miles) in alternatives E and F

Management Area Designation and Name	Malheur	Umatilla	Wallowa-Whitman
1A – Congressionally Designated Wilderness Areas	82,600	304,200	372,900
1B – Recommended Wilderness Areas	30,400	40,100	20,300
1C – Wilderness Study Area	0	0	2,400
2A – Wild and Scenic River (Includes Designated, Eligible, and Suitable Rivers)	12,100	44,600	52,900
2B – Research Natural Areas	11,100	11,000	8,000
2C – Botanical Areas	100	2,400	0
2D – Geological Areas	200	400	0
2E – Historical Areas	34,000	1,200	24,700
2F – Scenic Byways and All-American Roads	13 miles	51 miles	85 miles
2G – Nationally Designated Trails	9 miles	30 miles	25 miles
2H – Scenic Areas	14,400	31,100	0
2I – Starkey Experimental Forest and Range	0	0	30,500
2J – Municipal Watersheds	500	20,200	24,500
3A – Backcountry (nonmotorized use)	53,600	70,100	104,500
3B – Backcountry (motorized use)	119,100	160,600	145,500
3C – Wildlife Corridor	0	21,600	6,500
4A – General Forest	1,245,600	625,200	844,300
4B – Riparian Management Areas (300/150/100 foot buffer)	192,900	237,500	362,500
4C – Old Forest	0	0	0
5 – Developed Sites and Administrative Areas	2,200	3,700	7,700

Suitability of Areas (Alternatives B through F)

An area may be identified as generally suitable for uses that are compatible with desired conditions and objectives for that area. An area may be identified as generally not suitable for uses that are not compatible with desired conditions and objectives for that area. Identification of an area as generally suitable or generally not suitable for a use is guidance for project and activity decision making and not a commitment nor a final decision approving projects and activities. Uses of specific areas are approved through project and activity decision making.

Management areas are used in this forest plan to help further refine suitable uses and guide management.

The management area designations and names follow:

1A Congressionally Designated Wilderness Areas
1B Preliminary Administratively Recommended Wilderness Areas
1C Wilderness Study Area
2A Wild and Scenic River (Includes Designated, Eligible, and Suitable Rivers)
2B Research Natural Areas
2C Botanical Areas
2D Geological Areas
2E Historical Areas
2F Scenic Byways and All American Roads
2G Nationally Designated Trails
2H Scenic Areas
2I Starkey Experimental Forest and Range
2J Municipal Watersheds
3A Backcountry (nonmotorized use)
3B Backcountry (motorized use)
3C Wildlife Corridors
4A General Forest
4B Riparian Management Areas
4C Old Forest
5 Developed Sites and Administrative Areas

For ease of comparison, general suitability determinations for management areas for each of the action alternatives are displayed in the following tables. Please note that some management areas are not proposed for each national forest or for each alternative.

Alternative B

Table A-44. General suitability matrix for management areas for alternative B

Use or Activity	Management Area																	
	1A	1B	1C	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J*	3A	3B	4A	4B	5
Timber production	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	U
Timber harvest	U	U	U	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S
Grazing (cattle and sheep)	S	S	S	S	U	U	S	S	S	S	S	S	U	S	S	S	S	U
Motor vehicle use (summer)[1]	U	U	U	U[2]	U	S	S	S	S	S	S	U	U	U	S	S	S	S
Motor vehicle use (winter)	U	S	U	U[2]	U	S	S	S	S	S	S	U	U	U	S	S[1]	S	S
Road construction	U	U	U	U[2]	U	U	S	S	S	U	S	U	U	U	U	S	U	S
Trail construction (for motor vehicle use)	U	U	U	U[2]	U	U	S	S	S	U	S	U	U	U	S	S	U	S
Mechanical fuel treatment	U	U	U	U[2]	U	U	S	S	S	S	S	S	S	S	S	S	S	S
Energy development (wind farms, utility corridors, pipelines, etc.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	S

S designates use or activity as generally suitable. Refer to desired conditions and standards and guidelines for each management area and/or use for specific guidance.

U designates use or activity as generally not suitable. Refer to desired conditions and standards and guidelines for each management area and/or use for specific guidance.

* All activities in municipal watersheds are dependent on the agreement for management of the watershed between the Forest Service and the municipality.

1. indicates generally suitable applies only to use or activity on designated roads and trails and within designated areas.

2. indicates generally not suitable for wild and scenic rivers, generally suitable for recreational rivers.

Alternative C

Table A-45. General suitability matrix for management areas for alternative C

Use or Activity	Management Area																		
	1A	1B	1C	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J*	3A	3C	4A	4B	4C	5
Timber production	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	U	U
Timber harvest	U	U	U	S	U	S	S	S	S	S	S	S	S	U	S	S	U	U	U
Grazing (cattle and sheep)	S	S	S	S	U	U	S	S	S	S	S	S	U	S	S	S	U	S	S
Motor vehicle use (summer)[1]	U	U	U	U[2]	U	S	S	S	S	S	S	U	U	U	U	S	U	U	U
Motor vehicle use (winter)	U	U	U	U[2]	U	S	S	S	S	S	S	U	U	U	S[1]	S	U	U	U
Road construction	U	U	U	U[2]	U	U	S	S	S	U	S	U	U	U	U	S	U	U	U
Trail construction (for motor vehicle use)	U	U	U	U[2]	U	U	S	S	S	U	S	U	U	U	U	S	U	U	U
Mechanical fuel treatment	U	U	U	U[2]	U	U	S	S	S	S	S	S	S	U	S	S	U	S	S
Energy development (wind farms, utility corridors, pipelines, etc.)	U	U	U	U	U	U	S	S	S	S	S	S	S	U	S	S	U	U	S

S designates use or activity as generally suitable. Refer to desired conditions and standards and guidelines for each management area and/or use for specific guidance.

U designates use or activity as generally not suitable. Refer to desired conditions and standards and guidelines for each management area and/or use for specific guidance.

* All activities in municipal watersheds are dependent on the agreement for management of the watershed between the Forest Service and the municipality.

1. indicates generally suitable applies only to use or activity on designated roads and trails and within designated areas.

2. indicates generally not suitable for wild and scenic rivers, generally suitable for recreational rivers.

Alternative D

Table A-46. General suitability matrix for management areas for alternative D

Use or Activity	Management Area															
	1A	1C	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J*	3B	4A	4B	5
Timber production	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	U
Timber harvest	U	U	S	U	S	S	S	S	S	S	S	S	S	S	S	S
Grazing (cattle and sheep)	S	S	S	U	U	S	S	S	S	S	S	U	S	S	S	U
Motor vehicle use (summer)[1]	U	U	U[2]	U	S	S	S	S	S	S	U	U	S	S	S	S
Motor vehicle use (winter)	U	U	U[2]	U	S	S	S	S	S	S	U	U	S	S[1]	S	S
Road construction	U	U	U[2]	U	U	S	S	S	U	S	U	U	U	S	U	S
Trail construction (for motor vehicle use)	U	U	U[2]	U	U	S	S	S	U	S	U	U	S	S	U	S
Mechanical fuel treatment	U	U	U[2]	U	U	S	S	S	S	S	S	S	S	S	S	S
Energy development (wind farms, utility corridors, pipelines, etc.)	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	S

S designates use or activity as generally suitable. Refer to desired conditions and standards and guidelines for each management area and/or use for specific guidance.

U designates use or activity as generally not suitable. Refer to desired conditions and standards and guidelines for each management area and/or use for specific guidance.

* All activities in municipal watersheds are dependent on the agreement for management of the watershed between the Forest Service and the municipality.

1. indicates generally suitable applies only to use or activity on designated roads and trails and within designated areas.
2. indicates generally not suitable for wild and scenic rivers, generally suitable for recreational rivers.

Alternatives E and F

Table A-47. General suitability matrix for management areas for alternatives E and F

Use or Activity	Management Area																		
	1A	1B	1C	2A	2B	2C	2D	2E	2F	2G	2H	2I	2J*	3A	3B	3C	4A	4B	5
Timber production	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	U
Timber harvest	U	U	U	S	U	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Grazing (cattle and sheep)	S	S	S	S	U	U	S	S	S	S	S	S	U	S	S	S	S	S	U
Motor vehicle use (summer)[1]	U	U	U	U[2]	U	S	S	S	S	S	S	U	U	U	S	S	S	S	S
Motor vehicle use (winter)	U	S	U	U[2]	U	S	S	S	S	S	S	U	U	U	S	S[1]	S	S	S
Road construction	U	U	U	U[2]	U	U	S	S	S	U	S	U	U	U	U	S	S	U	S
Trail construction (for motor vehicle use)	U	U	U	U[2]	U	U	S	S	S	U	S	U	U	U	S	S	S	U	S
Mechanical fuel treatment	U	U	U	U[2]	U	U	S	S	S	S	S	S	S	S	S	S	S	S	S
Energy development (wind farms, utility corridors, pipelines, etc.)	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	S	U	S

S designates use or activity as generally suitable. Refer to desired conditions and standards and guidelines for each management area and/or use for specific guidance.

U designates use or activity as generally not suitable. Refer to desired conditions and standards and guidelines for each management area and/or use for specific guidance.

* All activities in municipal watersheds are dependent on the agreement for management of the watershed between the Forest Service and the municipality.

1 indicates generally suitable applies only to use or activity on designated roads and trails and within designated areas.

2 indicates generally not suitable for wild and scenic rivers, generally suitable for recreational rivers.

Objectives (Alternatives B through F)

Objectives are projections of Forest Service activities and program outcomes that are measurable and time specific. Like goals and desired conditions, objectives are not commitments or final decisions approving projects or activities. They are a way to measure progress towards meeting or maintaining the desired conditions over the life of the plan. The objectives reflect activities and program outcomes necessary to maintain or achieve desired conditions.

Objectives are based on ecological needs, community capacity, and expected funding, including budgets, partnerships, and cooperative agreements. The actual accomplishments will be dependent on actual funding, staffing levels, and local infrastructure. The objectives are not intended to limit or guarantee the amount of work that will be accomplished. More work may be accomplished if additional infrastructure or funding, such as increased budget allocations, partnerships, or other external sources, becomes available. Less work could occur if funding is less than expected, additional infrastructure is not constructed, or existing infrastructure declines and becomes unusable.

The identified objectives are just a partial list of the management activities expected to be accomplished to contribute to maintaining or achieving desired conditions during the first decade of the plan period, unless otherwise indicated within the objective statement. Objectives are displayed separately for each the Blue Mountains national forests (table A-48 to table A-50). The tables display the portion of the Ochoco administered by the Malheur as part of the Malheur.

More detail regarding the anticipated annual silvicultural, invasive and grazing accomplishments are provided in table A-48 to table A-50.

Table A-48. Comparison of objectives for the action alternatives for the Malheur National Forest. The objectives are just a partial list of the management activities expected to be accomplished to contribute to maintaining or achieving desired conditions during the first decade of the plan period, unless otherwise indicated within the objective statement.

Objective Statements for the Malheur National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
1.1 Watershed Function[3]					
(W1) Increase the number of watersheds in condition class 1 (from CC2) and 2 (from CC3) through active restoration. Measure: number of subwatersheds (HUC6) with improved condition class.	16 watersheds	20 watersheds	16 watersheds	16 watersheds	16 watersheds
Improve hydrologic function by: • Improving forest vegetative conditions (acres) (WH1)	4,400 acres (annually)	2,000 acres (annually)	20,700 acres (annually)	7,800 acres (annually)	5,600 acres (annually)
• Improving soil hydrologic function in areas of detrimental soil disturbance (acres) (WH2)	450 acres	800 acres	400 acres	600 acres	540 acres
• Reducing road-related sedimentation by reducing road density and reducing hydrologic connectivity of the road system (road miles) (WH3)	25-30 miles road surface treated (annually)	45-75 miles road surface treated (annually)	50-80 miles road surface treated (annually)	30-35 miles road surface treated (annually)	30-35 miles road surface treated (annually)
Improve riparian and wetland function by: • Restoring floodplain connections, channel morphology, channel structure, and flow regime (flood flows and low flows) (stream miles) (WR1)	55 miles	60 miles	50 miles	80 miles	75 miles
• Restoring riparian/wetland species composition (riparian acres) by increasing natural seedling establishment, planting, fencing, or modifying riparian management (riparian acres) (WR2)	200 acres	300 acres	200 acres	300 acres	275 acres

[3] All measures are proposed in priority watersheds.

Objective Statements for the Malheur National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
• Increasing effective stream shade (WQ objective 1) by increasing amount and extent of woody riparian species and increasing age-class structure of terrestrial vegetation in MA 4B (stream miles) (WR3)	300 miles	600 miles	300 miles	450 miles	400 miles
Improve riparian and wetland function by (continued): • Increasing extent and vegetative species diversity of off-channel and isolated wetlands by restoring hydrologic pathways, modifying existing water diversions, or fencing (number of sites) (WR4)	20 sites	30 sites	30 sites	30 sites	30 sites
• Increasing the number and extent of beaver-created wetlands (sites)	10 sites	15 sites	10 sites	12 sites	10 sites
Improve stream channel and aquatic habitat function by: • Improving riparian habitat conditions (riparian acres, WR1-3)	400 acres (annually)	900 acres (annually)	900 acres (annually)	600 acres (annually)	570 acres (annually)
• Restoring channel morphology to reflect natural conditions (miles)	25 miles	40 miles	25 miles	38 miles	35 miles
• Increasing habitat complexity through channel reconstruction, placement of large wood or other structures, habitat enhancement (miles)	50 miles	170 miles	50 miles	75 miles	70 miles
• Increasing aquatic habitat connectivity through culvert replacement (number of culverts)	60 culverts 90 stream miles	100 culverts 125 stream miles	60 culverts 95 stream miles	90 culverts 143 stream miles	80 culverts 140 stream miles
1.2 Species Diversity					
In cooperation with state wildlife agencies, expand bull trout occurrence within 10 years into unoccupied suitable stream segments within its historic range.	1 segment	2 segments	0 segments	1 segment	1 segment

Objective Statements for the Malheur National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Increase the amount and quality of source habitat (open, OFSS in the dry upland forest potential vegetation group) for white headed woodpecker (per decade).	31,000 acres	26,000 acres	58,000 acres	64,000 acres	32,000 acres
Increase the amount and quality of source habitat (open canopy dry/moist upland forest potential vegetation group) for western bluebird and Cassin's finch.	43,000 acres (finch)	27,000 acres (finch)	69,000 acres (finch) 11,000 acres (bluebird)	49,000 acres (finch)	37,000 acres (finch)
Maintain mule deer security cover on a percentage of the landscape within MA 4A.	26% of landscape	28% of landscape	24% of landscape	24% of landscape	26% of landscape
Restore stronghold watersheds connectivity for aquatic species.	6-10 subwatersheds or 120-200 stream miles	8-12 subwatersheds or 160-240 stream miles	3-5 subwatersheds or 60-100 stream miles	4-6 subwatersheds or 80-120 stream miles	4-6 subwatersheds or 80-120 stream miles
Reduce juniper canopy cover to less than 10 percent in sagebrush steppe habitat.	NA	NA	NA	800 acres	800 acres
Reduce sagebrush density to less than 10 percent canopy cover in sagebrush steppe habitats where sagebrush canopy cover is greater than 25 percent.	NA	NA	NA	700 acres	700 acres
1.4 Disturbance Processes					
1.4.1 Wildland Fire (planned and unplanned ignitions)					
Treat stands using silvicultural treatments and/or prescribed burning (planned ignition) to move towards Fire Regime Condition Class 1 and 2 in the dry and moist upland forest potential vegetation groups (per decade).	166,000 acres	129,000 acres	205,000 acres	220,000 acres	178,000 acres
Treat stands using silvicultural treatments and/or prescribed burning (planned ignition) to decrease the potential for high severity wildfire in the dry upland forest potential vegetation group (per decade).	150,000 acres	115,000 acres	180,000 acres	185,000 acres	155,000 acres

Objective Statements for the Malheur National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Manage wildfire (unplanned ignition) for resource benefits: modify species composition, stand density, structural stages, fire frequency, and fire severity to move Fire Regime Condition Class 2 and 3 to Fire Regime Condition Class 1 and 2 (per decade).	NA	86,000 acres	NA	39,000 acres	39,000 acres
1.4.2 Insects and Disease					
Within the dry upland forest potential vegetation group, treat stands with moderate to high susceptibility ratings using silvicultural treatments and/or wildland fire to decrease insect and disease susceptibility to low or moderate (per decade).	170,000 acres	130,000 acres	230,000 acres	225,000 acres	180,000 acres
Within the moist upland forest potential vegetation group, treat stands with moderate to high susceptibility ratings using silvicultural treatments and/or wildland fire to decrease insect and disease susceptibility to low or moderate (per decade).	20,000 acres	15,000 acres	25,000 acres	25,000 acres	20,000 acres
1.5 Invasive Species					
Reduce current infestations of invasive plant species.	1,500 acres	1,500 acres	3,000 acres	1,500 acres	1,500 acres
1.6 Structural Stages					
Decrease mid-age multi-story forest (UR stage) in the dry and moist upland forest potential vegetation groups by continuing to manage towards a large diameter (old forest) condition (per decade).	130,000 acres	100,000 acres	160,000 acres	180,000 acres	140,000 acres
Increase OFSS (open canopy) in the dry upland forest potential vegetation group by converting OFMS to OFSS (per decade).	8,000 acres	1,500 acres	48,000 acres	16,000 acres	10,000 acres
1.7 Plant Species Composition					
Increase shade intolerant stands in the dry upland forest potential vegetation group (per decade).	170,000 acres	130,000 acres	230,000 acres	225,000 acres	180,000 acres

Objective Statements for the Malheur National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Manage rangeland vegetation to improve phases C and D to phase A or B.	NA	NA	NA	7,000 acres	7,000 acres
1.8 Stand Density					
Reduce the dry and moist upland forest potential vegetation groups that are in the closed stand density class (per decade).	166,000 acres	129,000 acres	205,000 acres	220,000 acres	178,000 acres
1.10 Soil Quality					
Implement erosion control and stabilization measures on unstable hillslopes. Possible activities include road realignment and improving forest vegetation conditions.	200-400 acres	300-500 acres	150-250 acres	200-400 acres	180-350 acres
Restore soil function (also see objectives for 1.1 Watershed Function).	150-300 acres	200-400 acres	75-150 acres	175-350 acres	150-300 acres
1.11 Water Quality					
Improve water quality through implementation of water quality restoration plans.	4-8 watersheds 160-320 stream miles	6-10 watersheds 240-400 stream miles	3-6 watersheds 120-240 stream miles	4-6 watersheds 160-240 stream miles	4-6 watersheds 120-220 stream miles
2.7 Roads and Trails Access					
Maintain the road system for safe and efficient travel and for the protection, management, and use of NFS lands. Where open motor vehicle route density exceeds desired conditions, implement route closures and/or decommissioning or consider designating routes for other uses (refer to 1.1 Watershed Function for road decommissioning/obliteration objectives).	Miles of road maintenance: 225 miles MLs 4/5 27 miles ML 3 900 miles ML 2 (annually)	Miles of road maintenance: 160 miles ML 4/5 11 miles ML 3 64 miles ML 2 (annually)	Miles of road maintenance: 280 miles MLs 4/5 44 miles ML 3 1,280 miles ML 2 (annually)	Miles of road maintenance: 250 miles MLs 4/5 38 miles ML 3 1,025 miles ML 2 (annually)	Miles of road maintenance: 240 miles MLs 4/5 35 miles ML 3 1,000 miles ML 2 (annually)
3.3 Goods and Services					
Contribute to local economies by harvesting sawlogs and timber volume other than sawlogs (TSPQ annually).	31 MMBF	16 MMBF	87 MMBF	56 MMBF	37 MMBF
Contribute to local economies by providing forage for cattle and sheep.	126,500 AUMs (annually)	62,200 AUMs (annually)	125,500 AUMs (annually)	123,500 AUMs (annually)	123,500 AUMs (annually)

Table A-49. Comparison of objectives for the action alternatives for the Umatilla National Forest. The objectives are just a partial list of the management activities expected to be accomplished to contribute to maintaining or achieving desired conditions during the first decade of the plan period, unless otherwise indicated within the objective statement.

Objective Statements for the Umatilla National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
1.1 Watershed Function[4]					
(W1) Increase the number of watersheds in condition class 1 (from CC2) and 2 (from CC3). Measure: number of subwatersheds (HUC6) with improved condition class.	15 watersheds	20 watersheds	12 watersheds	14 watersheds	14 watersheds
Improve hydrologic function by: • Improving forest vegetative conditions (acres) (WH1)	2,500 acres (annually)	1,500 acres (annually)	12,600 acres (annually)	6,600 acres (annually)	3,700 acres (annually)
• Improving soil hydrologic function in areas of detrimental soil disturbance (acres) (WH2)	500 acres	900 acres	450 acres	750 acres	700 acres
• Reducing road-related sedimentation by reducing road density and reducing hydrologic connectivity of the road system (road miles) (WH3)	25-30 miles road surface treated (annually)	45-75 miles road surface treated (annually)	50-80 miles road surface treated (annually)	30-35 miles road surface treated (annually)	30-35 miles road surface treated (annually)
Improve riparian and wetland function by: • Restoring floodplain connections, channel morphology, channel structure, and flow regime (flood flows and low flows) (stream miles) (WR1)	60 miles	70 miles	55 miles	90 miles	85 miles
• Restoring riparian/wetland species composition (riparian acres) by increasing natural seedling establishment, planting, fencing, or modifying riparian management (riparian acres) (WR2)	110 acres	200 acres	110 acres	165 acres	150 acres
• Increasing effective stream shade (WQ objective 1) by increasing amount and extent of woody riparian species and increasing age-class structure of terrestrial vegetation in MA 4B (stream miles) (WR3)	150 miles	300 miles	150	225 miles	210 miles

[4] All measures are proposed in priority watersheds.

Objective Statements for the Umatilla National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
• Increasing extent and vegetative species diversity of off-channel and isolated wetlands by restoring hydrologic pathways, modifying existing water diversions, or fencing (number of sites) (WR4)	25 sites	35 sites	35 sites	40 sites	35 sites
• Increasing the number and extent of beaver-created wetlands (sites)	8 sites	15 sites	8 sites	10 sites	9 sites
Improve stream channel and aquatic habitat function by: • Improving riparian habitat conditions (riparian acres, WR1-3)	350 acres (annually)	800 acres (annually)	600 acres (annually)	525 acres (annually)	500 acres (annually)
• Restoring channel morphology to reflect natural conditions (miles)	30 miles	55 miles	30 miles	45 miles	40 miles
• Increasing habitat complexity through channel reconstruction, placement of large wood or other structures, habitat enhancement (miles)	60 miles	200 miles	60 miles	90 miles	85 miles
• Increasing aquatic habitat connectivity through culvert replacement (number of culverts)	50 culverts 45 stream miles	75 culverts 60 stream miles	50 culverts 45 stream miles	75 culverts 68 stream miles	70 culverts 60 stream miles
1.2 Species Diversity					
In cooperation with state wildlife agencies, expand bull trout occurrence within 10 years into unoccupied suitable stream segments within its historic range.	1 segment	2 segments	0 segments	1 segment	1 segment
Increase the amount and quality of source habitat (open, OFSS single story LOS in the dry upland forest potential vegetation group) for white-headed woodpecker. (per decade).	9,000 acres	8,000 acres	16,000 acres	12,000 acres	10,000 acres
Increase the amount and quality of source habitat (open canopy dry/moist upland forest potential vegetation group) for western bluebird and Cassin's finch.	44,000 acres (bluebird)	28,000 acres (bluebird)	91,000 acres (bluebird)	78,000 acres (bluebird)	53,000 acres (bluebird)
Maintain mule deer security cover on a percentage of the landscape within MA 4A.	33%	33%	28%	29%	32%

Objective Statements for the Umatilla National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Restore stronghold watersheds connectivity for aquatic species.	5-9 subwatersheds or 100-180 stream miles	8-10 subwatersheds or 160-200 stream miles	4-6 subwatersheds or 80-120 stream miles	3-5 subwatersheds or 60-100 stream miles	3-5 subwatersheds or 60-100 stream miles
1.4 Disturbance Processes					
1.4.1 Wildland Fire (planned and unplanned ignitions)					
Treat stands using silvicultural treatments and prescribed burning (planned ignition) to move towards Fire Regime Condition Class 1 and 2 in the dry and moist upland forest potential vegetation groups (per decade).	170,000 acres	140,000 acres	200,000 acres	220,000 acres	180,000 acres
Treat stands using silvicultural treatments and prescribed burning (planned ignition) to decrease the potential for high severity wildfire in the dry upland forest potential vegetation group (per decade).	95,000 acres	80,000 acres	110,000 acres	125,000 acres	100,000 acres
Manage wildfire (unplanned ignition) for resource benefits: modify species composition, stand density, structural stages, fire frequency, and fire severity to move Fire Regime Condition Classes 2 and 3 to Fire Regime Condition Classes 1 and 2 (per decade).	NA	52,000 acres	NA	37,000 acres	35,000 acres
1.4.2 Insects and Disease					
Within the dry upland forest potential vegetation group, treat stands with moderate to high susceptibility ratings using silvicultural treatments and/or wildland fire to decrease insect and disease susceptibility to low or moderate (per decade).	120,000 acres	100,000 acres	140,000 acres	155,000 acres	125,000 acres
Within the moist upland forest potential vegetation group, treat stands with moderate to high susceptibility ratings using silvicultural treatments and/or wildland fire to decrease insect and disease susceptibility to low or moderate (per decade).	40,000 acres	35,000 acres	50,000 acres	55,000 acres	45,000 acres

Objective Statements for the Umatilla National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
1.5 Invasive Species					
Reduce current infestations of invasive plant species.	7,000 acres	7,000 acres	15,000 acres	7,000 acres	7,000 acres
1.6 Structural Stages					
Decrease mid-age multi-story forest (UR stage) in the dry and moist upland forest potential vegetation groups by continuing to manage towards a large diameter (old forest) condition (per decade).	140,000 acres	110,000 acres	160,000 acres	175,000 acres	145,000 acres
Increase the OFSS (open canopy) stage in the dry upland forest potential vegetation group by converting OFMS to OFSS (per decade).	2,500 acres	0 acres	17,000 acres	6,000 acres	3,000 acres
1.7 Plant Species Composition					
Increase shade intolerant stands in the dry upland forest potential vegetation group (per decade).	120,000 acres	100,000 acres	140,000 acres	155,000 acres	125,000 acres
Manage rangeland vegetation to improve phases C and D to phase A or B.	NA	NA	NA	6,000 acres	6,000 acres
1.8 Stand Density					
Reduce the dry and moist upland forest potential vegetation groups that are in the closed stand density class (per decade).	170,000 acres	140,000 acres	200,000 acres	220,000 acres	180,000 acres
1.10 Soil Quality					
Implement erosion control and stabilization measures on unstable hillslopes. Possible activities include road realignment and improving forest vegetation conditions.	200-400 acres	300-500 acres	150-250 acres	200-400 acres	200-360 acres
Restore soil function (also see objectives for 1.1 Watershed Function).	150-300 acres	200-400 acres	75-150 acres	175-350 acres	160-320 acres
1.11 Water Quality					
Improve water quality through implementation of water quality restoration plans.	5-7 watersheds 200-280 stream miles	6-10 watersheds 240-400 stream miles	4-6 watersheds 160-240 stream miles	5-7 watersheds 200-280 stream miles	5-7 watersheds 200-280 stream miles

Objective Statements for the Umatilla National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
2.7 Roads and Trails Access					
Maintain the road system for safe and efficient travel and for the protection, management, and use of NFS lands. Where open motor vehicle route density exceeds desired conditions, implement route closures and/or decommissioning or consider designating routes for other uses (refer to 1.1 Watershed Function for road decommissioning/obliteration objectives).	Miles of road maintenance: 158 miles MLs 4/5 159 miles ML 3 110 miles ML 2 (annually)	Miles of road maintenance: 100 miles MLs 4/5 79 miles ML 3 30 miles ML 2 (annually)	Miles of road maintenance: 210 miles ML 4/5 300 miles ML 3 400 miles ML 2 (annually)	Miles of road maintenance: 200 miles ML 4/5 200 miles ML 3 140 miles ML 2 (annually)	Miles of road maintenance: 158 miles MLs 4/5 159 miles ML 3 110 miles ML 2 (annually)
3.3 Goods and Services					
Contribute to local economies by harvesting sawlogs and timber volume other than sawlogs (TSPQ annually).	29 MMBF	16 MMBF	76 MMBF	56 MMBF	36 MMBF
Contribute to local economies by providing forage for cattle and sheep.	35,600 AUMs annually	4200 AUMs annually	35,800 AUMs annually	35,800 AUMs annually	35,800 AUMs annually

Table A-50. Comparison of objectives for the action alternatives for the Wallowa-Whitman National Forest. The objectives are just a partial list of the management activities expected to be accomplished to contribute to maintaining or achieving desired conditions during the first decade of the plan period, unless otherwise indicated within the objective statement.

Objective Statements for the Wallowa-Whitman National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
1.1 Watershed Function[5]					
(W1) Increase the number of watersheds in condition class 1 (from CC2) and 2 (from CC3) through active restoration. Measure: number of subwatersheds (HUC6) with improved condition class.	24 watersheds	30 watersheds	24 watersheds	24 watersheds	24 watersheds
Improve hydrologic function by: • Improving forest vegetative conditions (acres) (WH1)	3,500 acres (annually)	2,100 acres (annually)	17,700 acres (annually)	7,300 acres (annually)	4,600 acres (annually)
• Improving soil hydrologic function in areas of detrimental soil disturbance (acres) (WH2)	650 acres	1,200 acres	600 acres	950 acres	850 acres
• Reducing road-related sedimentation by reducing road density and reducing hydrologic connectivity of the road system (road miles) (WH3)	25-30 miles road surface treated (annually)	45-75 miles road surface treated (annually)	50-80 miles road surface treated (annually)	30-35 miles road surface treated (annually)	30-35 miles road surface treated (annually)
Improve riparian and wetland function by: • Restoring floodplain connections, channel morphology, channel structure, and flow regime (flood flows and low flows) (stream miles) (WR1)	60 miles	70 miles	55 miles	90 miles	80 miles
• Restoring riparian/wetland species composition (riparian acres) by increasing natural seedling establishment, planting, fencing, or modifying riparian management (riparian acres) (WR2)	150 acres	250 acres	150 acres	225 acres	210 acres

[5] All measures are proposed in priority watersheds.

Objective Statements for the Wallowa-Whitman National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
• Increasing effective stream shade (WQ objective 1) by increasing amount and extent of woody riparian species and increasing age-class structure of terrestrial vegetation in MA 4B (stream miles) (WR3)	250 miles	500 miles	250 miles	375 miles	350 miles
• Increasing extent and vegetative species diversity of off-channel and isolated wetlands by restoring hydrologic pathways, modifying existing water diversions, or fencing (number of sites) (WR4)	25 sites	35 sites	35 sites	40 sites	35 sites
• Increasing the number and extent of beaver-created wetlands (sites)	10 sites	20 sites	10 sites	12 sites	12 sites
Improve stream channel and aquatic habitat function by: • Improving riparian habitat conditions (riparian acres, WR1-3)	450 acres (annually)	1,000 acres (annually)	800 acres (annually)	675 acres (annually)	600 acres (annually)
• Restoring channel morphology to reflect natural conditions (miles)	40 miles	60 miles	40 miles	60 miles	50 miles
• Increasing habitat complexity through channel reconstruction, placement of large wood or other structures, habitat enhancement (miles)	75 miles	230 miles	75 miles	113 miles	100 miles
• Increasing aquatic habitat connectivity through culvert replacement (number of culverts)	60 culverts 90 stream miles	90 culverts 120 stream miles	60 culverts 90 stream miles	90 culverts 135 stream miles	80 culverts 120 stream miles
1.2 Species Diversity					
In cooperation with state wildlife agencies, expand bull trout occurrence within 10 years into unoccupied suitable stream segments within its historic range.	1 segment	2 segments	0 segments	1 segment	1 segment
Increase the amount and quality of source habitat (open, OFSS in the dry upland forest potential vegetation group) for white headed woodpecker (per decade).	8,000 acres	7,000 acres	19,000 acres	11,000 acres	9,000 acres

Objective Statements for the Wallowa-Whitman National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Increase the amount and quality of source habitat (open canopy dry/moist upland forest potential vegetation group) for western bluebird and Cassin's finch.	41,000 acres (bluebird)	22,000 acres (bluebird)	85,000 acres (bluebird) 25,000 acres (finch)	66,000 acres (bluebird) 12,000 acres (finch)	44,000 acres (bluebird) 3,000 acres (finch)
Maintain Rocky Mountain elk security cover on a percentage of the landscape within MA 4A.	36%	36%	32%	33%	35%
Restore stronghold watersheds connectivity for aquatic species.	6-10 subwatersheds or 120-200 stream miles	8-12 subwatersheds or 160-240 stream miles	5-8 subwatersheds or 100-160 stream miles	6-9 subwatersheds or 120-180 stream miles	6-9 subwatersheds or 120-180 stream miles
1.4 Disturbance Processes					
1.4.1 Wildland Fire (planned and unplanned ignitions)					
Treat stands using silvicultural treatments and prescribed burning (planned ignition) to move towards Fire Regime Condition Class 1 and 2 in the dry and moist upland forest potential vegetation groups.	170,000 acres	155,000 acres	215,000 acres	220,000 acres	190,000 acres
Treat stands using silvicultural treatments and prescribed burning (planned ignition) to decrease the potential for high severity wildfire in the dry upland forest potential vegetation group.	110,000 acres	100,000 acres	140,000 acres	140,000 acres	120,000 acres
Manage wildfire (unplanned ignition) for resource benefits: modify species composition, stand density, structural stages, fire frequency, and fire severity to move Fire Regime Condition Class 2 and 3 to Fire Regime Condition Class 1 and 2.	NA	78,000 acres	NA	64,000 acres	76,000 acres
1.4.2 Insects and Disease					
Within the dry upland forest potential vegetation group, treat stands with moderate to high susceptibility ratings using silvicultural treatments and/or wildland fire to decrease insect and disease susceptibility to low or moderate.	135,000 acres	125,000 acres	170,000 acres	170,000 acres	150,000 acres

Objective Statements for the Wallowa-Whitman National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Within the moist upland forest potential vegetation group, treat stands with moderate to high susceptibility ratings using silvicultural treatments and/or wildland fire to decrease insect and disease susceptibility to low or moderate.	25,000 acres	23,000 acres	30,000 acres	35,000 acres	30,000 acres
1.5 Invasive Species					
Reduce current infestations of invasive plant species.	7,000 acres	7,000 acres	15,000 acres	7,000 acres	7,000 acres
1.6 Structural Stages					
Decrease mid-age multi-story forest (UR stage) in the dry and moist upland forest potential vegetation groups by continuing to manage towards a large diameter (old forest) condition.	135,000 acres	125,000 acres	170,000 acres	170,000 acres	150,000 acres
Increase OFSS (open canopy) in the dry upland forest potential vegetation group by converting OFMS to OFSS.	2,000 acres	0 acres	20,000 acres	5,000 acres	3,500 acres
1.7 Plant Species Composition					
Increase shade intolerant stands in the dry upland forest potential vegetation group.	135,000 acres	125,000 acres	170,000 acres	170,000 acres	150,000 acres
Manage rangeland vegetation to improve phases C and D to phase A or B.	NA	NA	NA	10,000 acres	10,000 acres
1.8 Stand Density					
Reduce the dry and moist upland forest potential vegetation groups that are in the closed stand density class.	170,000 acres	155,000 acres	215,000 acres	220,000 acres	190,000 acres
1.10 Soil Quality					
Implement erosion control and stabilization measures on unstable hillslopes. Possible activities include road realignment and improving forest vegetation conditions.	200-400 acres	200-400 acres	300-500 acres	150-250 acres	200-400 acres
Restore soil function (also see objectives for 1.1 Watershed Function).	150-300 acres	150-300 acres	200-400 acres	75-150 acres	175-350 acres

Objective Statements for the Wallowa-Whitman National Forest	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
1.11 Water Quality					
Improve water quality through implementation of water quality restoration plans.	8-10 watersheds 320-400 stream miles	12-14 watersheds 480-560 stream miles	4-6 watersheds 160-240 stream miles	5-7 watersheds 200-280 stream miles	5-7 watersheds 200-280 stream miles
2.7 Roads and Trails Access					
Maintain the road system for safe and efficient travel and for the protection, management, and use of NFS lands. Where open motor vehicle route density exceeds desired conditions, implement route closures and/or decommissioning or consider designating routes for other uses (refer to 1.1 Watershed Function for road decommissioning/obliteration objectives).	Miles of road maintenance: 79 miles MLs 4/5 147 miles ML 3 218 miles ML 2 (annually)	Miles of road maintenance: 75 miles MLs 4/5 79 miles ML 3 50 miles ML 2 (annually)	Miles of road maintenance: 100 miles MLs 4/5 200 miles ML 3 400 miles ML 2 (annually)	Miles of road maintenance: 90 miles MLs 4/5 170 miles ML 3 150 miles ML 2 (annually)	Miles of road maintenance: 95 miles MLs 4/5 160 miles ML 3 218 miles ML 2 (annually)
3.3 Goods and Services					
Contribute to local economies by harvesting sawlogs and timber volume other than sawlogs (TSPQ annually).	27 MMBF	15 MMBF	80 MMBF	50 MMBF	34 MMBF
Contribute to local economies by providing forage for cattle and sheep.	109,000 AUMs (annually)	29,500 AUMs (annually)	84,500 AUMs (annually)	80,500 AUMs (annually)	80,500 AUMs (annually)

Table A-51. Malheur National Forest anticipated annual accomplishments for the action alternatives (as related to objectives)

Activity	Unit of Measure	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Acres Suitable for Timber Production	acres	770,000	530,000	1,080,000	770,000	770,000
Predicted Harvest Level (TSPQ)	MMBF	31	16	87	56	37
ASQ	MMBF	55	34	88	55	55
Timber Harvest (includes the following two rows)						
Even-aged regeneration harvest	acres	1,500	800	3,300	2,900	1,800
Uneven-aged and intermediate harvest	acres	5,600	2,600	17,200	9,600	6,500
Total Timber Harvest	**acres**	**7,100**	**3,400**	**20,500**	**12,500**	**8,300**
Planting	acres	700	400	1,600	1,400	900
Precommercial thinning	acres	1,400	1,000	3,000	1,400	1,400
Prescribed burning (planned ignition) and mechanical treatment of fuels (within and outside harvest units)	acres	16,600	12,900	20,500	22,000	17,800
Suppress invasive plants	acres	1,500	1,500	3,000	1,500	1,500
Cattle and sheep grazing	AUMs	126,500	62,200	125,500	123,500	123,500

Table A-52. Umatilla National Forest anticipated annual accomplishments for the action alternatives (as related to objectives)

Activity	Unit of Measure	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Acres Suitable for Timber Production	acres	420,000	260,000	610,000	420,000	420,000
Predicted Harvest Level (TSPQ)	MMBF	29	16	76	56	36
ASQ	MMBF	51	31	73	51	51
Timber Harvest (includes the following two rows)						
Even-aged regeneration harvest	acres	1,200	500	2,600	2,400	1,500
Uneven-aged and intermediate harvest	acres	4,000	1,800	13,000	8,200	4,900
Total Timber Harvest	**acres**	**5,200**	**2,300**	**15,600**	**10,600**	**6,400**
Planting	acres	600	200	1,300	1,200	700
Precommercial thinning	acres	1,600	1,500	3,200	1,600	1,600
Prescribed burning (planned ignition) and mechanical treatment of fuels (within and outside harvest units)	acres	19,100	12,300	16,000	20,600	16,400
Suppress invasive plants	acres	1,500	1,500	3,000	1,500	1,500
Cattle and sheep grazing	AUMs	35,600	4,200	35,800	35,800	35,800

Table A-53. Wallowa-Whitman National Forest anticipated annual accomplishments for the action alternatives (as related to objectives)

Activity	Unit of Measure	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Acres Suitable for Timber Production	acres	530,000	310,000	770,000	530,000	530,000
Predicted Harvest Level (TSPQ)	MMBF	27	15	80	50	34
ASQ	MMBF	46	22	75	46	46
Timber Harvest (includes the following two rows)						
Even-aged regeneration harvest	acres	1,000	500	2,500	2,000	1,400
Uneven-aged and intermediate harvest	acres	3,550	1,550	13,750	7,350	4,650
Total Timber Harvest	**acres**	**4,550**	**2,050**	**16,250**	**9,350**	**6,050**
Planting	acres	500	200	1,200	1,000	700
Precommercial thinning	acres	2,600	1,700	5,200	2,600	2,600
Prescribed burning (planned ignition) and mechanical treatment of fuels (within and outside harvest units)	acres	15,050	12,550	17,000	19,850	16,550
Suppress invasive plants	acres	3,500	3,500	3,500	3,500	3,500
Cattle and sheep grazing	AUMs	109,000	29,500	84,500	80,500	80,500

Standards and Guidelines (Alternatives B through F)

The vast majority of the standards and guidelines included in the proposed action published for the scoping period remain as part of alternative B, the modified proposed action. Changes and additions are noted in the following tables and are proposed to help emphasize the different ways that the action alternatives respond to the purpose and need and to the significant issues.

Forestwide Standards and Guidelines

Standards and guidelines are organized by resource or management action and generally apply to all three national forests. Where indicated, they apply only to the national forest(s) identified in the table. The standard and guideline designator column includes the current designator along with the one used for the proposed action (G- or S-) where applicable to ease comparison to the proposed action. New or modified standards and guidelines are identified.

Table A-54. Comparison of forestwide standards and guidelines for the action alternatives for each national forest

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Species Diversity				
Late Old Structure Habitat[6]				
WLD-HAB-1 G-1	**Guideline** Management activities that limit the ability of wildlife to disperse between patches of source habitat should be avoided; area and patch size of late old structure should be maintained or improved and road density within and between old forest patches should be maintained or reduced.	**Standard** Management activities that limit the ability of wildlife to disperse between patches of source habitat shall be avoided; area and patch size of late old structure shall be maintained and road density within and between old forest patches should be maintained or reduced.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
WLD-HAB-2 G-2	**Guideline** The extent of existing late old structure stands within the moist and cold old forest types that are 300 acres or larger should not be reduced or fragmented.	**Standard** The extent of existing late old structure stands within the moist and cold old forest types that are 300 acres or larger shall not be reduced or fragmented.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.

[6] Standards and guidelines for late old structure habitat apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
WLD-HAB-3 G-3	**Guideline** Riparian corridors connecting moist and cold old forest types should not be reduced.	**Standard** Riparian corridors connecting moist and cold old forest types shall be improved.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
WLD-HAB-4 *New*	This alternative has no corresponding standard or guideline.	**Standard** Cold and moist late old structure habitats 300 acres or greater and separated by less than 2 miles shall be connected by forested corridors 300 feet wide or wider with a 60 percent or greater canopy cover.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
WLD-HAB-5 *New*	This alternative has no corresponding standard or guideline.	**Standard** Manage for old age trees so as much old forest structure as possible is sustained over time across the landscape. Sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition across the landscape.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
Special Habitats[7]				
WLD-HAB-6 S-1	**Standard** Activities that have potential to cause abandonment or destruction of known denning, nesting, or roosting sites of threatened, endangered, or sensitive species shall not be authorized or allowed within 1,200 feet of those sites.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[7] Standards and guidelines for special habitats apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
WLD-HAB-7 G-10	This alternative has no corresponding standard or guideline.	**Standard** Nest disturbing management activities shall not occur within a radius of 1,320 feet from known active goshawk nests between April 1 and August 1.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
WLD-HAB-8 *New*	This alternative has no corresponding standard or guideline.	**Standard** Establish northern goshawk dispersal post-fledgling family areas in appropriate habitat when current density does not attain a post-fledgling family area every two and one-half miles.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
WLD-HAB-9 *New*	**Guideline** Northern goshawk home range establishment: • Post-fledgling family areas will be approximately 600 acres in size. Post-fledgling family areas will include the nest sites and consist of the habitat most likely to be used by the fledglings during their early development. • Establish a minimum of three nest areas and three replacement nest areas per post-fledgling family area. The nest areas and replacement nest areas should be approximately 30 acres in size. A minimum total of 150 acres of nest areas should be identified within each post-fledgling family area.	This alternative retains the alternative B modified management direction.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
	• Nest site selection will be based first on using active nest sites followed by the most recently used historical nest areas. When possible, all historical nest areas should be maintained. • Manage for nest replacement sites to attain sufficient quality and size to replace the three suitable nest sites.			
WLD-HAB-10 G-11	**Guideline** To the extent practical, known cavity or nest trees should be preserved when conducting prescribed burning (planned ignition) activities, mechanical fuel treatments, and silvicultural treatments.	**Standard** Known cavity or nest trees shall be preserved when conducting prescribed burning (planned ignition) activities, mechanical fuel treatments, and silvicultural treatments.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
WLD-HAB-11 *New*	This alternative has no corresponding standard or guideline.	**Standard** Manage for breeding areas that will support a minimum of 3 reproductive pairs of pileated woodpeckers per watershed.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
WLD-HAB-12 S-7	**Standard** Where mechanical treatment activities occur within dry or cool moist forest habitat, all snags 21 inches d.b.h. and greater and 50 percent of the snags from 12 to 21 inches d.b.h. shall be retained, except for the removal of danger/hazard trees. Snags shall be retained in patches.	This alternative retains the alternative B modified management direction.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
WLD-HAB-13 G-16	**Guideline** Motor vehicle use within elk winter range should not be authorized or allowed between December 1 and April 30.	**Standard** Motor vehicle use within elk winter range shall not be authorized or allowed between December 1 and April 30.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
WLD-HAB-14 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** In greater sage-grouse habitat, developing new roads, motor vehicle trails, and artificial water impoundments should be avoided. During the breeding season, seasonal closure of open motor vehicle routes within 2 miles of known leks (protected activity centers) should be considered.
WLD-HAB-15 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** Surface occupancy for mineral or fossil fuel exploration or extraction should not be authorized or allowed within 3 miles of occupied greater sage-grouse leks (protected activity centers).
WLD-HAB-16 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** Power lines, communication towers, meteorological towers, and other tall structures should not be constructed within 2 miles of greater sage-grouse leks (protected activity centers).
WLD-HAB-17 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** Construction of wind turbines should not be authorized or allowed within 3 miles of known greater sage-grouse leks (protected activity centers).
WLD-HAB-18 G-7	**Guideline** Bat maternity and roost sites should not be disturbed.	This alternative retains the alternative B modified management direction.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Post Fire Habitat[8]				
WLD-HAB-19 G-4	**Guideline** Greater than 50 percent of post-fire source habitat should be retained and should not be salvage logged, except in the wildland urban interface.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
WLD-HAB-20 G-5 *Changed to standard*	**Standard** Salvage logging shall not occur within burned source habitat areas less than 100 acres, except for the removal of danger/hazard trees.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
WLD-HAB-21 G-6	**Guideline** Where salvage logging occurs, all snags 21 inches d.b.h. and greater and 50 percent of the snags from 12 to 21 inches d.b.h. should be retained except for the removal of danger/hazard trees. Snags should be retained in patches.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
WLD-HAB-22 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** Following wildfires greater than 10 acres in greater sage-grouse habitat at high risk of annual grass invasions, seeding with an appropriate mixture should be accomplished to reduce the probability of cheatgrass establishment.

[8] Standards and guidelines forpost-fire habitats apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Survey[9]				
WLD-HAB-23 *New*	This alternative has no corresponding standard or guideline.	**Standard** Prior to potentially disturbing activities, potential bat sites shall be surveyed to determine presence or absence of bats with a high degree of confidence.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
WLD-HAB-24 *New*	This alternative has no corresponding standard or guideline.	**Standard** At least one year of survey of the analysis area, including a half mile beyond the boundary prior to activities that modify habitat, shall be completed. Two years of survey shall be accomplished to verify questionable sightings, unconfirmed nest sites, etc., If nesting goshawks are found during the first year of inventory, a second year of inventory is not needed in that territory.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
Riparian Habitat[10]				
WLD-HAB-25 G-12	**Guideline** Where management activities occur within riparian habitat, the quantity, stature, and health of shrubs should not be reduced or degraded.	This alternative retains the alternative B modified management direction.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
WLD-HAB-26 G-14	**Guideline** Roads and trails should not be constructed within high elevation riparian areas.	**Standard** Roads and trails shall not be constructed within high elevation riparian areas.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[9] Standards for survey apply to all three national forests
[10] Guidelines for riparian habitat apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
WLD-HAB-27 G-15	**Guideline** Residual herbaceous vegetation within riparian areas should be maintained at a level adequate to prevent stream bank degradation.	**Standard** Residual herbaceous vegetation within riparian areas shall be maintained at a level adequate to prevent stream bank degradation.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
Open Habitat[11]				
WLD-HAB-28 G-13	**Guideline** Vigor and areal extent of seed producing grasses and forbs should not be reduced.	This alternative retains the alternative B modified management direction.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
WLD-HAB-29 *New*	This alternative has no corresponding standard or guideline.	**Guideline** Where management activities occur within source habitat, the amount of shrubs in the early-seral stages of forest communities should not be reduced.	This alternative has no corresponding standard or guideline.	These alternatives have no corresponding standard or guideline.
Plant Species (federally listed and species at risk)				
Spalding's catch-fly (*Silene spaldingii*)[12]				
PL-TES-1 *New*	**Standard** Livestock grazing shall not be authorized or allowed during the *Silene spaldingii* active growth period (generally between May 15 and August 30) in pastures that exhibit low departure from the desired condition, unless the grazing management history demonstrates that livestock avoid *Silene spaldingii* occupied habitat.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.

[11]

[12] Standards apply to the Umatilla and Wallowa-Whitman National Forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
PL-TES-2 *New*	**Standard** Livestock grazing shall not be authorized or allowed in pastures occupied by *Silene Spaldingii* that exhibit moderate or greater departure from desired condition.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
Plant Species (federally listed and species at risk) and Range Management and Domestic Livestock Grazing[13]				
PL-TES-3 *New*	**Guideline** Domestic livestock grazing should not be authorized or allowed in the fens/bogs sensitive plant habitat groups.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
PL-TES-4 *New*	**Guideline** Maximum forage utilization of key species should not exceed 30 percent in occupied habitat of threatened, endangered, and sensitive plant species, except where an approved conservation strategy, conservation agreement, or recovery plan approves an alternate use level.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
PL-TES-5 *New*	**Guideline** New water developments and salting should not be authorized or allowed within one-quarter mile of occupied habitat of threatened, endangered, or sensitive plant species.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.

[13] Guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Plant Species (federally listed and species at risk) and Timber Harvest and Silviculture[12]				
PL-TES-6 *New*	**Guideline** Timber harvest and associated vegetation activities should avoid the occupied habitat of threatened, endangered, and sensitive plant species (minimum 100 foot buffer), unless the silvicultural prescription will benefit the species or its habitat.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
Plant Species (federally listed and species at risk) and Wildfire (unplanned ignition) Management Activities/Fuels Management[12]				
PL-TES-7 *New*	**Guideline** Slash piles and other fuels should be managed to avoid the occupied habitat of threatened, endangered, and sensitive plant species (minimum 100 foot buffer).	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
PL-TES-8 *New*	**Guideline** Wildland fire (planned and unplanned) suppression lines should not be constructed within occupied habitat of threatened, endangered, and sensitive plant species.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
Plant Species (federally listed and species at risk) and Road Construction[12]				
PL-TES-9 *New*	**Guideline** New road construction should be designed to avoid the occupied habitat of threatened, endangered, and sensitive plant species (minimum 25-foot buffer).	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Plant Species (federally listed and species at risk) and Recreation Management[12]				
PL-TES-10 *New*	**Guideline** All new trail construction should be designed to avoid the occupied habitat of threatened, endangered, and sensitive plant species (minimum 25 foot buffer).	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
Plant Species (federally listed and species at risk) and Minerals Management[12]				
PL-TES-11 *New*	**Guideline** Mining operations should be authorized or allowed only if activities are planned to avoid threatened and endangered plant species. Sensitive plant species should be avoided to the greatest extent possible.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
Plant Species (federally listed and species at risk) and Lands[12]				
PL-TES-12 *New*	**Guideline** Land exchanges should avoid the disposition of occupied habitat of threatened, endangered, and sensitive plant species.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.
Wildland Fire[14]				
FIRE-1 S-8	**Standard** Safety shall be the top priority when conducting wildland fire (planned and unplanned) operations.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[14] Standards and guidelines apply to all three national forests.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
FIRE-2 G-27	**Guideline** Minimum Impact Suppression Tactics (MIST) should be utilized in sensitive areas, such as designated wilderness areas, designated wild and scenic river corridors, research natural areas, botanical areas, riparian management areas, cultural and historic sites, developed recreation areas, special use permit areas that have structures, and historic and recreational trails. MIST techniques should also be used for post fire restoration activities.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
FIRE-3 G-28	**Guideline** Mechanical fireline should not be constructed in areas with greater than 35 percent slope or on highly erodible soils unless potential adverse effects can be mitigated.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
FIRE-4 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** Greater sage-grouse habitat should be identified in fire management plans and should be given high priority for protection.
FIRE-5 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** Prescribed fire should not be authorized or allowed within greater sage-grouse habitat unless the pre-burn assessment documents minimal risk of invasion by cheat grass or other invasive weeds.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Invasive Species (Aquatic and Terrestrial)[15]				
NOX-1 S-9	**Standard** See alternative A "Management Direction for Invasive Species."	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
NOX-2 G-29 *Changed to standard*	**Standard** Materials used for construction or restoration projects on National Forest System lands shall be free of invasive species.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
NOX-3 G-36 *Changed to standard*	**Standard** All activities shall be conducted to minimize or prevent the potential spread or establishment of invasive species.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
Timber Harvest and Silviculture[16]				
FOR-1 S-11	**Standard** Clearcutting, shelterwood, and other even-aged regeneration harvest methods shall be used only when an interdisciplinary team/line officer has determined that protection can be assured for resources, such as soil, watershed, fish, wildlife, recreation, aesthetics, and the regeneration of the timber resource. It shall also be determined as the optimal harvest method.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[15] Standards apply to all three national forests
[16] Standards and guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
FOR-2 S-12	**Standard** Forest openings created by the application of even-aged regeneration harvest methods shall be limited to a maximum size of 40 acres. Exceptions are permitted on an individual basis after a 60-day public notice period and review by the regional forester. This maximum size opening limitation does not apply to areas harvested after large scale disturbances resulting from wildfire, insects, disease, windthrow, or other catastrophic events.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
FOR-3 S-13	**Standard** Cut blocks, patches, or strips created by the application of even-aged regeneration harvest methods shall be shaped and blended with the natural terrain.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
FOR-4 S-14	**Standard** Areas that are harvested using even-aged regeneration harvest methods on lands identified as suitable for timber production shall be capable of being adequately restocked within five years of final harvest. Adequately restocked is based on national forest or regional stocking standards.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
FOR-5 G-37	**Standard** Stands shall generally have reached the culmination of mean annual increment of growth as per NFMA sec.6 (m) prior to harvest. This does not preclude the use of thinning or other stand improvement measures or salvage or sanitation harvesting of timber stands that are substantially damaged by fire, windthrow, or other catastrophic events or that are in imminent danger of insect or disease outbreaks. Exceptions: after consideration of multiple uses, include other activities, such as cutting for experimental and research purposes, removing particular species of trees, improving wildlife habitat, range, or recreation resources.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
FOR-6 G-38	**Guideline** Silvicultural treatments should include provisions to avoid detrimental changes in water temperatures, blockages of water courses, and deposits of sediment.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
FOR-7 G-39	**Guideline** Timber harvest projects should include provisions for the maintenance or restoration of soil and water resources, including protection for streams, stream banks, shorelines, lakes, wetlands, and other bodies of water.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
FOR-8 G-40	**Guideline** Silvicultural treatments should be developed through interdisciplinary review that considers multiple use of the general area and ensures that the harvest systems used are not selected primarily because they give the greatest dollar return or the greatest unit output of timber.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
FOR-9 G-41	**Guideline** Timber harvest should not cause irreversible damage to soil, slope, or other watershed conditions.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
FOR-10 G-42	**Guideline** Timber harvest on lands not suitable for timber production should occur only to meet multiple-use purposes other than timber production.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
Range Management and Domestic Livestock Grazing[17]				
RNG-1 G-43 *Modified*	**Guideline** Grazing after wildland fire (planned and unplanned) should be managed so as not to cause a trend away from the key species desired condition. This may include growing season deferment for one or more years following wildland fire.	**Standard** Grazing after wildland fire shall be deferred until vegetation recovers to a condition where grazing will not cause the percent composition of native species to be reduced (cause a downward trend in key species). This generally will be a minimum of 5 years, but could be up to 10 years depending on the extent and severity of the fire and other factors.	This alternative has no corresponding standard or guideline.	These alternatives retain the alternative B modified management direction.

[17] Standards and guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
RNG-2 G-44	**Guideline** New fences should be designed to accommodate wildlife movement.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	**Guideline** This alternative retains the alternative B modified management direction with the following addition: In greater sage-grouse habitat, fence construction within 1 mile of known leks (protected activity centers) and seasonal high use areas should not be authorized or allowed. Fence construction on the crest of low hills should not be authorized or allowed unless the fence is marked with anti-strike markers.
RNG-3 G-45	**Guideline** All new water developments should provide for small mammal and bird escape.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-4 G-46	**Guideline** In areas classified as less than fully capable or suitable, only limited grazing should be authorized or allowed only after the limitations of the site are considered in designing the site-specific allotment management plan.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

<table>
<tr><th>Standard or Guideline Designator</th><th>Alternative B</th><th>Alternative C</th><th>Alternative D</th><th>Alternatives E and F</th></tr>
<tr><td>RNG-5</td><td colspan="4">Maximum percent utilization by management system
See MA 4B standards and guidelines for management direction for grazing within riparian management areas.
Table A-54a. Key grass and forbs species utilization within upland sites
<table>
<tr><th rowspan="3">Management System</th><th colspan="8">Maximum Percent Utilization</th></tr>
<tr><th colspan="2">Alt. B Departure from Desired Condition (guideline)</th><th colspan="2">Alt. C Departure from Desired Condition (standard)</th><th colspan="2">Alt. D Departure from Desired Condition (guideline)</th><th colspan="2">Alt. E and F Departure from Desired Condition (guideline)</th></tr>
<tr><th>Low</th><th>Moderate or Greater</th><th>Low</th><th>Moderate or Greater</th><th>Low</th><th>Moderate or Greater</th><th>Low</th><th>Moderate or Greater</th></tr>
<tr><td>Season long</td><td>50%</td><td>30%</td><td>30%</td><td>30%</td><td>45%</td><td>40%</td><td>35%</td><td>30%</td></tr>
<tr><td>Management systems that incorporate deferment, rest, rotation</td><td>55%</td><td>35%</td><td>30%</td><td>30%</td><td>50%</td><td>45%</td><td>40%</td><td>35%</td></tr>
</table>
Utilization should be based on a point in time measurement.
Utilization includes all use by permitted livestock, wildlife, insects, wildfire, or recreational use.
Utilization will be based on height-weight curves and/or ocular estimates or other approved measures.
Utilization is based on key species.
Low-moderate departure: phase A or B
Moderate or greater departure: phase C or D</td></tr>
<tr><td>RNG-6
G-47</td><td>Guideline
Upland shrub utilization should not exceed 45 percent as determined by any science-based method.</td><td>Standard
Upland shrub utilization shall not exceed 25 percent as determined by any science-based method.</td><td>This alternative has no corresponding standard or guideline.</td><td>Guideline
Upland shrub utilization should not exceed 40 percent as determined by any science-based method.</td></tr>
</table>

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
RNG-7 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** Grazing utilization within occupied greater sage-grouse habitats should not exceed 40 percent at any time during the grazing season and will be determined specifically for each greater sage-grouse habitat, i.e., grazing utilization measured as an average of the entire pasture or grazing unit will not be used to determine compliance with this guideline.
RNG-8 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** During greater sage-grouse breeding season, livestock turnout and trailing should avoid concentration on known greater sage-grouse leks (protected activity centers).
Bighorn Sheep[18]				
RNG-9 S-2	**Standard** Domestic sheep or goat grazing shall not be authorized or allowed on lands where effective separation from bighorn sheep cannot be reasonably maintained.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-10 S-3	**Standard** The use of domestic goats or sheep for manipulation of vegetation (i.e., noxious weed control, fuels reduction) shall not be authorized or allowed within or adjacent to source habitat for bighorn sheep.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[18] Standards and guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
RNG-11 S-4	**Standard** The use of recreational pack goats shall not be authorized or allowed within or adjacent to source habitat for bighorn sheep.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-12 *New*	**Standard** An effective monitoring program shall be in place to detect presence of bighorn sheep in identified high-risk areas when authorized domestic sheep or goats are present on adjacent or nearby allotments.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-13 *New*	**Guideline** Trailing of domestic sheep or goats should not be authorized or allowed within 7 miles of bighorn sheep home ranges.	**Standard** Trailing of domestic sheep or goats shall not be authorized or allowed within 15 miles of bighorn sheep home ranges.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-14 *New*	**Standard** When effective monitoring has not been conducted for bighorn sheep presence, domestic sheep or goat grazing shall not be authorized.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-15 *New*	**Standard** Permitted domestic sheep and goats shall be counted onto and off of the allotment by the permittee. A reasonable effort to account for the disposition of any missing sheep must be made by the permittee.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-16 *New*	**Standard** When permitted sheep are found to be missing, the Forest Service shall be notified within 24 hours.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
RNG-17 *New*	**Standard** Authorized domestic sheep or goats shall be individually marked in a manner that allows immediate identification of ownership at a distance during the grazing season at all times while on NFS lands.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-18 *New*	**Standard** Implement emergency actions when bighorn sheep presence is detected within 7 miles of active domestic sheep or goat grazing or trailing. Actions to be taken shall ensure separation between bighorn sheep and domestic sheep or goats.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
RNG-19 *New*	**Guideline** To maintain separation, when bighorn sheep are found within 7 miles of an active domestic sheep and goat allotment, implementation of emergency actions for domestic sheep and goat grazing could include: Reroute (move) domestic sheep or goats to a new routing path that will take them away from the likely bighorn movement; this may involve rerouting within the permitted allotment, movement to a different allotment, or, if the situation cannot otherwise be resolved, moving the permitted sheep off of the national forest until the situation can be resolved Inform the appropriate state agency of the bighorn sheep location	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Scenery[19]				
SCEN-1 G-49	**Guideline** Short-term reductions to existing scenic integrity levels should be authorized only when needed to achieve the long-term restoration or rehabilitation of scenic integrity and/or scenic stability.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
Cultural Resources[18]				
CUL-1 G-50	**Guideline** Prehistoric, historic, and traditional cultural properties should be protected unless an exemption is specified in a programmatic agreement or a project specific mitigation plan is developed in consultation with the appropriate State Historic Preservation Officer.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
Key Watersheds[20]				
KW-1 S-15	**Standard** There shall be no net increase in the mileage of Forest Roads in any key watershed unless the increase results in a reduction in road-related risk to watershed condition. Priority should be given to roads that pose the greatest relative ecological risks to riparian and aquatic ecosystems.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[19] Guideline applies to all three national forests
[20] Standards apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
KW-2 S-16	**Standard** Hydroelectric and other surface water development authorizations shall include requirements for in-stream flows and habitat conditions that maintain or restore native fish and other desired aquatic species populations, riparian dependent resources, favorable channel conditions, and aquatic connectivity.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
KW-3 S-17	**Standard** New hydroelectric facilities and water developments shall not be located in a key watershed unless it can be demonstrated that there are minimal risks and/or no adverse effects to the fish and water resources for which the key watershed was established.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
Watershed Restoration[21]				
WR-1 G-57	**Guideline** Watershed restoration projects should be designed to maximize the use of natural ecological processes as a tool in meeting and maintaining restoration objectives.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
WR-2 G-58	**Guideline** Watershed restoration projects should be designed to minimize the need for long-term maintenance.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[21] Guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
WR-3 *New*	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	This alternative has no corresponding standard or guideline.	**Guideline** Hydrologic connectivity and sediment delivery from roads and trails should be minimized. This includes roads inside and outside of riparian management areas.
Old Forest[22]				
OF-1 G-59	**Guideline** Management activities within or outside old forest stands should retain live old forest trees ≥ 21 inches d.b.h. Exceptions include: • Tree(s) need to be removed to favor hardwood species, such as aspen or cottonwood, or other special plant habitats • Late seral species, such as grand fir, are competing with large diameter early seral species, such as ponderosa pine • Tree(s) need to be removed to reduce danger/hazard trees along roads and in developed sites • A limited amount of old forest trees need to be removed where strategically critical to reinforce and improve effectiveness of fuel reduction in wildland-urban interfaces	**Standard** Management activities within and outside old forest stands shall retain live trees ≥ 21 inches d.b.h.	This alternative has no corresponding standard or guideline.	**Guideline** **Alternative E:** Management activities within and outside old forest stands should generally emphasize retaining live old trees of desirable species. For most species, old trees are generally considered to be greater than 150 years in age and may exhibit certain old tree characteristics. However, these old tree characteristics may vary by site and should be further developed on a project-specific basis. **Alternative F:** Management activities should retain live old trees greater than 150 years old, except in lodgepole pine cover types (retain trees greater than 120 years old).
OF-2 *New*	**Guideline** New motor vehicle routes should not be constructed within old forest stands.	**Standard** New motor vehicle routes shall not be constructed in old forest stands.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[22] Standards and guidelines apply to all three national forests

Management Area Standards and Guidelines

The following standards and guidelines are organized by management area. Forestwide design criteria displayed in the previous table apply to all management areas.

Standards and guidelines are organized by resource or management action and generally apply to all three national forests. Where indicated, they apply only to the national forest(s) identified in the table. The standard and guideline designator column includes the current designator along with the one used for the proposed action (G- or S-) where applicable to ease comparison. New or modified standards and guidelines are identified as such.

Table A-55. Comparison of management area specific standards and guidelines for the action alternatives for each national forest

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 1A Congressionally Designated Wilderness Areas[23]				
MA 1A WIL-1 S-19	**Standard** With the exception of permitted livestock, animals other than pack stock and pets (see glossary) shall not be authorized or allowed in wilderness areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WIL-2 S-28	**Standard** Wheeled vehicles, such as wagons and game carts, shall not be authorized or allowed within wilderness areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WIL-3 G-61	**Guideline** New proposals for outfitter and guide special use permits or recreation event permits should be approved only when the special use or event is consistent with wilderness area desired conditions and a need is identified by a Needs Assessment and Capacity Analysis.	**Standard** New proposals for outfitter and guide special use permits or recreation event permits shall be approved only when the special use or event is consistent with wilderness area desired conditions and a need is identified by a Needs Assessment and Capacity Analysis.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[23] Standards and guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 1A WIL-4 G-63	**Guideline** Party sizes greater than 12 people and/or 18 head of stock should not be authorized or allowed within wilderness areas.	**Standard** Party sizes greater than 12 people and/or 18 head of stock shall not be authorized or allowed within wilderness areas.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WIL-5 G-64	**Guideline** The hitching or tethering of a horse or other saddle or pack animal should not be authorized or allowed within 200 feet of lakes or within 100 feet of streams and posted wetlands within wilderness areas.	**Standard** The hitching or tethering of a horse or other saddle or pack animal shall not be authorized or allowed within 200 feet of lakes or within 100 feet of streams and posted wetlands within wilderness areas.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WIL-6 S-29	**Standard** Hitching or tethering of horses or other saddle or pack animals to trees, except for loading or unloading, shall not be authorized or allowed at campsites within wilderness areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A Congressionally Designated Wilderness Areas within the Malheur National Forest				
MA 1A MAL-WIL-1 S-25	**Standard** Storing or abandoning personal property, equipment, and supplies for more than 72 hours shall not be authorized or allowed in the Strawberry Mountain Wilderness Area.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A MAL-WIL-2 G-62	**Guideline** Camping and campfires should not be authorized or allowed within 200 feet of lakes, streams, or other camps within wilderness areas.	**Standard** Camping and campfires shall not be authorized or allowed within 200 feet of lakes, streams, or other camps within wilderness areas.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 1A Congressionally Designated Wilderness Areas within the Umatilla National Forest				
MA 1A UMA-WIL-2 G-62	**Guideline** Camping and campfires should not be authorized or allowed within 200 feet of lakes, streams, or other camps within wilderness areas.	**Standard** Camping and campfires shall not be authorized or allowed within 200 feet of lakes, streams, or other camps within wilderness areas.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A Congressionally Designated Wilderness Areas within the Wallowa-Whitman National Forest				
MA 1A WAW-WIL-1 S-20	**Standard** Eagle Cap Wilderness Area visitors shall not be authorized unless they obtain and possess an entry permit.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WAW-WIL-2 S-21	**Standard** Campfires shall not be authorized or allowed within 100 feet of any lake or posted wetland in the Eagle Cap Wilderness Area.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WAW-WIL-3 S-22	**Standard** Campfires shall not be authorized or allowed within one-quarter mile of the following lakes in the Eagle Cap Wilderness Area: Bear Lake (Bear Creek Area), Blue Lake, Chimney Lake, Dollar Lake, Eagle Lake, Frazier Lake, Little Frazier Lake, Glacier Lake, Hobo Lake, Ice Lake, Jewett Lake, Laverty Lake, Maxwell Lake, Mirror Lake, Moccasin Lake, Prospect Lake, Steamboat Lake, Sunshine Lake, Swamp Lake, Tombstone Lake, Traverse Lake, and Upper Lake.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 1A WAW-WIL-4 S-23	**Standard** Grazing of horses and other saddle and pack animals shall not be authorized or allowed within 200 feet of any lake in the Eagle Cap Wilderness Area.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WAW-WIL-5 S-24	**Standard** Eagle Cap Wilderness Area visitors shall not be authorized or allowed to enter posted restoration sites.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WAW-WIL-6 S-25	**Standard** Storing or abandoning personal property, equipment, and supplies for more than 72 hours shall not be authorized or allowed in the Eagle Cap Wilderness Area.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WAW-WIL-7 S-26	**Standard** Party sizes greater than 12 people and/or 18 head of stock shall not be authorized or allowed in the Eagle Cap Wilderness Area.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WAW-WIL-8 S-27	**Standard** When camping, party sizes greater than 6 people and/or 9 head of stock shall not be authorized or allowed in the Lakes Basin Management Area of the Eagle Cap Wilderness Area.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Wildland Fire Management Activities within MA 1A[24]				
MA 1A WIL-FIRE-1 G-65	**Guideline** All firelines should be restored by actions such as scattering slash piles along and onto firelines, knocking down or burning all slash piles greater than 18 inches tall, pulling back and covering all sod with slash, and placing boulders, logs, and slash on firelines to discourage use and camouflage entrance points. Additionally, all firelines that are within 100 feet of intercepting trails, roads, or stream crossings should be restored by cutting stumps flush and close to the ground (height of 4 to 5 inches), covering tops with a layer of soil (1 to 2 inches), and chopping and roughening the ends of logs and stumps.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WIL-FIRE-2 G-66	**Guideline** Waterbars should be constructed on fireline slopes that exceed 10 percent.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WIL-FIRE-3 G-67	**Guideline** Garbage and trash should be removed.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WIL-FIRE-4 G-68	**Guideline** Camps should be restored by replacing logs and rocks, re-contouring terrain, scarifying soil, and scattering twigs, rocks, and dead branches to discourage use and camouflage entrance points.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[24] Guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 1A WIL-FIRE-5 G-69	**Guideline** Closed roads that were opened to provide access to wilderness areas should be closed after the use has concluded.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1A WIL-FIRE-6 G-70	**Guideline** Wilderness trails used as firelines should be returned to original condition after the use has concluded.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 1B Preliminary Administratively Recommended Wilderness Areas and MA 1C Wilderness Study Areas[25]				
MA 1B/C WIL-ST-1 G-71	**Guideline** Existing and proposed uses that could compromise wilderness area eligibility prior to congressional designation should not be authorized.	**Standard** Existing and proposed uses that could compromise wilderness area eligibility prior to congressional designation shall not be authorized.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A Wild and Scenic Rivers (includes Designated, Eligible, and Suitable Rivers)[26]				
MA 2A WSR-1 G-72	**Guideline** New proposals for outfitting and guiding special use permits or recreation event permits should be approved only when the special use or event is consistent with Outstandingly Remarkable Values (ORVs), wild and scenic rivers desired conditions, and when a need is identified by a needs assessment and capacity analysis.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[25] Guideline applies to all three national forests
[26] Standards and guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 2A WSR-2 S-30	**Standard** Hitching or tethering of horses or other saddle or pack animals to trees, except for loading or unloading, shall not be authorized or allowed at campsites within wild and scenic river corridors.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WSR-3 G-73	**Guideline** Hitching, tethering, hobbling, and confining of saddle and pack animals within wild and scenic river corridors should be authorized or allowed only in designated stock facilities or at hardened campsites.	**Standard** Hitching, tethering, hobbling, and confining of saddle and pack animals within wild and scenic river corridors shall be authorized or allowed only in designated stock facilities or at hardened campsites.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WSR-4 G-74	**Guideline** New designated routes and trails should not be constructed within riparian management areas unless no other feasible alternative exists.	**Standard** New designated routes and trails shall not be constructed within riparian management areas.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WSR-5 G-75	**Guideline** Recreation livestock should be allowed or authorized only in designated areas.	**Standard** Recreation livestock shall be allowed or authorized only in designated areas.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WSR-6 G-76	**Guideline** Timber harvest roads should not be constructed within wild and scenic river corridors.	**Standard** Timber harvest roads shall not be constructed within wild and scenic river corridors	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WSR-7 G-77	**Guideline** Firewood collection (except for use at onsite campfires) should be allowed only at designated sites within wild and scenic river corridors, preferably not within riparian management areas.	**Standard** Firewood collection (except for use at onsite campfires) shall be allowed only at designated sites within wild and scenic river corridors, outside riparian management areas.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 2A WSR-8 G-78	**Guideline** The construction of roads and river crossings that are visible from the river corridor of wild and scenic sections should not be authorized or allowed except when necessary to meet recreation purposes.	**Standard** The construction of roads and river crossings that are visible from the river corridor of wild and scenic sections shall not be authorized or allowed except when necessary to meet recreation purposes.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WSR-9 S-34	**Standard** Hazard trees shall be felled and left where they fall or moved to a desirable location within the wild and scenic river corridor.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WSR-10 S-35	**Standard** Mining of common minerals shall not be authorized.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WSR-11 S-36	**Standard** Oil and gas leasing shall not be authorized or allowed within 1,320 feet of the high water mark in wild river corridors.	Oil and gas leasing shall not be authorized or allowed within wild river corridors.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A Wild and Scenic Rivers within the Malheur National Forest (includes Designated, Eligible, and Suitable Rivers)				
MA 2A MAL-WSR-1 S-37	**Standard** Motor vehicle use shall not be authorized or allowed on trail 303 within the Malheur Wild and Scenic River corridor and on trail 381 with in the North Fork Malheur Wild and Scenic River corridor.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A MAL-WSR-2 S-38	**Standard** Livestock grazing shall not be authorized between Crane Creek and the southern boundary of the Malheur National Forest between July 1 and September 15.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 2A Wild and Scenic Rivers within the Umatilla National Forest (includes Designated, Eligible, and Suitable Rivers) There are no standards and guidelines specific to the Umatilla National Forest. The WSR standards and guidelines displayed previously for all three national forests apply.				
MA 2A Wild and Scenic Rivers within the Wallowa Whitman National Forest (includes Designated, Eligible, and Suitable Rivers)				
MA 2A WAW-WSR-1 S-32	**Standard** Camping shall not be authorized or allowed in the Lostine River corridor except in campgrounds, at trailheads, and in designated campsites.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2A WAW-WSR-2 S-33	**Standard** With the exception of trailheads and other designated areas, hitching, tethering, hobbling, and confining of saddle and pack animals shall not be authorized or allowed within the Lostine River corridor.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2B Research Natural Areas[27]				
MA 2B RNA-1 *New*	**Standard** Management activities that directly or indirectly modify the integrity of the ecological processes shall not be authorized or allowed.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2B RNA-2 G-86 *Changed to standard*	**Standard** Mineral exploration and development activities shall be managed to minimize impacts to research natural areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[27] Standards and guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 2B RNA-3 G-87 *Changed to standard*	**Standard** Removal of common mineral material shall not be authorized or allowed within research natural areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C Botanical Areas [28]				
MA 2C BOT-1 G-91	**Guideline** Visitor activities should be managed to avoid degradation to botanical areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C BOT-2 G-92	**Guideline** Interpretive facilities should not conflict with the overall purpose of establishing botanical areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C BOT-3 G-93	**Guideline** Silvicultural treatments should be allowed only when designed to enhance the special features of botanical areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C BOT-4 G-94	**Guideline** Firewood collection should not be authorized or allowed within botanical areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C BOT-5 G-95	**Guideline** Mineral exploration and development activities should be managed to minimize impacts to botanical areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C BOT-6 G-96	**Guideline** Removal of common mineral material should not be authorized or allowed within botanical areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[28] Guidelines apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 2C BOT-7 G-97	**Guideline** Botanical areas should be managed as avoidance areas for utility corridors.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C BOT-8 G-98	**Guideline** Planned fire should be used to maintain or enhance the vegetation condition for which the botanical area was established.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C BOT-9 G-99	**Guideline** Endemic (normal) levels of insects and disease disturbance should be allowed within botanical areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2C BOT-10 G-100	**Guideline** Invasive species should be reduced or eradicated within botanical areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2I Starkey Experimental Forest and Range[29]				
MA 2I STA EXP-1 *New*	**Guideline** To protect valuable infrastructure and assure compatibility with research needs and objectives, natural, unplanned ignitions should be suppressed with a high level of management response. Suppression activities are coordinated with the Station director, research project leader, or designee.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2I STA EXP-2 *New*	**Guideline** Planned ignitions should occur when/where compatible with research needs or objectives.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[29] Standards and guidelines apply to Wallowa-Whitman National Forest

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 2I STA EXP-3 *New*	**Standard** Special forest product collection and firewood cutting shall only be allowed when/where compatible with research objectives.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2I STA EXP-4 *New*	**Standard** Vehicle access shall only be allowed on designated routes, unless necessary to meet research needs or objectives.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2I STA EXP-5 *New*	**Standard** Starkey EFR shall be closed to public access from fall until spring to protect deer and elk from harassment and stress during winter, with specific dates established periodically as consistent with research objectives.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2I STA EXP-6 *New*	**Guideline** Existing old growth stands should be retained and additional stands that are the closest to old growth structure should be retained at a rate of 20 percent of the land area.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2I STA EXP-7 *New*	**Standard** Plans of operation for existing locatable mineral claims shall be reviewed and modified, to the extent practicable, to be compatible with existing or planned research.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 2J Municipal Watersheds[30]				
MA 2J MUN-WAT-1 S-39	**Standard** All management activities shall be designed to protect water quality at the intake in public water supply watersheds.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 2J MUN-WAT-2 S-40	**Standard** Fertilizers and chemicals shall only be used in emergency situations, subject to the terms of existing agreements between individual cities and the U.S. Department of Agriculture.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 3A Backcountry (nonmotorized use) and MA 3B Backcountry (motorized use)[31]				
MA 3A/B BACK-1 S-58	**Standard** Silvicultural treatments shall generally be limited to small diameter material and may take place only for the following reasons: To improve habitat for species with viability concerns, restore terrestrial or aquatic ecosystem composition and structural characteristics, or to maintain existing unique or important wildlife features or plant communities Appropriate administrative use When cutting, sale, or removal of timber is incidental to the implementation of another suitable management activity	**Standard** Silvicultural treatments shall not be allowed.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[30]Standards and guidelines apply to all three national forests
[31]Standards apply to all three national forests

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 3A/B BACK-2 S-59	**Standard** New road construction shall be limited to that required for designated special uses or required by law to provide access to non-Federal land or valid existing rights.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B Riparian Management Areas				
General Management within Riparian Management Areas[32]				
MA 4B RMA-1 G-101	**Guideline** When riparian management areas are functioning properly, project activities should be designed to maintain those conditions. When riparian management areas are not properly functioning, project activities should be designed to improve those conditions. Project activities in riparian management areas should not result in long-term degradation to aquatic and riparian conditions at the watershed scale. Limited short term or site-scale effects from activities in riparian management areas may be acceptable when they support, or do not diminish, long-term benefits to aquatic and riparian resources.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[32] Standards and guidelines apply to all three national forests.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-2 S-41	**Standard** Herbicides, insecticides, pesticides and other toxicants, and other chemicals shall be applied only to maintain, protect, or enhance aquatic and riparian resources or to restore native plant communities.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-3 G-102	**Guideline** Generally, trees needed to maintain, protect, or enhance aquatic and riparian resources that are felled for safety should be felled and left on site.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-4 G-103	**Guideline** Water drafting sites should be located and managed to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows needed to maintain riparian resources, channel conditions, and fish habitat.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-5 S-42	**Standard** Pumps shall be screened at drafting sites to prevent entrainment of fish and shall have one-way valves to prevent back-flow into streams.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-6 G-125	**Guideline** Fish habitat and water quality should be protected when withdrawing water for administrative purposes.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Wildland Fire Management Activities/Fuels Management within MA 4B[31]				
MA 4B RMA-FIRE-1 G-104	**Guideline** Disturbed areas, such as firelines, drop-points, camps, roads, and trails, should be restored by actions such as scattering slash piles, replacing logs and boulders, scarifying soils, recontouring terrain, and reseeding with native species.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FIRE-2 G-105	**Guideline** Chemicals and retardant should not be used for suppression and mop-up within riparian areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FIRE-3 G-106	**Guideline** Pumping directly from a stream channel should be avoided if chemical products are to be injected directly into the system. When chemicals are used, pumping should be conducted from a fold-a-tank that is located outside the riparian area.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FIRE-4 G-107	**Guideline** Pumps and charged hoses should not be back flushed into live water.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-FIRE-5 G-108	**Guideline** Temporary firefighting facilities (e.g., incident bases, camps, helibases, staging areas, helispots, and other centers) for incident activities should be located outside riparian management areas. When no practical alternative exists, all appropriate measures to maintain, restore, or enhance aquatic and riparian dependent resources should be used. (See guideline MA4B RMA-FIRE-1).	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FIRE-6 G-109	**Guideline** Aerial application of chemical retardant, foam, or other firefighting chemicals and petroleum should be avoided within 300 feet of waterways.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FIRE-7 G-110	**Guideline** Water drafting sites should be located and managed to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows needed to maintain riparian resources, channel conditions, and fish habitat.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FIRE-8 S-44	**Standard** Portable pump set-ups shall include containment provisions for fuel spills and fuel containers shall have appropriate containment provisions. Vehicles shall be parked in locations that avoid entry of spilled fuel into streams.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-FIRE-9 G-111	**Guideline** Generally, firelines should be located and configured to minimize sediment delivery, creation of new stream channels, and unauthorized roads and trails.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FIRE-10 S-45	**Standard** Minimum Impact Suppression Tactics (NWCG 2006) techniques for wildfire suppression activities shall be used in riparian management areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FIRE-11 S-46	**Standard** To minimize soil damage when chipping fuels within riparian management areas, chip bed depths on dry soils shall be limited to 7.5 cm or less (Busse et al. 2005).	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
Timber Management and Silviculture within MA 4B[33]				
MA 4B RMA-FOR-1 G-112	**Guideline** Silvicultural treatments should occur in riparian management areas only as necessary to maintain, restore or enhance conditions that are needed to support aquatic and riparian dependent resources.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[33] Standards and guidelines apply to all three national forests.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-FOR-2 S-47	**Standard** Firewood collection shall not be authorized or allowed in the active floodplain or within primary source areas for large woody debris. Active floodplain is the area bordering a stream that is inundated by flows at a surface elevation defined by two-times the maximum bankfull depth (i.e., bankfull depth measured at thalweg).	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FOR-3 G-113	**Guideline** New landings, designated skid trails, staging or decking should not occur in riparian management areas, unless there are no reasonable alternatives, in which case they should: Be of minimum size Be located outside the active floodplain Minimize effects to large wood, bank integrity, temperature, and sediment levels	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-FOR-4 G-114	**Guideline** Yarding activities should achieve full suspension over the active channel. Active channel is the bankfull width of flowing perennial or intermittent streams.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Range Management and Domestic Livestock Grazing within MA 4B[34]				
MA 4B RMA-RNG-1 S-48	**Standard** New livestock handling and/or management facilities shall be located outside riparian management areas, except for those that inherently must be located in a riparian management area and those needed for resource protection.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RNG-2 G-115	**Guideline** Table A-55a displays the maximum utilization guidelines for riparian management areas.			

Table A-55a. Maximum utilization within riparian management areas*

Measure	Alt. B	Alt. C**	Alt. D	Alt. E	Alt. F
Maximum percent utilization of woody vegetation (percent of mean annual vegetative production)	40%	25%	40%	25% within bull trout spawning and rearing reaches 40% for all other watercourses including anadromous fish reaches	25% in bull trout spawning and rearing habitat (all three national forests) 35% in anadromous fish reaches (UMA and WAW) 40% outside bull trout spawning and rearing habitat (MAL) 40% outside anadromous fish reaches (UMA and WAW)
Maximum percent utilization of herbaceous vegetation(percent of mean annual vegetative production)	40%	10%	40%	25% within bull trout spawning and rearing reaches 40% for all other watercourses including anadromous fish reaches	25% in bull trout spawning and rearing habitat (all three national forests) 35% in anadromous fish reaches (UMA and WAW) 40% outside bull trout spawning and rearing habitat (MAL) 40% outside anadromous fish reaches (UMA and WAW)

* In addition, the minimum residual stubble height (applies at the greenline) for all alternatives is 4 to 6 inches. The maximum bank alteration for all alternatives is 20 percent.

** For alternative C, this is a standard for maximum utilization within riparian management areas.

[34] Standards and guidelines apply to all three national forests.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-RNG-3 G-116	**Guideline** During allotment management planning, removing existing livestock handling or management facilities from riparian management areas should be considered.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RNG-4 G-117	**Guideline** Livestock trailing, bedding, watering, loading, and other handling in riparian management areas should be minimized.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RNG-5 G-118	**Standard** Trampling of federally listed threatened or endangered fish redds by livestock shall be avoided.	This alternative retains the alternative B modified management direction.	**Guideline** Trampling of federally listed threatened or endangered fish redds by livestock should be avoided.	These alternatives retain the alternative B modified management direction.
Roads Management within MA 4B[35]				
MA 4B RMA-RD-1 S-49	**Standard** Side-casting (placement of unconsolidated earthen waste materials resulting from road construction or maintenance) in riparian management areas shall be avoided.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RD-2 S-50	**Standard** Fill material shall not be placed on organic debris in riparian management areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[35] Standards and guidelines apply to all three national forests.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-RD-3 S-51	**Standard** Disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow shall be minimized or avoided when constructing or reconstructing roads or landings either inside or outside of riparian management areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RD-4 G-120	**Guideline** Wetlands and unstable areas should be avoided when reconstructing existing roads or constructing new roads and landings. Minimize impacts where avoidance is not practical.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RD-5 S-52	**Standard** New or replaced permanent stream crossings shall accommodate flows at least 20 percent greater than the 100-year flood event, including associated bedload and debris.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RD-6 S-53	**Standard** Where physically feasible, construction or reconstruction of stream crossings shall avoid diversion of streamflow out of the channel and down the road in the event of crossing failure.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RD-7 S-54	**Standard** In fish bearing streams, construction or reconstruction of stream crossings shall provide and maintain passage for all fish species and all life stages of fish.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-RD-8 G-121	**Guideline** Construction or reconstruction of stream crossings should allow passage for other riparian dependent species where connectivity has been identified as an issue.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RD-9 G-122	**Guideline** Fish passage barriers should be retained where they serve to restrict access by undesirable nonnative species and are consistent with restoration of habitat for native species.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RD-10 G-123	**Guideline** Hydrologic connectivity and sediment delivery from roads should be minimized. This includes roads inside and outside of riparian management areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-RD-11 G-124	**Guideline** Road drainage should be routed away from potentially unstable channels, fills, and hillslopes. This applies both inside and outside of riparian management areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Recreation Management within MA 4B[36]				
MA 4B RMA-REC-1 G-126	**Guideline** Generally, placing new facilities or infrastructure within expected long-term channel migration zones should be avoided. Where activities, such as the placement or construction of road-stream crossings, boat ramps, docks, and interpretive trails, inherently must occur in riparian management areas, locate them to minimize impacts on riparian dependent resource conditions (e.g., within geologically stable areas, avoiding major spawning sites).	**Standard** Placing new facilities or infrastructure within expected long-term channel migration zones shall be avoided. Where activities, such as the placement or construction of road-stream crossings, boat ramps, docks, and interpretive trails, inherently must occur in riparian management areas, they shall be located to minimize impacts on riparian dependent resource conditions (e.g., within geologically stable areas, avoiding major spawning sites).	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-REC-2 G-127	**Guideline** Removing or relocating existing recreation facilities that are causing unacceptable impacts in riparian management areas should be considered.	**Standard** Existing recreation facilities that are causing unacceptable impacts in riparian management areas shall be relocated.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[36] Standards and guidelines apply to all three national forests.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Minerals Management within MA 4B[37]				
MA 4B RMA-MIN-1 G-128	**Guideline** Adverse effects to aquatic and other riparian-dependent resources from mineral operations should be minimized or avoided. For operations in riparian management areas, ensure operators take all practicable measures to maintain, protect, and rehabilitate water quality and habitat for fish and wildlife and other riparian dependent resources that may be affected by the operations.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	
MA 4B RMA-MIN-2 G-129	**Guideline** Structures, support facilities, and roads should be located outside riparian management areas. Where no alternative to siting facilities in riparian management areas exists, locate them in a way to minimize adverse effects to aquatic and other riparian-dependent resources. Existing roads should be maintained to minimize damage to aquatic and riparian dependent resources.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	

[37] Standards and guidelines apply to all three national forests.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-MIN-3 S-55	**Standard** Mine waste facilities with the potential to generate hazardous material (per CERCLA) shall be located outside of riparian management areas. If no reasonable alternative to locating these facilities in riparian management areas exists, then locate and design the waste facilities using the best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.
MA 4B RMA-MIN-4 G-130	**Guideline** Where possible, the operating plans for existing activities should be adjusted to minimize adverse effects to aquatic and riparian dependent resources in the riparian management areas.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
Lands Ownership (Hydropower) within MA 4B[38]				
MA 4B RMA-HYD-1 S-56	**Standard** Authorizations for all new and existing special uses, including, but not limited to water diversion or transmission facilities (e.g., pipelines and ditches), energy transmission lines, roads, hydroelectric, and other surface water development proposals, shall result in the re-establishment, restoration, or mitigation of habitat conditions and ecological processes identified as being essential for the maintenance or improvement of habitat conditions for fish, water and other riparian dependent species and resources. These processes include in-stream flow regimes, physical and biological connectivity, water quality, and integrity and complexity of riparian and aquatic habitat.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.
MA 4B RMA-HYD-2 S-57	**Standard** New support facilities shall be located outside of riparian management areas. Support facilities include any facilities or improvements (e.g., workshops, housing, switchyards, staging areas, and transmission lines) not directly integral to the production of hydroelectric power or necessary for the implementation of prescribed protection, mitigation or enhancement measures.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

[38] Standards and guidelines apply to all three national forests.

Standard or Guideline Designator	Alternative B	Alternative C	Alternative D	Alternatives E and F
MA 4B RMA-HYD-3 G-131	**Guideline** If existing support facilities are located within the riparian management areas, they should be operated and maintained to restore or enhance aquatic and riparian dependent resources. At time of permit re-issuance, consider removing support facilities, where practical.	This alternative retains the alternative B modified management direction.	This alternative retains the alternative B modified management direction.	These alternatives retain the alternative B modified management direction.

The following management areas do not have specific standards or guidelines:

- MA 2D Geological Areas
- MA 2E Historical Areas
- MA 2F Scenic Byways and All-American Roads
- MA 2G Nationally Designated Trails
- MA 2H Scenic Areas
- MA 3C Wildlife Corridor
- MA 4A General Forest
- MA 5 Developed Sites and Administrative Areas

Budget Assumptions

Budget assumptions are discussed to inform the reader how the budget for the alternatives was determined.

The current budget is based on the three-year average using 2007 through 2009 budget data (table A-56). For the alternatives, the budget changes are based on differences in management activities discussed in the comparison of objectives, (table A-44, table A-45, and table A-46):

- Alternative B, modified proposed action: the budget remains flat for all activity areas.
- Alternative C: funding for vegetation management and other ground disturbing activities is de-emphasized in favor of watershed restoration (road closure and decommissioning and stream channel and fish passage improvements), invasive species control, and habitat improvements in the dry forest.
- Alternative D: budget is increased reflecting the emphasis on vegetation management, fuels reduction, road maintenance, and range management.
- Alternative E: budget is increased reflecting the emphasis on vegetation management but less than under alternative D. Fuels reduction is increased as is road treatments (reflected in wildlife and watershed management).
- Alternative F: budget is increased reflecting the emphasis on vegetation management and fuels reduction.

The following table displays the projected budget needs for the alternatives and for various programs and activities.

Table A-56. Budget assumptions for the action alternatives for each national forest

Management Activity	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Road Maintenance					
Malheur	flat	minus 80%	plus 40%	plus 15%	plus 15%
Umatilla	flat	minus 50%	plus 115%	plus 25%	plus 25%
Wallowa-Whitman	flat	minus 55%	plus 60%	minus 20%	minus 20%
Recreation	flat	flat	flat	flat	flat
Wildlife/Watershed Management	flat	plus 200%	plus 25%	plus 50%	plus 20%
Range Management					
Malheur	flat	minus 75%	plus 5%	flat	flat
Umatilla	flat	minus 90%	plus 30%	flat	flat
Wallowa-Whitman	flat	minus 75%	plus 45%	flat	flat
Vegetation Management					
Malheur	flat	minus 50%	plus 175%	plus 65%	plus 15%
Umatilla	flat	minus 45%	plus 170%	plus 80%	plus 20%
Wallowa-Whitman	flat	minus 50%	plus 195%	plus 70%	plus 20%
Fuels Reduction					
Malheur	flat	minus 40%	plus 20%	plus 20%	plus 5%
Umatilla	flat	minus 25%	plus 5%	plus 30%	plus 10%
Wallowa-Whitman	flat	minus 55%	plus 15%	plus 35%	plus 5%

Draft Monitoring and Evaluation Plan for Alternatives B, C, D, E, and F

There are three types of monitoring: implementation, effectiveness, and validation. Implementation monitoring determines if "we did what we said we would do." Effectiveness monitoring determines how well a particular practice helps achieve a project objective. The purpose of validation monitoring is to test key assumptions and generally involves designed research.

This monitoring and evaluation plan is designed primarily to assess whether or not forest plan implementation is making progress toward achieving desired conditions described by various forest plan goals, objectives, and standards and guidelines (CFR 210.12(k)). Some desired conditions and goals will not be monitored. Some effectiveness monitoring is also in the monitoring plan.

Forest Service planning regulations also contain specific monitoring requirements that are incorporated into the monitoring and evaluation plan.

There are many other Forest Service monitoring programs designed to address specific questions. Those programs are not part of this monitoring plan.

Monitoring and evaluation are separate, sequential activities required by the National Forest Management Act (NFMA). Monitoring is the collection of data by observation or measurement. Evaluation is the analysis and interpretation of monitoring data. The results of monitoring and evaluation may lead to changes in forest plan management direction.

Monitoring the effects of climate change on the achievement of forest plan goals, objectives, and standards and guidelines within the life of a forest plan (10 to 15 years) is challenging. Due to the 10 to 20 year cycle of the Pacific Decadal Oscillation (PDO) and the overlapping 5 to 10 year cycle of the El Niño Southern Oscillation (ENSO) and their effects on climate, long-term data sets are needed to be able to detect differences due to climate change. Implicit in the evaluation phase of monitoring is that, where possible, the effects of climate both in the short term (PDO and ENSO) and in the long term would be incorporated into the evaluation.

Table A-57. Monitoring plan framework for the action alternatives for each national forest

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	Related Programs/ Indicators	Monitoring Frequency, Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal requirement S: strategic C: consultation	
1. Status of select watershed conditions. Key ecosystem characteristics related to water resources and watershed conditions, such as water quality, quantity, timing and distribution provide the basis for monitoring watershed conditions.							
What is the status and trend of water quality?	Miles of state-listed impaired waters	State 303d-list	5 years	Implementation	Moderate	L, S, C	1.11 Water Quality
What is the status and trend of stream temperature?	Stream temperature	NRIS-AqS temperature data, other agency databases, RMRS stream temperature models	Annual, 5 years	Implementation	Moderate	L, S, C	FOR-6 G-38
What is the status and trend of streamflows?	Streamflow	Federal and state agency databases and Forest Service databases	Annual, 10 years	Implementation	Moderate	S, C	1.1.1 Hydrologic Function
Are watershed/aquatics standards and guidelines and BMPs being implemented at project sites (e.g., range, roads, recreation, and vegetation management)?	Multiple	Project files, field observations	Annual, 5 years	Implementation	High	L, S, C	1.1 Watershed Function

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	**Related Programs/ Indicators**	**Monitoring Frequency, Evaluation Frequency**	**Monitoring Type**	**Precision/ Reliability**	**Why? L: legal requirement S: strategic C: consultation**	
Are watershed/aquatics standards and guidelines and BMPs effective at achieving desired on-site conditions at project sites (e.g., range, roads, recreation, and vegetation management)?	Multiple	Field observations	Annual, 5 years	Effectiveness	Moderate	L, S, C	1.1 Watershed Function
What is the status and trend of watershed condition in all watersheds and in key watersheds?	Multiple watershed condition indicators and attributes	Forest Service and other agency databases	3-5 years	Implementation	Moderate	S, C	1.1 Watershed Function
What is the status and trend of riparian vegetation condition?	Grazing utilization on riparian vegetation, PIBO parameters	PIBO and forest datasets	Annual, 5 years	Implementation	Moderate	L,S, C	1.1.2 Riparian Function
What is the change in the distribution of known sites for selected aquatic and riparian invasive species?	Presence of selected invasive species	Federal and state agency databases and Forest Service databases	Annual, 5 years	Implementation	High	S, C	1.5 Invasive Species
What is the status and trend of aquatic habitat?	Miles of stream habitat improved, PIBO parameters	Forest Service databases, PIBO datasets	Annual, 5 years	Implementation	Moderate	L,S, C	1.1.6 Aquatic Habitat
What is the status and trend of aquatic habitat connectivity?	Miles of stream reconnected	Forest Service databases	Annual, 5 years	Implementation	High	L,S, C	1.1.6 Aquatic Habitat

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	Related Programs/ Indicators	Monitoring Frequency, Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal requirement S: strategic C: consultation	
2. Status of select ecological conditions including key characteristics of terrestrial and aquatic ecosystems.							
Have lands been adequately restocked within five years of regeneration harvest?	Stocking	FACTS	5 years, 5 years	Implementation	High	L	FOR-4 S-14
Have lands that are not suitable for timber production become suitable?	Forest extent, congressional designations	CVS, GIS	5 years, 5 years	Implementation	Moderate	L	3.3.1 Forest Products
What is the maximum size opening from even-aged management?	Opening sizes	FACTS	5 years, 5 years	Implementation	Moderate	L	FOR-3 S-12
What are the trends in Fire Regime Condition Class?	Acres by FRCC	CVS/FIA vegetation databases, remote sensing	Annual, 5 years	Implementation	Moderate	S	1.4.1 Wildland Fire
What are the trends in high insect and disease hazard acres?	Spread of selected insects and diseases	Insects and disease surveys	Annual, 5 years	Effectiveness	Moderate	S	1.4.2 Insects and Disease
What are the trends in stand density?	Trees per acre by potential vegetation group	CVS (FIA)	5 years, 5 years	Implementation	High	S	1.8 Stand Density
What are the trends in stand density?	Acres of stand density reduction treatment	FACTS	Annual, 5 years	Implementation	High	S	1.8 Stand Density

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	**Related Programs/ Indicators**	**Monitoring Frequency, Evaluation Frequency**	**Monitoring Type**	**Precision/ Reliability**	**Why? L: legal requirement S: strategic C: consultation**	
What are the trends in the introduction, establishment, and spread of invasive plants?	Acres infested/acres treated	FACTS	Annual, 5 years	Implementation, effectiveness	Moderate	L	1.5 Invasive Species
What are the trends in early seral tree species (ponderosa pine and western larch) composition?	Acres with desired species composition	CVS (FIA)	5 years, 5 years	Implementation, effectiveness	Moderate	S	1.7 Plant Species Composition
3. Status of select set of the ecological conditions required under §219.9 to contribute to the recovery of federally listedT&E species, conserve proposed and candidate species, and maintain a viable population of each SOCC.							
What is the condition and trend in habitats for aquatic focal species (steelhead, spring Chinook salmon, bull trout, and redband trout	See Status and Trend-Aquatic habitat, Status and Trend-Aquatic Habitat Connectivity	Forest Service databases, PIBO datasets	Annual, 5 years	Implementation, Effectiveness	Moderate	L, S, C	1.2 Species Diversity
4. Status of focal species to assess the ecological conditions required under§ 219.9.							
What are the population trends and/or habitat trends of the management indicator species?	Pileated woodpeckers and white-headed woodpecker: follow regional protocol	See regional protocols	5 years, 5 years	Implementation, effectiveness	Moderate	L	1.2 Species Diversity
What are the population trends and/or habitat trends of the management indicator species?	Rocky Mountain elk (WAW and UMA only) and mule deer (MAL only)	State population data/open route density on winter range/FACTS	5 years, 5 years	Implementation, effectiveness	Moderate	L	1.2 Species Diversity

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	Related Programs/ Indicators	Monitoring Frequency, Evaluation Frequency	Monitoring Type	Precision/ Reliability	Why? L: legal requirement S: strategic C: consultation	
What are the trends in source habitat and risk factors for boreal owl (UMA only), western bluebird, and fox sparrow?	Changes due to management or disturbance events	Accomplishment reports, FACTS, Fire GIS layer, open route density (boreal owl and western bluebird only)	2 years, 5 years	Implementation, effectiveness	Moderate	S	1.2 Species Diversity
What are the trends in source habitat and risk factors for Cassin's finch?	Changes due to management or disturbance events	Accomplishment reports, FACTS, Fire GIS layer	2 years, 2 years (5 years for alternatives B, C, and F, UMA only)	Implementation, effectiveness	Moderate	S	1.2 Species Diversity
What is the trend of northern goshawk (alternative C only)?	Follow established protocols			Implementation, effectiveness	Moderate	S	WLD-HAB-9
What are the trends in whitebark pine survival and recruitment?	Whitebark pine survival and recruitment	Whitebark pine transects and plots	5 years, 5 years	NA	Moderate	S	1.13 Special Habitats
5. Status of visitor use, visitor satisfaction, and progress toward meeting recreation objectives.							
Is recreation user satisfaction maintained or improved over time?	Visitor use	National Visitor Use Monitoring Data or similar national monitoring protocol	5 years	Effectiveness	High	S	2.3 Recreation

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	**Related Programs/ Indicators**	**Monitoring Frequency, Evaluation Frequency**	**Monitoring Type**	**Precision/ Reliability**	**Why? L: legal requirement S: strategic C: consultation**	
Are recreation facilities properly maintained and meet all health, safety and accessibility requirements?	Recreation facility condition	National Visitor Use Monitoring Data or similar national monitoring protocol	5 years	Effectiveness	High	S	2.3 Recreation
6. Measurable changes on other plan area related to climate change and other stressors that may be affecting the plan area.							
Does new scientific information related to climate change indicate a need to change plan components?	New scientific findings	Best available scientific information	5 years	5 years	Low	S	1.2 Species Diversity, 2.11 Community Resiliency
7. Progress toward meeting the desired conditions and objectives in the plan, including for providing multiple use opportunities.							
Are watershed/aquatic restoration projects (e.g., road decommissioning, passage improvements, riparian stream habitat improvements, etc.) being implemented at a rate consistent with forest plan objectives?	Annual accomplishment metrics (e.g., road miles decommissioned)	Forest Service databases	Annual	Implementation	High	S, C	1.1 Watershed Function
Are structural stages trending towards the desired range of variation?	Structural stage distribution	CVS (FIA), FACTS, FSVeg Spatial	Annual, 5 years	Implementation, effectiveness	Moderate	S	1.6 Structural Stages
Are trends in percent of herblands and shrublands making progress towards achieving the desired condition?	CVS plots	CVS (FIA)	5 years, 5 years	Implementation, effectiveness	High	S	1.6 Structural Stages

Proposed Monitoring Question	Proposed Indicator						Plan Component
	Parameter	**Related Programs/ Indicators**	**Monitoring Frequency, Evaluation Frequency**	**Monitoring Type**	**Precision/ Reliability**	**Why? L: legal requirement S: strategic C: consultation**	
Are acres restored using wildfire consistent with levels expected in the forest plan (alternatives C, E, and F only)?	Acres of restoration from wildfire	FACTS	Annual, 5 years	Implementation	Moderate	S	1.4.1 Wildland Fire
Is the mix of wildfire severity and frequency within the range of variation shown in table A-12?	Wildfire severity and frequency	Remote sensing data	Annual, 5 years	Implementation	Moderate	S	1.4.1 Wildland Fire
Is open route density less than or equal to the desired condition?	Open route density in watersheds by management area	GIS, INFRA, MVUM	Annual, 5 years	Implementation	High	S	2.7 Roads and Trails Access
8. The effects of each management system to determine that they do not substantially and permanently impact the productivity of the lands (16 U.S.C. 1604(g)(3)C). Focus on key ecosystem characteristics in the plan area related to soils and soil productivity identified in the assessment and planning process.							
Are outputs of goods and services being produced consistent with the levels expected in the forest plan?	Acres of fuels reduction treatments, CCF timber harvest, AUMs	FACTS, TIM	Annual, 5 years	Implementation	High	L	3.3 Goods and Services

Appendix B: Methodology

Environmental consequences are the estimated physical, biological, social, and economic effects that would result from implementing the alternatives. NEPA requires the analysis and disclosure of direct, indirect, and cumulative effects to the affected environment. Environmental consequences are interchangeable with effects. The analysis of these anticipated effects provides a basis for comparing alternatives and a method by which the interdisciplinary team, the public, and the responsible official can assess the consequences through time and in a particular geographic area.

Agencies are required to insure the professional integrity of discussion and analysis of effects that are included in environmental impact statements. As part of that assurance, the methodologies used and relied upon for conclusions are to be identified (40 CFR 1502.24). This appendix provides the methodologies used in the analysis of environmental consequences that would result from implementing the alternatives.

Access

Whether an area is deemed generally suitable or unsuitable for a particular use can vary among alternatives depending on the focus or type of management emphasis of the alternative. If a use is compatible with achieving the goals and desired conditions within a particular management area, it is considered suitable. For example, an alternative designed to emphasize natural processes and less intrusive management would have fewer areas where motor vehicle use would be compatible with achieving the desired conditions than an alternative designed to emphasize a more active management approach would have. Management of National Forest System roads and trails has been and continues to be of interest to the public. While some people suggested allocating additional backcountry areas to provide opportunities for solitude and nonmotorized recreation, others requested that additional areas be designated suitable for motor vehicle use without reducing the area that is currently suitable.

Relationships, Social and Economic Well-being, and Resilience

Socio-economic Impact Zones

Three areas, or socio-economic impact zones, are used to characterize each national forest's economic and social conditions. Counties are selected and combined into the national forest-specific socio-economic zones displayed in table B-1. These socio-economic impact zones were primarily developed considering three criteria: (1) the number of Forest Service-administered acres in each county, which relates to county payments, (2) trade flows of national forest products and by-products moving to and between local processing facilities, and (3) interconnected county economies. More information about the county selection process is available from the project record.

A series of human ecology based social studies conducted within the last several years, and public involvement-related mapping exercises completed in conjunction with this plan revision process

were also considered in defining socio-economic impact zones. The resulting data suggest that community members tend to conduct business, recreate, and socialize within larger geographic regions called human resource units (HRUs) (James Kent Associates 2006). HRU boundaries generated by this work were similar to the county-based socio-economic impact zones in table B-1.

Table B-1. Socio-economic impact zones

Malheur Socio-economic Impact Zone	Umatilla Socio-economic Impact Zone	Wallowa-Whitman Socio-economic Impact Zone
Grant County, OR Harney County, OR	Grant County, OR Morrow County, OR Umatilla County, OR Union County, OR Wallowa County, OR Wheeler County, OR Asotin County, WA Columbia County, WA Garfield County, WA Walla Walla County, WA Nez Perce County, ID	Baker County, OR Union County, OR Wallowa County, OR

Data Sources and Methods

The sources for most of the social and demographic data are based on surveys conducted by the U.S. Census Bureau, Bureau of Labor, and Bureau of Economic Analysis. These data are generated at the county level. The advantage of using these data sources at the county scale is the data are readily available and consistent across different geographies. This analysis displays the data by county and by socio-economic impact zone along with state level data as a reference. One must recognize that counties are large and using data at this level often masks social and economic conditions and trends occurring at the subcounty or community scale. The potential subcounty changes are not quantifiable given the scale of forest plan decisions and are not addressed.

Industry level employment and income data are derived using IMPLAN model data and software (Minnesota Implan Group). The IMPLAN data and analysis system provides a level of specificity for employment and income at a finer industry scale than data reported by the Bureau of Economic Analysis. The IMPLAN data and analysis system is also a useful tool to estimate the potential contribution of alternative management strategies on the economies of the socio-economic impact zones.

Each national forest and its goods, services, and uses are assigned to the socio-economic impact zone bearing its name. This means the potential social and economic effects related to the management activities within the Malheur National Forest are not identified for businesses that do not exist in it the Malheur socio-economic impact zone, even though those businesses may exist in the other two socio-economic impact zones.

Additional information about data sources and methods is provided as the data are presented.

Livestock Grazing and Grazing Land Vegetation

Grazing by livestock or native herbivores can affect grazing land health, including removing plant material, trampling soils (compaction, displacement, and structural damage), and trailing (alteration of water flow patterns). With proper management these impacts are insignificant compared with the natural resilience of the grazing land ecosystem. However, excessive grazing can cause impacts that move a system beyond its short-term ability to maintain functionality. Excessive impacts for an extended period can cause the system to cross thresholds that permanently alter it beyond its ability to recover (Laycock 1994, Miller et al. 1994). It is assumed in this document that, in general utilization of 40 percent or less of the forage on the landscape would result in proper management (see discussion of utilization below).

Grazing land, especially riparian and wetland areas are subject to impacts from a wide variety of other uses and activities. The most critical of impacts come from roads (impacts to riparian/aquatic water relationships), large wild ungulates (impacts primarily to spring and fall rangelands), and fire (impacts from fire exclusion, wildfire/prescribed fire, and natural drought cycles).

All alternatives include management standards or guidelines that provide for the sustainability of the grazing lands of the planning area. Grazing land health and sustainability is defined by the degree to which the integrity of soils and the ecological processes of grazing land ecosystems are maintained in a healthy functional status over time in response to various disturbance processes. The determination of whether or not grazing lands are healthy depends on the levels of soil stability and watershed function, the integrity of nutrient cycles, plant species composition, and the level of disturbance resiliency relative to site potential.

The basic measures of grazing land health are tied to the state and transition models with phases A and B presumed to be capable of ensuring long-term sustainability and resiliency. Phase C is assumed to be of concern but is still likely to allow grazing land to operate within the range of natural variability. Phase D is assumed to have resulted from some impact that may have crossed a threshold. Although there is no direct measure of grazing land health parameters associated with these phases, impacts to grazing land vegetation are often directly related and correlated to impacts to the soil resource. Therefore, the use of the phases model is believed to be a good representation of soil stability, nutrient cycles, disturbance resilience, plant species composition and health, and watershed function.

In order to provide context, especially for the economic and well-being section of this document, the total animal unit months (AUMs) available for each alternative must be estimated. For a variety of reasons, AUMs can vary on an annual basis, as well as by forest. For this reason, the number of cattle permitted between 2007 and 2009 was averaged for each forest and then divided by the number of suitable acres within active cattle allotments in 2010 to obtain an average AUM per suitable acre. This was then used to estimate the number of cattle AUMs for each alternative, including alternative A to allow unbiased comparison between alternatives.

Suitability and Capability for Livestock Grazing

A suitability determination is the process of evaluating a land area through a modeling of suitability and capability for a specified land use (such as permitted livestock grazing). Total land base acres minus (nonsuitable and noncapable) gives the modeled suitability determination. This is a landscape scale estimation based on GIS modeling and is not a site-specific determination.

Information including existing vegetation, potential vegetation, and soils was used to make the capability and suitability identification.

Capability is the initial step in determination of suitability and reflects the potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management activity. Capability depends upon current resource conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease. For forest planning purposes, capability does not vary by alternative and is determined once during the forest planning process.

Capability is determined by identifying all the lands within the project area that are National Forest System lands or other lands administered by the Forest Service, then subtracting areas with soil types not meeting criteria to sustain forage or grazing; areas covered by water; and areas with overstory tree canopy cover or unpalatable shrub cover greater than 60 percent. The remaining area is identified as capable rangeland.

Rangeland suitability is further refined from the capable rangeland. Once the capable rangeland is determined, acres that do not have a proposed management area prescription that would allow for grazing are subtracted. Administrative sites, recreation areas, and other areas of specific use are also subtracted, as are areas specifically closed to grazing by past actions or incompatibility of use between resources. The remaining area is identified as suitable rangeland to be used in the forest planning process.

Forest Plan Suitability Determination

For forest planning purposes, the combined “capability” and “suitability” analysis constitutes the suitability determination. This analysis is normally done separately for cattle and for sheep as appropriate, and possibly for other kinds of animals. It is normally completed for each alternative (or grouping of similar alternatives) being considered. Suitability may vary by alternative although capability normally will not.

The capability and suitability analysis and resultant suitability determination is not a decision to graze livestock on any specific area of land, nor is it a decision about or estimate of livestock grazing capacity. The capability/suitability analysis and suitability determination may or may not be used to provide supporting information for a decision to graze livestock on a specific area.

Any landscape area will contain areas that are capable and/or suitable, as well as areas that are modeled as being other than capable and/or suitable. Since the Forest Plan level Suitability Determination is based on a landscape scale modeling process and is dealing with a wide variety of very complex landscape parameters (e.g., slope, aspect, plant communities, soils, and so forth), it is inevitable that Suitable and Non-Suitable acres will intermingle on a land base of any significant size. Therefore, these Suitability Determinations are not intended to imply that livestock will be precluded from being found on lands that may be modeled as other than capable or suitable.

Forage Production Estimates

Estimates of forage production were based on average production (pounds per acre per year) for each grouping of plant associations. Approximately 500 individual plant associations were grouped into the 22 vegetation groups. Each plant association was classified into a temperature-

moisture matrix by the Area Ecologist. Vegetation groups are aggregations of plant associations found in the Blue Mountains (Powell et al. 2007 Johnson 1987, 1992) and represent a combination of temperature and moisture regimes. Table B-2 displays the average forage production for each of the vegetation groups. The forage estimates were derived from Johnson 1987 and 1992 field sampled measurements for each plant association.

Table B-2. Average forage production by plant association group

Vegetation Group	Representative plant association	Forage production (pounds per acre per year)
Cold Riparian Forest (Cold RF)	Subalpine fir / aquatic sedge	250
Cold Riparian Herbland (Cold RH)	Woodrush sedge	700
Cold Riparian Shrubland (Cold RS)	Willow / aquatic sedge	300
Cold Upland Forest (Cold UF)	Cws811, Grand fir/ grouse huck	30-500 (200)
Cold Upland Herbland (Cold UH)	Gs11, green fescue	500-1,300 (900)
Cold Upland Shrubland (Cold US)	Ss4915, Mountain big sage, needlegrass	50 – 450 (300)
Dry Upland Forest (Dry UF)	Cwg112, Grand fir pine grass	300 – 600 (450)
Dry Upland Herbland (Dry UH)	Gb41, Bluebunch wheatgrass	400 – 800 (600)
Dry Upland Shrubland (Dry US)	Sd9111, Stiff sagebrush / Sandberg's bluegrass	100 to 250 (200)
Dry Upland Woodland (Dry UW)	Cjs111, western juniper / low sagebrush	300 – 400 (350
Low Soil Moisture Riparian Forest (Low SM RF)	Ponderosa pine / Common snowberry (floodplain)	200
Low Soil Moisture Riparian Herbland (Los SM RH)	Md3111, Kentucky bluegrass (dry meadow)	600
Low Soil Moisture Riparian Shrubland (Low SM RS)	Willow / Kentucky bluegrass	200
Moderate Soil Moisture Riparian Forest (Mod SM RF)	Black cottonwood / Common snowberry	200
Moderate Soil Moisture Riparian Herbland (mod SM RH)	False hellebore	200
Moist Upland Forest (Moist UF)	Cwf311, Grand fir / Twinflower	<200
Moist Upland Herbland (Moist UH)	Gb5917, Idaho fescue-bluebunch wheatgrass-balsamroot	200 – 1,000 (650)
Moist Upland Shrubland (Moist US)	Sd2911, Mountain big sagebrush / Idaho fescue-bluebunch	230 – 625 (425)
Moist Upland Woodland (Moist UW)	Cjs41, Western juniper / Mountain mahogany / Idaho fescue	300 – 700 (400)
Warm Riparian Forest (Warm RF)	Quaking aspen / Mesic forb	200

The estimates in table B-2 are coarse, and even though a single number was used to calculate potential forage, the reality is that production can be variable and influenced by site specifics such as the seral stage of vegetation being analyzed or annual variations due to weather. All of these variables need to be accounted for when this information is used for project level planning. The representative plant association was determined by using the plant association within each vegetation group that was most abundant as indicated by the current vegetation survey (CVS) data.

The current production figures were developed by multiplying the production figures in table B-2 by the total number of acres in each vegetation group, capability group, and national forest. The total acres within each vegetation group were derived from the output of the range suitability modeling process described above. The production figures represent the current vegetation conditions, which in the case of the forested groups are heavily influenced by overstory canopy cover. In general, the higher the overstory canopy cover, the lower the understory production. Production for forested areas that were also classified as noncapable was calculated by multiplying the noncapable, forested acres by 50 pounds per acre per year because much of the area, although being closed canopy, still could provide a minimum amount of forage.

Further information and greater detail are part of the project record.

Old Forest

The Pacific Northwest Region of the Forest Service (Region 6) has standards for the classification of vegetation, which were used during the process of developing a consistent set of structural stages for the Blue Mountains forest plan revision. However, the regional standards do not mandate a specific structure classification system, but instead provide flexibility to develop a classification system based on several different systems presented in the standards document. The first step in choosing a classification system was to compare what was currently in use by each national forest. All three national forests within the Blue Mountains used a slightly different system developed from guidance in the 1993 Eastside screens document. After several tri-Forest wildlife-silviculture-fuels meetings in 2004-05, it was decided that the forest plan revision team would use a consistent structural stage classification system based on Interior Columbia Basin Ecosystem Management Project (ICBEMP) science, which was also consistent with the region 6 standards. It was also decided that the revision team would use a potential vegetation classification system that linked to the ICBEMP science. The upland forest potential vegetation types selected were: cold forest, moist forest, and dry forest. The structural stages selected were: stand initiation, stem exclusion, understory reinitiation, old forest single-story, and old forest multi-story. The revision team also elected to track the cover type (dominant species composition) within each potential vegetation type. We used the definitions for old forest that were found in ICBEMP SDEIS appendix 17 a-b. The appendix states that the term “old forest” and “old growth” were used synonymously but they chose to use old forest because it was more evocative of the ecosystem being discussed. We also chose to use the term old forest in plan revision. The definitions used in ICBEMP were specific to different potential vegetation groups as described in the 1993 Region 6 “interim old growth definition” document. There are no other widely used, science based definitions for old forest that we know of. The definitions describe old forest characteristics for tree age, size, down wood, snags, number of layers, variation in tree size and spacing, and canopy gaps. Data sources for estimates of the current abundance of old forest included the Current Vegetation Survey (CVS) and vegetation polygon. Modeling of old forest was generally based on density of trees by diameter. The modeling typically used tree size as a

surrogate for age because size was the attribute most commonly available in the different sets of data we used. Tree age was generally not available.

Historical estimates of old forest were used as one of the factors for developing desired conditions. Historic estimates for old forest came from our locally built Vegetation Dynamics Development Tool (VDDT) model. Other factors such as potential climate change were also considered in developing the desired condition.

The amount of old forest under each of the alternatives was modeled using VDDT and displayed at years 20 and 50. For more information, see the vegetation modeling section.

Preliminary Administratively Recommended Additions to the National Wilderness Preservation System

As part of the plan revision process, the Forest Service is required to evaluate inventoried roadless areas and assess their wilderness character and to make recommendations regarding their inclusion in the National Wilderness Preservation System. Through the Wilderness Act of 1964 (PL 88-577), Congress created the National Wilderness Preservation System to provide protection for lands untrammeled by man. This act provides direction for the USDA to recommend suitable primitive areas for addition to the National Wilderness Preservation System. The Forest Service can only recommend wilderness area allocations to Congress via forest plans, and only Congress can designate wilderness areas through the legislative process. Recommendations and designation are often controversial and Congress may defer the issue for many years before taking action. In the interim, the Forest Service is required to manage preliminary administratively recommended wilderness areas to protect their wilderness character and values for potential inclusion to the National Wilderness Preservation System.

During the 1980s, the national forests in the Blue Mountains evaluated 978,000 acres in 60 inventoried roadless areas for possible wilderness area recommendations to Congress. Of this total, no acres were recommended for wilderness area designation in the 1990 forest plans, primarily as a result of the intervening passage of the Oregon Wilderness Act of 1984 (P.L. 98-328) that designated 931,000 acres of wilderness state-wide and established the Oregon Cascades Recreation Area. Consequently, the 1990 Blue Mountain national forest plans allocated approximately 272,700 acres to management areas that partially preserved their undeveloped character, and 428,800 acres were allocated to management areas that allowed for active management, including further development of the transportation system. For the current forest plan revision process, a total of 84 potential wilderness areas comprising approximately 719,030 acres were evaluated for potential wilderness area recommendation. All of the acres evaluated are within the national forests and represent almost 13 percent of the total area.

In addition to the Blue Mountains Forest Plan Revision inventory process that considered National Forest System lands, the inventory also included an inventory of lands with wilderness character that was completed by the Bureau of Land Management. The Bureau of Land Management classified three areas near the Forest Service boundary as lands with wilderness character. These areas, situated adjacent to potential wilderness areas, are managed as Bureau of Land Management lands with wilderness character. The three areas comprise a relatively minor portion and contribution of the total potential wilderness area acres. The Bureau of Land

Management is the lead agency for these parcels, but they are included in the reports for those potential wilderness areas.

A total of 84 areas on the Blue Mountain national forests were evaluated for potential wilderness using standards outlined in Forest Service Handbook (FSH) 1909.12, Chapter 70 – Wilderness Evaluation. An area recommended as suitable for wilderness area designation must meet the tests of capability, availability, and need. In addition to the inherent wilderness quality it possesses, an area must provide opportunities and experiences that are dependent upon or enhanced by a wilderness environment. The ability of the Forest Service to manage the potential wilderness area must also be considered.

Capability is defined as the degree to which the area contains the basic characteristics that make it suitable for wilderness designation without regard to its availability for or need as wilderness. It is the degree to which an area contains wilderness qualities. These include the integrity of the natural environment and scenery; opportunities for solitude, challenge, and primitive recreation; and unique ecological or cultural features. Factors, such as size, shape, relationship to external influences, and boundary location, were examined to determine manageability (FSH 1909.12 Chapter 70 subpart 72.1).

Availability is conditioned by the value of and need for the wilderness area resource compared to the value of and need for other resources. A brief description of uses, wildlife, water resources, livestock grazing, timber, minerals, oil and gas, cultural resources, land use authorizations, lands not federally administered, and disturbances is included in the availability section of each potential wilderness area evaluation. These evaluations are available from the project record (FSH 1909.12 Chapter 70, subpart 72.2).

Need for wilderness designation is determined through an analysis of the degree to which an area contributes to the National Wilderness Preservation System based on several factors on both a regional and a local basis. Need evaluations have been documented in the Forest Service Region 6 Wilderness Need Evaluation for the Malheur, Umatilla, and Wallowa-Whitman National Forests (January 11, 2010). The Blue Mountain national forests needs evaluation includes potential contributions to the local and national distribution of wilderness areas and associated ecological and social values (FSH 1909.12 Chapter 70, subpart 72.3).

Inventoried roadless areas (IRAs) are defined by a combination of rules and regulations. As part of the forest plan revision process, inventoried roadless areas provided a starting point for the review process to assess all areas for potential wilderness area designation. Areas were evaluated based on criteria outlined above.

In this analysis, the alternatives differ in the total areas recommended for preliminary administratively recommended additions to the National Wilderness Preservation System and areas recommended for nonwilderness.

The following six factors and criteria from the Forest Service Handbook (FSH 1902.12, Chapter 70 Subpart 72.31) were used to assess wilderness need:

1. The location, size, and type of other wilderness areas in the general vicinity and their distance from the proposed area. Considering accessibility of areas to population centers and user groups. Public demand for wilderness may increase with proximity to growing population centers.

2. Present visitor pressure on other wilderness areas, the trends in use, changing patterns of use, population expansion factors, and trends and changes in transportation.
3. The extent to which nonwilderness lands on the national forests or other federal lands are likely to provide opportunities for unconfined outdoor recreation experiences.
4. The need to provide a refuge for those species that have demonstrated an inability to survive in less than primitive surroundings or the need for a protected area for other unique scientific values or phenomena.
5. Within social and biological limits, management may increase the capacity of established wildernesses to support human use without unacceptable depreciation of the wilderness resource.
6. An area's ability to provide for preservation of identifiable landform types and ecosystems. Consideration of this factor may include utilization of Edwin A. Hammond's subdivision of landform types and the Bailey-Kuchler ecosystem classification. This approach is helpful from the standpoint of rounding out the National Wilderness Preservation System and may be further subdivided to suit local, subregional, and regional needs.

Ecological Resilience

The data and analysis that was used to show the changes in forest structural stages for each forest was converted into graphs that showed the rate of change for each alternative. The ecological resilience analysis used this rate of change to compare the alternatives.

Soils

A summary of general soil types in the Blue Mountains is in the land type associations (LTAs) description (Sasich and Ottersberg 2006) and GIS layer. Landtype associations are differentiated based on 1) vegetation zones, 2) geology groups, and 3) landforms. There are 80 landtype associations in the Blue Mountains. In addition to the three characteristics that differentiate the landtype associations, Sasich and Ottersberg (2006) give information on volcanic ash, texture, rock fragments, depth to bedrock, soil climate, hydrologic and sedimentation properties and responses, productivity, vegetation recovery, limitations for roads and heavy machinery operability, timber and range suitability, and other characteristics. More detailed, site-specific soil information for most of Umatilla and Wallowa-Whitman National Forests and the northern part of the Malheur National Forest is in the Terrestrial Ecological Unit Inventory (TEUI) GIS layer and database. For areas that lack TEUI, Soil Resource Inventory information is available for each national forest at an intermediate scale.

Table B-3 displays the range (in acres) of detrimental soil conditions on the landscape as a result of historic timber harvest activities. The range (in acres) of detrimental soil conditions from ground-based timber harvest activities was determined by calculating 5 percent and 55 percent of the acres of timber harvest, the lowest published detrimental soil conditions (Bliss 2006, Craigg 2005) and the highest published detrimental soil conditions (Harkenrider 1979) respectively. Five percent was added to the result to account for detrimental impacts from constructing National Forest System roads and temporary roads.

Table B-3. Estimated detrimental soil conditions (DSCs) for ground-based and cable and aerial logging systems for each national forest (existing condition)

National Forest	Ground-based Timber Harvest Activities		Cable and Aerial Timber Harvest Activities		Total Timber Harvest Activities	
	Harvest	Range of DSCs	Harvest	Range of DSCs	Harvest	Range of DSCs
MAL	407,486	40,748 to 244,491	49,347	3,454 to 5,428	456,833	44,202 to 249,919
UMA	185,936	18,593 to 111,561	64,654	4,525 to 7,111	250,590	23,118 to 118,672
WAW	300,676	30,067 to 180,405	24,846	1,739 to 2,733	325,522	31,806 to 183,138
Totals	894,098	89,408 to 536,457	138,847	9,718 to 15,272	1,032,945	99,126 to 551,729

The range (in acres) of detrimental soil conditions on the landscape as a result of historic aerial timber harvest activities was determined by calculating 2 percent and 6 percent of the acres of aerial timber harvest, the lowest published detrimental soil conditions (Allen 1997) and the highest published detrimental soil conditions (Bliss 2006) respectively. Again, 5 percent was added to the result to account for detrimental impacts from constructing National Forest System roads and temporary roads.

The ranges (in acres) of detrimental soil conditions for both ground-based and aerial harvest systems include impacts associated with site preparation activities and post-harvest treatments, including post-harvest slash treatment. The acres of past timber harvest activities were calculated using GIS data. Since some areas have been harvested more than once, acres for these areas will be included more than once in the totals displayed in table B-3.

Following is a brief description of the analysis procedure and calculations used to estimate change in detrimental soil conditions by alternative.

In evaluating the potential effects of the alternatives on soils, a comparison of the total acres that would be treated for each activity is used as a surrogate for potential detrimental soil effects. To estimate the amount of detrimental soil conditions resulting from those activities during the first decade of the plan period, the number of acres of potential detrimental soil condition is calculated using the following formula: acres of activity multiplied by percent soil disturbance factor of specific treatment per year. Acres of activity by national forest and alternative on an annual basis are displayed in table 110. The soil disturbance factor for timber management activities is displayed in table B-4.

Table B-4. Potential areal extent of new detrimental soil conditions associated with timber management activities for all alternatives (soil disturbance factor used to estimate new detrimental soil conditions for all alternatives)

Timber Management Activity	Detrimental Soil Conditions
Even-aged harvest with ground-based system	15%
Even-aged harvest with cable logging system	6%
Uneven-aged harvest with ground-based system	8%
Pre-commercial thinning and mechanical fuels treatment	5%

The process for assigning risk classes for grazing included determining the overlap of landtype associations with grazing suitability maps for each alternative. Each grazing suitability class was assigned a rating of low, moderate, or high (pers. comm. Steve Howes 2011) A rating of low risk to soils from grazing was given to landtype associations rated with high suitability. A rating of

moderate risk to soils from grazing was given to landtype associations rated with low to moderate suitability. A rating of high risk to soils from grazing was given to landtype associations rated unsuitable for grazing. Unsuitable grazing lands generally included landtype associations associated with steep slopes, very shallow and rocky soils, and/or sites producing less than 200 pounds of forage annually.

Air Quality

Air quality within the plan area, due to regional transport winds, can be affected by actions that occur at considerable distances from the area. The distance from these sources helps to buffer any potential adverse industrial/metropolitan pollutants. Population growth in the Pacific Northwest and southwestern Idaho, centered in Boise, may diminish this buffer in coming decades.

Current air quality effects on wilderness areas and surrounding Class 2 lands is primarily from smoke and regional haze that affects large areas of the West under certain, poorly understood conditions. The issue of regional haze and its effects on western vistas has been and is being studied at a scale beyond this analysis in programs, such as the Grand Canyon Visibility Transport Commission. In addition, impairment reduction goals for visibility have been mandated by the EPA.

Visibility monitoring in the Blue Mountains is accomplished through Forest Service participation in the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. There are two IMPROVE monitors in the Blue Mountains, one in the Starkey Experimental Forest and Range and the other at the Bowman Dam in the HCNRA. The IMPROVE monitors collect aerosol samples that are then analyzed to obtain a chemical profile of the airborne particles that affect visibility. Using these monitors from 2000 to 2004, baseline visibility was established as part of the requirements of the Clean Air Act's Regional Haze Rule. The standard visual range was calculated by averaging the measurements for the worst days (20 percent of the total) and the best days (also 20 percent of the total). The results are figures for the worst-case day and best-case day. During the baseline period for the Starkey site, the standard visual range was 57 km for the worst-case days. The standard visual range for the best-case days is more than four times better (247 km). For the Bowman Dam site, the standard visual range for the worst-case days was 57 km, and it was 238 km for the best-case days. The Regional Haze Rule requires visibility to improve to the equivalent of natural conditions during worst-case days (average) by 2064, which are 156 km for the Starkey Experimental Forest and Range site and 176 km for the Bowman Dam site. Additionally, the rule requires no degradation during the best-case days by 2064.

Haze during these worst-case days at these sites is caused by two pollutants: organic carbon and ammonium nitrate. Organic carbon generally is a summer and fall pollutant that is caused primarily by wildland fires and other vegetative burning. Ammonium nitrate generally is a winter pollutant that occurs when cold, humid conditions prevail. Sources of ammonium nitrate include motor vehicle emissions, industrial boilers, fires, and ammonia from agricultural sources, including feedlots.

Watershed Function, Water Quality, and Water Uses

Biophysical and ecological conditions in the Blue Mountains have been assessed through a number of broad scale studies including ICBEMP (Quigley and Arbelbide 1997), the Eastside Ecosystem Management Assessment (Everett 1994, McIntosh et al. 1994), subbasin plans (NWPPC 2005), and recovery plans (USFWS 2002, Snake River Salmon Recovery Board 2006, USFWS 2008, Carmichael and Taylor 2009). In addition, approximately 50 watershed analyses have been conducted by the Forest Service for the three Blue Mountains national forests. Information from watershed analyses has been used by the Forest Service to prioritize restoration needs for vegetation, wildlife, fisheries, and watersheds (USDA Forest Service 2001, 2002, 2005). Previous analyses have all been conducted at either the subbasin or watershed scale and do not necessarily provide information with a consistent level of detail, or at the same scale used in this analysis. Instead, this analysis uses the results of a model developed specifically to assess watershed conditions in the Blue Mountains.

Watershed conditions in the Blue Mountains were assessed through the use of a sustainability model based on the Ecosystem Management Decision Support System (EMDS) (Reynolds 1996, 1999). The methods used are described in detail in (Gecy 2013). The basic approach uses detailed analysis of watershed, riparian, stream channel, and aquatic habitat attributes. Assessment of the state of these attributes is used to define the condition of the approximately 550 subwatersheds containing National Forest System lands in the Blue Mountains. Watershed condition is combined with information about the status and distribution of four selected focal species (bull trout, Chinook salmon, steelhead, and inland redband trout) to determine aquatic ecological condition (AEC), which is discussed in the “Aquatic Species Diversity and Viability” section of this document. One or more of these species occupies nearly all freshwater habitats in National Forest System lands in the Blue Mountains.

Focal species and watershed conditions were evaluated for each subwatershed containing National Forest System lands in the Blue Mountains. The modeling process, in combination with information from recovery plans, subbasin plans, and existing Forest Service analyses were used to identify key watersheds and a subset of those key watersheds called priority watersheds where the Forest Service would focus restoration efforts. Key and priority watershed selection are described in the analysis assumptions and methods section. This discussion addresses watershed conditions, as indicated by past management intensity, vegetation conditions, riparian conditions, and stream channel conditions.

Watershed conditions were evaluated based on existing forest and rangeland vegetation conditions and departure of vegetation from the historical range of variability (Countryman and Justice 2010) using the vegetation dynamics development tool (VDDT, ESSA Technologies Ltd. 2007). Road density and the percentage of road miles within or near riparian areas are used as an index of land use intensity (Lee et al. 1997) and the hydrologic connectivity of the road system to area streams (Wemple et al. 1996). Rangeland and riparian use intensity was estimated by summing current domestic livestock use by subwatershed and estimating average annual forage production in each subwatershed by vegetation class. The resulting measure compares actual livestock forage use to estimates of forage production (Holechek et al. 2006) and identifies relative livestock forage use across National Forest System lands.

Riparian and stream channel conditions were based on stream habitat surveys conducted by the Forest Service between 1989 and 2006. Survey data includes information on channel morphology,

substrate, riparian composition, and aquatic habitat features. In some cases, this data was supplemented with survey data from the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (PIBO, Kershner et al. 2004, Archer 2009). Forest vegetation data was overlain on stream maps in GIS to identify the dominant near-stream vegetation composition and provides an alternate measure of riparian vegetation condition.

Riparian and stream channel conditions were compared to conditions in a set of reference reaches consisting of reaches located in existing roadless and wilderness areas that do not have roads within 300 feet of streams. This resulted in a subset of 588 possible reference reaches out of 2,889 reaches surveyed. Reference conditions were identified following methods similar to those described in Kershner et al. (2004) and Al-Chokhachy et al. (2010). Some stream attributes vary by channel type (e.g., pool abundance and pool-riffle ratio) or riparian vegetation type (large wood frequency). Separate models of riparian and aquatic habitat conditions were required for reaches surveyed from 1989 through 1995 and 1996 through 2006 due to differences in how some attributes were surveyed and because of the low number of stream reaches surveyed since 1995 (20 percent of the total).

Mid-scale Analysis

Mid-scale or watershed analysis is a process for identifying and characterizing the status and trends of key physical and ecological conditions and processes influencing aquatic and riparian ecosystems at watershed scales, identifying the primary management issues associated with those conditions, and identifying opportunities to address them. Watershed analysis is not a forest plan component, but is an important process for informing forest plan implementation, as it provides context for management activities.

Decision makers use the results of watershed analysis to diagnose the status and trend of aquatic and riparian resources; tailor and/or refine broad-scale desired conditions to finer scales; establish watershed-scale objectives for aquatic and riparian resource management; identify key management needs and opportunities, including restoration; and develop local monitoring programs. Watershed analysis is not a decision-making process, but provides the information needed to determine the types and scales of land management activities appropriate to attaining forest plan desired conditions. Specifically, this process provides the basis for developing watershed restoration programs and implementing a diverse range of land management activities in a manner that protects and/or enables natural recovery of watershed conditions.

Key and Priority Watersheds

The focus of watershed restoration is to complete needed restoration work from ridge top to valley bottom to provide healthy watersheds (Ziemer 2004, USDA Forest Service 2005). Not all watersheds are expected to be in good condition at the same time and the condition of some existing high quality watersheds will eventually be degraded by future disturbance, so that replacement high quality habitats will be needed for some populations of aquatic and riparian species (Reeves et al. 1995, Reeves and Duncan 2009).

Because of the extent of decline in populations of some aquatic species and the degradation of their habitats, protection of remaining strong populations and their habitats is crucial to their recovery (Sedell et al. 1997). A network of key watersheds is identified in order to meet this need. Key watersheds have a combination of relative population strength for one of four aquatic focal species (Chinook salmon, steelhead, inland redband trout, and bull trout), good watershed conditions, and good aquatic and riparian habitat condition (Reiss et al. 2008). Key watersheds

are identified at the subwatershed level and consist of areas approximately 10,000 to 40,000 acres. Key watersheds are expected to be managed so that risk to aquatic and riparian habitats is minimized.

Some of the attributes of key watersheds that make them important for aquatic species may also make them important for terrestrial wildlife species as they often encompass a variety of habitats important to various wildlife species, including source habitats, deer and elk summer range, deer and elk winter range, and migration corridors. Key watersheds are less likely to be affected by past land uses and more likely to be important to the maintenance of water quality and quantity for a variety of downstream uses, including human uses.

The intent of the strategy is to protect and restore whole watersheds while reducing the risk to remaining populations of aquatic species and increasing the availability and connectivity of high quality aquatic and riparian habitats. Watersheds in good condition would be maintained by reducing existing impacts, implementing best management practices (BMPs), and through more comprehensive project design that facilitates integration between different resource disciplines. Watershed restoration activities are prioritized so that investments are made in areas that have the highest restoration potential while providing the greatest benefit to multiple resources and the least risk to existing populations. These areas are identified as priority watersheds and are displayed in tables table B-5, table B-6, and table B-7.

The model developed for assessing watershed, riparian, and aquatic habitat conditions was also used to identify key watersheds, compare alternatives, and to assess the relative importance of National Forest System lands to the viability of selected focal species. A description of the methods is available from the project record.

There are 167 watersheds are identified as key watersheds in the three National Forests. These key watersheds are located in 17 of the 25 subbasins that include National Forest System lands in the Blue Mountains. From this set of key watersheds, 67 are identified as priorities for restoration, of which 26 are within the Malheur National Forest, 15 are within the Umatilla National Forest, and 26 are within the Wallowa-Whitman National Forest. Key and priority watersheds comprise 936,600 acres, or 54 percent of the area of the Malheur National Forest; 810,000 acres, or 58 percent of forest area in the Umatilla National Forest; and, 1,481,000 acres or 62 percent of forest area in the Wallowa-Whitman National Forest.

Priority watersheds are selected based on existing restoration priorities and include sites of ongoing restoration, or restoration actions that are expected to be completed or started during the life of the plan, so that priority watersheds consist of those areas where restoration actions are proposed or are being planned during the next 10 to 20 years. Priority watersheds are a subset of key watersheds. It is expected that when planned work is completed in priority watersheds, that individual forests will develop new sets of priority watersheds so that restoration needs are met over the long term but work remains focused in a smaller set of watersheds at any given time. Priority watersheds occupy 415,000 acres (24 percent) of the Malheur National Forest, 244,800 acres (17 percent) of the Umatilla National Forest and 310,500 acres (13 percent) of the Wallowa-Whitman National Forest. The full list of key and priority watersheds for the national forests is displayed in table B-5, table B-6, and table B-7.

Table B-5. Malheur National Forest key (KWS) and priority (P) watersheds by subbasin

Subbasin	HUC6	Name	NFS Acres	Category
Upper Malheur	170501160101	Upper Big Creek	12,605	KWS
	170501160102	Lake Creek	19,861	KWS
	170501160103	Bosonberg Creek	14,894	KWS
	170501160104	Summit Creek	23,226	P
	170501160105	Cliff Creek	29,183	KWS
	170501160201	Upper Wolf Creek	11,444	P
	170501160202	East Fork Wolf Creek	12,549	P
	170501160203	Squaw Creek	11,560	P
	170501160204	Calamity Creek	31,366	P
	170501160301	Upper Pine Creek	26,496	P
	170501161101	Swamp Creek	25,589	KWS
	170501161102	Elk Creek	13,531	KWS
	170501161103	Crane Creek	28,670	P
	170501161105	Skagway Creek	10,986	KWS
	170501161201	Upper Little Malheur River	31,501	KWS
Upper John Day	170702010104	Utley Creek	9,270	KWS
	170702010305	Corral Creek	16,061	KWS
	170702010306	Lower Deer Creek	12,271	KWS
	170702010401	Tex Creek	29,024	KWS
	170702010405	Lower Murderers Creek	3,130	KWS
	170702010601	Rail Creek	15,333	KWS
	170702010602	Deardorff Creek	10,858	KWS
	170702010603	Reynolds Creek	16,365	KWS
	170702010605	Dads Creek	7,079	KWS
	170702010701	Upper Canyon Creek	22,746	KWS
	170702010702	East Fork Canyon Creek	15,424	KWS
	170702010801	Strawberry Creek	9,639	KWS
	170702010805	Indian Creek	12,240	KWS
	170702010806	Castle Creek	6,313	KWS
	170702011006	Dry Creek	6,336	KWS
	170702011103	Fields Creek	10,820	KWS
Middle Fork John Day	170702030101	Squaw Creek	11,150	P
	170702030102	Idaho Creek-Summit Creek	13,237	P
	170702030103	Dry Fork	11,224	P
	170702030104	Clear Creek	12,158	P
	170702030105	Bridge Creek	11,484	P
	170702030106	Mill Creek	16,647	P
	170702030201	Vinegar Creek	17,851	P
	170702030202	Little Boulder Creek-Deerhorn	17,789	P

Subbasin	HUC6	Name	NFS Acres	Category
	170702030203	Granite Boulder Creek	21,628	P
	170702030204	Big Boulder Creek	10,709	P
	170702030205	Coyote Creek-Balance Creek	11,196	P
	170702030206	Middle Camp Creek	18,817	P
	170702030207	Lick Creek	10,448	P
	170702030208	Lower Camp Creek	10,495	P
	170702030302	Big Creek	16,231	P
Silvies	171200020103	Upper Scotty Creek	10,182	KWS
	171200020201	Upper Bear Creek	19,187	KWS
	171200020302	Upper Camp Creek	24,578	KWS
	171200020503	Myrtle Creek	26,967	KWS
	171200020601	Crowsfoot Creek	13,718	KWS
	171200020602	Whiskey Creek	19,037	KWS
	171200020603	Bear Canyon Creek	11,396	KWS
	171200020604	Little Emigrant Creek	22,971	KWS
	171200020606	Sawtooth Creek	12,495	KWS
Silver	171200040101	Still Spring Creek	14,915	P
	171200040102	Delintment Creek	17,597	P
	171200040103	Dodson Creek	11,794	P
	171200040104	Sawmill Creek	14,376	P
Total Acres			936,649	
Total Key Watershed Acres and Total Key Watersheds			521,592	33 KWS
Total Priority Watershed Acres and Total Priority Watersheds			415,057	26 P

Table B-6. Umatilla National Forest key (KWS) and priority (P) watersheds by subbasin

Subbasin	HUC6	Name	NFS Acres	Category
Lower Snake-Asotin	170601030201	North Fork Asotin Creek	24,962	KWS
	170601030202	Lick Creek	8,261	KWS
	170601030203	South Fork Asotin Creek	11,931	KWS
	170601030204	Charley Creek	9,241	KWS
	170601030206	Upper George Creek	8,722	KWS
Upper Grande Ronde	170601041002	Little Lookingglass Creek	20,572	KWS
Lower Grande Ronde	170601060301	Upper South Fork Wenaha River	20,345	KWS
	170601060302	Lower South Fork Wenaha River	14,791	KWS
	170601060303	North Fork Wenaha River	17,579	KWS
	170601060304	Beaver Creek	9,458	KWS
	170601060305	Wenaha River-Rock Creek	17,442	KWS
	170601060306	Upper Butte Creek	16,850	KWS
	170601060307	Lower Butte Creek	11,804	KWS
	170601060308	Wenaha River-Cross Canyon	19,412	KWS

Subbasin	HUC6	Name	NFS Acres	Category
	170601060309	Upper Crooked Creek	18,941	KWS
	170601060310	First Creek	13,628	KWS
	170601060311	Lower Crooked Creek	16,577	KWS
	170601060312	Lower Wenaha River	6,141	KWS
Tucannon	170601070601	Headwaters Tucannon River	24,491	P
	170601070602	Panjab Creek	16,254	P
	170601070603	Little Tucannon River	16,319	P
	170601070604	Cummings Creek	8,691	P
Walla Walla	170701020101	Upper South Fork Walla Walla River	17,886	KWS
	170701020102	Middle South Fork Walla Walla River	14,074	KWS
	170701020201	Upper Mill Creek	19,605	KWS
	170701020301	Upper North Fork Touchet River	15,560	KWS
Umatilla	170701030104	North Fork Umatilla River	17,491	KWS
	170701030202	East Meacham Creek	11,327	KWS
	170701030203	Butcher Creek	9,892	KWS
	170701030204	North Fork Meacham Creek	30,039	KWS
	170701030205	Camp Creek	15,774	KWS
	170701030206	Boston Canyon	8,086	KWS
North Fork John Day	170702020104	Trout Creek	6,483	KWS
	170702020105	North Fork John Day River-Crane Creek	18,857	KWS
	170702020204	Clear Creek	17,724	P
	170702020205	Lake Creek	12,015	P
	170702020206	Lower Granite Creek	17,807	P
	170702020301	North Fork John Day-Dixon Bar	13,003	KWS
	170702020302	Meadow Creek	17,191	KWS
	170702020303	Big Creek	21,148	KWS
	170702020304	North Fork John Day-Corral Creek	18,338	KWS
	170702020401	North Fork Desolation	14,896	P
	170702020402	Upper Desolation Creek-Battle Creek	21,252	P
	170702020403	Desolation Creek-Kelsay Creek	13,120	KWS
	170702020404	Lower Desolation	6,780	KWS
	170702020702	Meadow Brook	8,518	KWS
	170702020706	Upper Potamus Creek	14,935	KWS
	170702020801	Swale Creek	13,127	P
	170702020802	Little Wall Creek	19,706	P
	170702020803	Little Wall Creek-Skookum Creek	20,529	P
	170702020804	Wilson Creek	14,849	P
	170702020805	Middle Big Wall	15,460	P

Subbasin	HUC6	Name	NFS Acres	Category
	170702020806	Lower Big Wall Creek	11,663	P
Total Acres			809,548	
Total Key Watershed Acres and Total Key Watersheds			564,764	38 KWS
Total Priority Watershed Acres and Total Priority Watersheds			244,784	15 P

Table B-7. Wallowa-Whitman National Forest key (KWS) and priority (P) watersheds by subbasin

Subbasin	HUC6	Name	NFS Acres	Category
Brownlee	170502010601	Upper Pine Creek	17,996	P
	170502010603	Clear Creek	14,875	P
	170502010605	East Pine Creek	15,946	P
	170502010606	Pine Creek-Fish Creek	5,401	P
	170502010607	Upper North Pine Creek	18,793	KWS
	170502010608	Lake Fork Creek	20,027	KWS
	170502010609	Lower North Pine Creek	13,886	KWS
Burnt	170502020101	Upper North Fork Burnt River	16,117	KWS
	170502020102	Camp Creek	16,941	KWS
	170502020103	North Fork Burnt River-Patrick Creek	8,215	KWS
	170502020104	Trout Creek	19,169	KWS
	170502020105	North Fork Burnt River-Petticoat Creek	12,710	KWS
	170502020106	West Fork Burnt River	8,706	KWS
	170502020107	Middle Fork Burnt River	11,373	KWS
	170502020201	Upper South Fork Burnt River	20,137	KWS
	170502020202	Middle South Fork Burnt River	19,753	KWS
	170502020301	West Camp Creek	11,978	KWS
	170502020302	East Camp Creek	10,054	KWS
Powder	170502030101	Cracker Creek	18,149	KWS
	170502030105	Deer Creek	19,347	KWS
	170502030402	Lower Salmon Creek	2,683	KWS
	170502030404	Rock Creek	12,077	KWS
	170502030501	Upper North Powder River	12,175	KWS
	170502031002	West Eagle Creek	12,542	KWS
	170502031004	East Fork Eagle Creek	26,352	KWS
Imnaha	170601020101	North Fork Imnaha River	13,308	KWS
	170601020102	South Fork Imnaha River	17,760	KWS
	170601020103	Imnaha River-Rock Creek	11,121	KWS
	170601020104	Imnaha River-Dry Creek	21,378	KWS
	170601020105	Gumboot Creek	12,113	KWS
	170601020106	Imnaha River-Crazyman Creek	14,558	KWS
	170601020204	Freezeout Creek	9,198	KWS

Subbasin	HUC6	Name	NFS Acres	Category
	170601020205	Imnaha River-Chalk Creek	6,222	KWS
	170601020301	Upper Big Sheep Creek	12,526	P
	170601020302	Lick Creek	10,229	P
	170601020303	Big Sheep Creek-Tyee Creek	12,918	P
	170601020304	Big Sheep Creek-Carrol Creek	8,522	P
	170601020306	Big Sheep Creek-Steer Creek	15,064	KWS
	170601020407	Big Sheep Creek-Lower Little Sheep Creek	4,372	KWS
	170601020502	Imnaha River-Fence Creek	7,594	KWS
	170601020503	Upper Horse Creek	21,589	KWS
	170601020504	Lower Horse Creek	11,175	KWS
	170601020505	Upper Lightning Creek	16,776	KWS
	170601020506	Sleepy Creek	11,705	KWS
	170601020507	Lower Lightning Creek	9,778	KWS
	170601020508	Upper Cow Creek	13,855	KWS
	170601020509	Lower Cow Creek	10,276	KWS
	170601020510	Imnaha River-Thorn Creek	15,650	KWS
North Fork John Day	170702020101	North Fork John Day River-Baldy Creek	16,945	KWS
	170702020102	Trail Creek	12,074	KWS
	170702020103	North Fork John Day River-Onion Creek	7,644	KWS
	170702020201	Upper Granite Creek	7,142	P
	170702020202	Bull Run Creek	18,759	P
	170702020203	Beaver Creek	12,119	P
Upper Grande Ronde	170601040101	Grande Ronde River-Tanner Gulch	15,278	P
	170601040102	Limber Jim Creek	11,929	P
	170601040103	Grande Ronde River-Meadowbrook Creek	12,779	P
	170601040104	Chicken Creek	10,967	P
	170601040105	Sheep Creek	18,979	P
	170601040106	Little Fly Creek	10,559	P
	170601040107	Upper Fly Creek	10,304	P
	170601040108	Lower Fly Creek	8,926	P
	170601040109	Grande Ronde River-Warm Springs Creek	17,096	P
	170601040201	Upper Meadow Creek	16,054	KWS
	170601040202	Middle Meadow Creek	21,357	KWS
	170601040203	Upper McCoy Creek	12,144	KWS
	170601040204	Lower McCoy Creek	5,570	KWS
	170601040205	Dark Canyon Creek	10,040	KWS
	170601040206	Lower Meadow Creek	18,155	KWS

Subbasin	HUC6	Name	NFS Acres	Category
	170601040304	Spring Creek	13,325	KWS
	170601040306	Rock Creek	5,830	KWS
	170601040401	Upper Five Points Creek	13,032	KWS
	170601040402	Pelican Creek	11,319	KWS
	170601040403	Lower Five Points Creek	11,741	KWS
	170601040501	North Fork Catherine Creek	21,603	P
	170601040502	South Fork Catherine Creek	15,173	P
	170601040503	Catherine Creek-Milk Creek	4,771	P
	170601040504	Little Catherine Creek	6,902	P
	170601040506	Little Creek	3,177	P
	170601040702	Mill Creek	5,662	P
	170601040902	Upper Indian Creek	14,869	KWS
Wallowa	170601050101	Upper Wallowa River	26,932	KWS
	170601050106	Hurricane Creek	18,613	KWS
	170601050108	Spring Creek	4,650	KWS
	170601050109	Wallowa River-Wallowa Lake	4,396	KWS
	170601050201	Upper Lostine River	11,214	KWS
	170601050202	Lostine River-Lake Creek	17,090	KWS
	170601050204	Lower Lostine River	1,614	KWS
	170601050401	Upper Bear Creek	21,661	KWS
	170601050402	Lower Bear Creek	14,795	KWS
	170601050501	Upper Minam River	22,557	KWS
	170601050502	Minam River-China Cap Creek	21,828	KWS
	170601050503	North Minam River	13,978	KWS
	170601050504	Minam River-Chaparral Creek	22,457	KWS
	170601050505	Little Minam River	29,043	KWS
	170601050506	Minam River-Trout Creek	22,840	KWS
	170601050507	Lower Minam River	4,246	KWS
Lower Grande Ronde	170601060401	Upper Chesnimnus Creek	14,837	KWS
	170601060402	Devils Run Creek	12,899	KWS
	170601060403	Middle Chesnimnus Creek	17,793	KWS
	170601060407	Peavine Creek	15,111	KWS
	170601060502	Elk Creek	9,727	KWS
	170601060504	Joseph Creek-Sumac Creek	9,641	KWS
	170601060506	Davis Creek	7,946	KWS
	170601060507	Lower Swamp Creek	14,904	KWS
	170601060508	Joseph Creek-Cougar Creek	12,970	KWS
	170601060601	Joseph Creek-Peavine Creek	11,240	KWS
	170601060602	Joseph Creek-Rush Creek	5,669	KWS
	170601060603	Upper Cottonwood Creek	12,185	KWS

Subbasin	HUC6	Name	NFS Acres	Category
	170601060604	Broady Creek	10,272	KWS
	170601060605	Horse Creek	5,857	KWS
	170601060606	Lower Cottonwood Creek	6,710	KWS
Total Acres			1,480,992	
Total Key Watershed Acres and Total Key Watersheds			1,170,455	86 KWS
Total Priority Watershed Acres and Total Priority Watersheds			310,536	26 P

Analysis Methods for Watershed Conditions

The watershed condition model used to assess watershed, riparian area, and aquatic habitat conditions in National Forest System lands and identify key watersheds (Reiss et al. 2008) was adapted for use in this analysis (Gecy 2013a). Three attributes are used to represent hillslope conditions within subwatersheds: forested vegetation condition, roads, and use intensity by domestic livestock. These attributes influence the routing of water and sediment from hillslopes to stream channels. The condition of forested vegetation is based on the relative departure from the historical range of variability, as described in the forested vegetation, timber resources, and wildland fire section of this document and by Countryman and Justice (2010). The departure scores compare stand structure, stand density, and species composition for each of 21 potential vegetation groups occurring in the Blue Mountains to the range of historical conditions for each potential vegetation group. The departure score calculated for each subwatershed is a composite of the departure from HRV of each potential vegetation group occurring in the subwatershed. For this analysis, estimates of the projected change in departure scores of the three dominant forested potential vegetation groups (dry upland forest, cool upland forest, and moist upland forest) at 10 years and 20 years are used to assess changes in vegetation condition and results are applied to all subwatersheds within each national forest. These three potential vegetation groups account for 87 percent, 80 percent, and 70 percent of the area of the Malheur, Umatilla, and Wallowa-Whitman National Forests respectively. The percentage of change in departure scores in tables 142, 164, and 185 in chapter 3 reflects the expected improvement in forested vegetation conditions, and indicates the relative rate of change towards HRV expected in each alternative for the Malheur, Umatilla and Wallowa-Whitman national forests, respectively. In this analysis, vegetation changes are assessed at 10 years and 20 years. All other factors used in the analysis are assumed to take place in the first 10 years.

Two road attributes are used in the analysis: road density and hydrologically connected roads. Road density is used in part as a measure of past land use intensity as described in Lee et al. (1997). Hydrologically connected roads are defined as roads or portions of roads that route water and/or sediment directly to stream channels. The extent of hydrologically connected roads is estimated using GIS. It is approximated by the miles of roads occurring within 300 feet of any stream. Changes to the road system based on restoration objectives and that are expected to occur during the next 10 years are used to compare differences between the alternatives. The metric used in the analysis is based on the assumption that hydrologically connected roads act as additional channels that extend the channel network in a given subwatershed, resulting in increased rates of runoff and sediment delivery to streams.

Livestock use intensity, as defined by Holechek et al. (2006), is an estimate of forage use by domestic livestock relative to long-term average forage production and is used to scale livestock use to the inherent productivity of rangeland sites. The influence of grazing in this analysis is based on the conclusion of Holechek et al. (2006) that grazing is sustainable if long-term forage

use does not exceed 40 percent of available forage. Forage production for all vegetation types was estimated using methods described in the Livestock Grazing and Grazing Land Vegetation section of this document along with methods described by Johnson and Simon (1987) and Johnson and Clausnitzer (1992) and is summed by subwatershed. Forage use was estimated by summing animal unit months (AUMs) by subwatershed and converting AUMs to forage use using methods described in the Forest Service handbook (FSH2209.13 Chapter 90).

For this analysis, predicted changes in the condition of forested vegetation are averaged for each national forest and applied to all subwatersheds. Differences in livestock use are also applied to all watersheds on the basis that the differences in stocking rates are known for each national forest for each alternative but are not known for specific subwatersheds, except that in alternative C livestock grazing would not occur in subwatersheds containing ESA-listed fish species. All restoration actions are assumed to occur in priority watersheds. Therefore, changes in vegetation and livestock use affect the condition of all watersheds, but restoration of roads, riparian areas, and aquatic habitats change only the condition of priority watersheds.

Together, vegetation condition, roads, and livestock grazing intensity comprise 50 percent of the watershed condition scores for individual watersheds. Measures of riparian area and aquatic habitat condition comprise the remaining 50 percent. In the analysis that follows, changes in upslope watershed conditions are displayed for year 10 and year 20. It is assumed that all restoration work described in the objectives will occur in the first 10 years, but forested vegetation condition continues to change through year 20. Changes in watershed condition from years 10 through 20 are based solely on the change in forested vegetation conditions.

Influences on riparian habitat conditions discussed in the analysis include the extent of riparian management areas, intensity of grazing in riparian areas, and limits on forage utilization in riparian areas. Stream channel and aquatic habitat conditions are assessed in terms of the extent of passive and active measures that would be used to restore stream channel and aquatic habitat conditions.

The model used to assess watershed conditions for this analysis (EMDS, Reynolds 2006) assigns output scores in the range of +1 to -1. Model scores that approach +1 are said to support the proposition that watersheds (or an individual attribute) reflect good conditions and values approaching -1 are defined as offering no support for the proposition of good condition. In this analysis, only the upslope attributes influencing watershed condition are displayed. Differences in other attributes are discussed narratively. For display purposes, the range of output scores is divided into 3 classes (1, 2 and 3), and the number of watersheds falling into each class is displayed to show the relative influence on “condition” of changes in each attribute. Throughout this analysis, condition classes are displayed for all watersheds on each forest and then for priority watersheds.

Aquatic Species

Analysis Area

For purposes of Cumulative Effects, the area analyzed consists of fish habitats in the subbasins where the Blue Mountains national forests are located, as this is the scale at which population viability is analyzed. Indirect effects of National Forest System management on fish populations in these subbasins, is focused on effects to habitat in National Forest System lands for each species of conservation concern.

Management Indicator Species

Management indicator species under the existing 1990 forest plans for the Blue Mountain Forests were selected because their population changes were believed to indicate the effects of management activities. Redband trout, steelhead and other species of trout were variously selected as management indicator species for the existing 1990 Forest Plans, as required by CFR 219.19(a)(1) and the 1982 Planning Rule. These species are identified in tables 206 through 208 in the Affected Environment section of this DEIS. Only alternative A was analyzed for effects to the 1990 Forest Plan management indicator species, for reasons explained in chapter 3 of this DEIS.

Focal Species

In the present time, the concept of focal species is currently perceived as more useful for maintaining viability of populations of native fish and other aquatic species in the analysis area, rather than continued use of management indicator species. The utility of focal species for assessing viability of aquatic species populations is discussed in chapter 3 of this DEIS.

Focal species for plan revision were selected from a list of species chosen as focal species in the various Northwest Power and Planning Council Subbasin Plans in 2004. That list was first reviewed to exclude species whose habitats are entirely outside and downstream of National Forest System lands. From there, four native salmonid (trout and salmon) species were selected to represent the full range of stream and river habitats used by aquatic species for spawning and rearing in the three Blue Mountains national forests. These species are all considered cold or cool-water species and all require good water quality. Effects to their habitats is expected to serve as indicators of effects to the species, and to other aquatic species with similar distributions and habitat requirements. No warm-water or nonnative species were selected, as there are no current concerns for viability of any of these species.

No species were selected to represent isolated undeveloped headwater spring habitats, as the few native aquatic species which might otherwise be used are far too localized in their known distributions, and their viability will be assessed and managed through project-specific biological evaluations. Those species are identified and discussed in chapter 3.

Species selected as focal species were:

- spring Chinook salmon; large and medium rivers and large tributaries;
- Steelhead; medium rivers to small tributaries at middle elevations;
- bull trout; coldest high-elevation tributaries
- redband trout; medium rivers to small tributaries at middle and upper elevations; stream and river habitats where no other salmonid species are present

Species Distribution

Species presence/absence data from National Forest System stream inventories, combined with mapped distributions obtained from Streamnet.org, and local biologists' knowledge, was used to identify subwatersheds and stream reaches where spawning and rearing habitat for individual focal species and other species of conservation concern is present in National Forest System lands.

Species Population Status

Species viability and population viability status for listed species in each subbasin, was drawn from published species status assessments. National Marine Fisheries Service is the agency responsible for determining viability of steelhead and spring Chinook salmon populations and each species as a whole. U.S. Fish and Wildlife Service is the agency responsible for determining viability of bull trout and redband populations and viability of each species as a whole.

National Marine Fisheries Service is responsible under the Magnuson-Stevens Act for ensuring viability of all Pacific salmon species, including salmon species which are not currently listed as Threatened or Endangered. Federal agencies, whose management actions may affect viability of any salmon species, are required to consult with the National Marine Fisheries Service under the Act, to minimize risks to viability of salmon populations. National Marine Fisheries Service's most recent status assessment for steelhead and salmon populations present in planning area subbasins, is available online at: http://www.nmfs.noaa.gov/pr/listing/reviews.htm

U.S. Fish and Wildlife Service's most recent status assessment for bull trout is available online at: http://www.fws.gov/pacific/bulltrout/5yrreview.html.

By definition, any subbasin-scale population not currently listed or proposed as threatened or endangered under the Endangered Species Act, is considered Viable, for purposes of this analysis.

An interagency Conservation Assessment for redband trout was recently completed (May et al. 2010). That assessment defined redband conservation populations for purposes of assessing long-term viability of the species. U.S. Fish and Wildlife Service determinations of "not warranted for listing" in Federal Registers, served as the basis for assessing viability status for conservation populations in the Great Basin and Middle Snake River regions of the planning area, outside the current range of steelhead.

Aquatic species for which viability is a developing concern in one or more of the Blue Mountain national forests are identified as Sensitive species on the Regional Forester's sensitive species list for the Pacific Northwest Region.

Habitat Quantity

Gecy (2013a) describes how habitat for each focal species was quantified in each subwatershed and subbasin. The methods for determining general conditions of aquatic habitat quality in National Forest System lands and for all lands in each subbasin, are also described in Gecy (2013a).

Habitat Condition

Aquatic habitat conditions were determined at multiple scales, from subwatershed to subbasin. Methodology followed Reiss et al. (2008), as adapted for use in the Blue Mountains Aquatic Sustainability Model (Gecy 2013a). Model outputs describe general aquatic habitat conditions in each subbasin, and included average impacts to aquatic habitats in general from barrier culverts within National Forest System lands

A GIS map of distribution of each focal species was overlaid with locations of known culvert barriers within National Forest System lands in each subbasin. Specific location of culvert barriers relative to distribution of the species in each subbasin was assessed visually using

professional judgment to refine model conclusions regarding habitat conditions for individual species in each subbasin.

Effects to Focal Species

Protection

Outputs from the Blue Mountains Aquatic Sustainability Model include protection scores for National Forest System lands in each subbasin (Gecy 2013a). Those protection scores vary by alternative, based on changes in the relative mix of acres allocated as Suitable for timber production, livestock grazing and roaded access, through the various Management Areas. Gecy (2013a) describes the process by which the model integrated the acres in each management area to produce protection scores at the subbasin scale for each alternative. Protection scores reflect the degree to which species and their habitats at subbasin scale are protected from risk of negative effects from land management activities due to the balance of land allocations within each subbasin.

Key watersheds are considered current strongholds for focal species and are the foundation for sustaining viability for focal species populations. Gecy (2013a) describes the process for selection of key watersheds.

Protection of key watersheds, forestwide riparian management areas, and designated critical habitats are important considerations for assessing effects to viability of focal species and Endangered Species Act-listed species. The number and distribution of key and priority watersheds under PACFISH and INFISH was compared to the number and distribution of key and priority watersheds in new forest plan alternatives. The rationales for the proposed changes, and implications of those changes were evaluated qualitatively.

Effects to forestwide riparian management areas were discussed in the following sections: “Plant Species Diversity and Threatened, Endangered, and Sensitive Plants;” “Livestock Grazing and Grazing Land Vegetation;” and “Watershed Function, Water Quality, and Water Uses.” Effects to aquatic habitats in general, follow those conclusions.

Active Restoration of Priority Watersheds

Active restoration of priority watersheds is the meaningful measure of effects of active restoration of focal species. Priority watersheds were chosen for restoration based on the high probability of effectiveness of that restoration for maintaining and restoring viability of species of conservation concern. Local Forest Service biologists identified which key watersheds could meet these criteria, based on professional judgment and local knowledge of the species and habitats in the watersheds.

The “Watershed Function, Water Quality, and Water Uses” section discloses effects of active restoration of upland forest vegetation management in priority watersheds, treatments of forest roads for restoration of watershed function and hydrologic processes, and effects of active restoration of riparian and aquatic habitats. Effects to aquatic species from active restoration are indirectly affected similarly to effects to watershed function and water quality.

Climate Change

Hydrologic changes shown in tables 227 through 229 in chapter 3 were directly taken from maps in the documents cited in table footnotes. Changes in landscape processes (e.g., fire, drought, or

flood) at subbasin scale referenced Haak et al. (2010), who provided maps based on subwatersheds. Those subwatershed-based maps were overlaid with subbasin boundaries. Overall balance and relative location of heightened risk was assessed by initial visual balance of color coding at subbasin-scale in each in the risk maps.

Forested Vegetation, Timber Resources, and Wildland Fire

Benchmark Analysis

As required by the 1982 planning rule, a Benchmark Analysis was completed in 2010 as a part of the analysis of the management situation for the Blue Mountains revised forest plans. The Benchmark Analysis was used to define the range within which alternatives were constructed. This analysis calculated the maximum biological production potential for timber production both with and without departure from the base schedule (nondeclining flow). Other benchmarks included maximizing present net value (PNV) with and without departure from the base schedule and the minimum level of management needed to maintain and protect the unit as part of the National Forest System. The acres suitable for timber production that were used in the Benchmark Analysis (1.8 million acres) differed only slightly from those used in the analysis of alternatives B, E, and F (1.7 million acres). The Benchmark Analysis only modeled lands suitable for timber production.

Minimum management requirements (MMR) guide the development, analysis, implementation, and monitoring of forest plans. The Benchmark Analysis utilized the following minimum management requirements:

- No regeneration harvests or harvesting of trees greater than 21 inches d.b.h. occurred within old forest because of a deficit of old forest structure. All old forest stands were considered unsuitable for timber production but still available for harvest for objectives other than timber production.
- All areas that met the criteria for potential wilderness area designation were identified as unsuitable for timber production. Minimal harvest only occurred within these areas to meet objectives other than timber production.
- All riparian management areas (ARCS) were modeled as unsuitable for timber production.
- No harvest was scheduled within areas determined to be unsuitable for timber production due to concerns about sensitive soils or difficulty regenerating sites within five years.

The modeling strata were based on three components: forest type (cold, moist, and dry); land allocation (wilderness, reserved lands, and active management); and treatment type (plant, pre-commercial thin, partial harvest, salvage harvest, individual tree selection, group selection, shelterwood, and prescribed fire). Multipliers were used in the VDDT model to prioritize the potential for treatment between the different vegetation groups. The results of the modeling for each of the five benchmarks were summarized for the Malheur, Umatilla, and Wallowa-Whitman National Forests.

Timber Suitability

The NFMA requires that National Forest System lands be classified as to their suitability and availability for timber harvest and production. A timber suitability analysis following the NFMA

and 36 CFR 219.14 was completed as a part of the planning process. This process is basically a series of subtractions of land from the total forest land base utilizing the following 3 broad categories to identify lands not available for timber production:

1. National Forest System lands that have been withdrawn from wood product production. These are lands designated by Congress, the Secretary of Agriculture, or the Chief of the Forest Service for other multiple-use objectives that preclude timber production (e.g., units of the National Wilderness Preservation System and Research Natural Areas).
2. National Forest System lands (exclusive of withdrawn areas) that are not forested, including lands that are incapable of supporting 10 percent tree cover; administrative sites; and lands maintained in a nonforest condition, such as power line rights-of-way.
3. Available forestland physically unsuited for timber production due to the inability to ensure adequate restocking or the potential for irreversible damage to soils or watersheds. However, acres within these forest types are considered available for timber harvest where irreversible damage to soils or watersheds would not result and where such activities contributed to underlying management emphases and objectives.

Forestlands remaining after identifying the subset of unsuitable forestlands described above are those that are tentatively available for and capable of timber production, and are also referred to as tentatively suitable forestland. Tentatively suitable forestlands represent the maximum number of acres that could be managed for regular and predictable wood product outputs (i.e., timber production). These acres remained constant as a starting point for the development of alternatives. Tentatively suitable lands were then separated into two categories based on the design parameters and objectives for each alternative. The lands were identified as:

1. Suitable for timber production
2. Unsuitable for timber production, but available for timber harvest if needed to meet desired conditions and objectives (NFMA sec (6)(k))

The following table displays lands tentatively suitable for timber production by national forest. Inventoried roadless areas were also subtracted from lands tentatively suitable for timber production, thus reducing the number of acres available. While inventoried roadless areas are not suitable for timber production, silvicultural treatments which focus on the removal of generally small diameter timber could occur on an infrequent basis to improve threatened and endangered species habitat or to reduce the risk of uncharacteristic wildfire.

Table B-8. Acres of lands tentatively suitable for timber production (step A of 36 CFR 219.14)

Category	MAL	UMA	WAW
1. NFS lands total acres	1,700,000	1,400,000	1,800,000
a. Non-forest land	215,000	199,000	250,000
b. Potential for irreversible damage	0	0	0
c. No assurance of adequate restocking	139,000	37,000	150,000
d. Forest land withdrawn from production	101,000	347,000	390,000
2. Total unsuitable land	455,000	583,000	790,000
3. Tentatively suitable forest land	1,245,000	817,000	1,010,000

The design of the alternatives further influenced the acres suitable for timber production. Each alternative started with the areas identified as tentatively suitable (see 36 CFR 219.14 timber resource land suitability) for timber production displayed in the table above. Design parameters for each alternative resulted in a subtraction in acres suitable for timber production from the tentatively suitable acres. The main factors/criteria resulting in a change from suitable to unsuitable included changing classification of the following types of areas to unsuitable: old forest, riparian management areas, MA 3A and 3B (backcountry), MA 1B (preliminary administratively recommended wilderness areas), and specially designated areas (research natural areas, municipal watersheds, etc.). Under most of the alternatives, these management areas were not compatible with the definition of timber production (regularly scheduled entries) or objectives of the alternatives.

Vegetation Modeling

Active management treatments for the Blue Mountains DEIS alternatives were simulated using the vegetation dynamics development tool (VDDT) model in 2010 and 2011. The VDDT developed by ESSA Technologies, Ltd., of Vancouver, British Columbia, is a user-friendly computer tool that provides a modeling framework for examining the role of succession, various disturbance agents, and management actions for vegetation (Beukema and Kurz 2000). The VDDT model was designed to project changes in vegetation over time. It allows the projection of the combined effects of multiple factors—such as wildland fire, management treatments, pathogens, growth, and competition—over long time periods. The interaction of these factors can be quite complex and sometimes counterintuitive. The VDDT model provides a flexible framework for understanding this complexity by allowing users to define as many or as few interactions and connections as needed to tease out relationships.

The states within the model are described by combinations of vegetation structure and composition including: potential vegetation type, structural stage, species composition, number of tree layers, stand density (canopy cover), and tree diameter. The combinations of structure and composition for all of the models produced 403 different states. The transitions part of the model describes how vegetation transitions between the different states through time. The transitions are described as either deterministic or probabilistic. Probabilistic transitions are those that occur due to disturbances, such as fire, insects, disease, timber harvest, planting, or thinning. Natural transitions between different states due to succession through time (deterministic transitions) are also included in the model.

Each alternative was run through the VDDT model for 15 simulations, each with a length of 100 years. Vegetation data for each alternative was summarized by potential vegetation group for each national forest at years 20 and 50.

The following table displays descriptions of the seven different VDDT forested models used to model the DEIS alternatives. The seven VDDT models were summarized into three potential vegetation groups: cold upland forest (UF), moist upland forest, and dry upland forest.

Table B-9. VDDT model descriptions

VDDT Model	Potential Vegetation Group	Model Description
SW	Cold UF	Whitebark pine forest
CD	Cold UF	Cold dry forest (subalpine, spruce, LP)
CM	Moist UF	Moist grand fir, spruce, lodgepole, larch
DG	Dry UF	Dry grand fir forest
DD	Dry UF	Dry Douglas-fir forest
DP	Dry UF	Dry ponderosa pine forest
XP	Dry UF	Hot/dry ponderosa pine

The modeling landscape (forested environment) was further broken into four VDDT model groups in order to allocate different amounts of treatments based on the design of the DEIS alternatives. The VDDT model groups were based on a combination of the management areas in each alternative, and levels and types of treatment assumptions for each alternative (see following table). Each of the VDDT models in the previous table was included in one of the VDDT model groups in the following table. Into which model group a particular piece of land fell, as well as the percent of treatment, varied by alternative.

Table B-10. VDDT model groups

VDDT Model Group	Primary Management Area or Vegetation Type	Percent of EIS Alternative Harvest Acres Allocated to the Group
Wilderness areas	MA 1 (wilderness areas)	Zero
Minimal management	MA 3A and 3B (backcountry) and MA 2B (RNAs)	1%
Low level management	MA 2s (special areas), MA 4B Old Forest, and MA 4C Riparian Management Areas	10-20%
Active areas	General forest outside of old forest, MA 2s, and riparian areas	80-90%

In addition to the level of harvest within each VDDT model group, assumptions were made about the allocation of treatments between each of the VDDT potential vegetation groups. The following table displays the distribution of treatments between the cold, moist, and dry upland forest potential vegetation groups. The majority of treatments would occur in the dry upland forest potential vegetation group. The dry upland forest potential vegetation group exhibits the greatest degree of departure from the HRV/desired conditions. However, treatments would also occur in the moist and cold upland forest potential vegetation groups.

Table B-11. Treatment distribution by potential vegetation group (percent)

VDDT Potential Vegetation Group	Treatment Distribution between Potential Vegetation Group s
Cold UF	5-10%
Moist UF	10-30%
Dry UF	60-90%

All of the treatments (harvesting, fire, planting, fuels treatments) in the model are assumed to follow the following minimum management requirements (36CFR 219.27). Minimum management requirements (MMR) are defined as, "The minimum specific management requirements to be met in accomplishing goals and objectives for the National Forest System." The requirements guide the development, analysis, approval, implementation, monitoring and evaluation of forest plans. The following broad items are discussed in section 219.27 of the 1982 planning rule:

a. **Resource protection** - This includes conserving soil and water resources, providing for diversity of plant and animal communities, and providing for viable populations and habitat for vertebrate species.

b. **Vegetation manipulation** - This includes requirements for adequate restocking, multiple use goals, and avoiding permanent impairment of productivity of the land.

c. **Silvicultural practices** - This includes provisions for harvesting on lands not suited for timber production only to protect other multiple-use values, adequately re-stocking stands within 5 years of final harvest, and using treatments to prevent potentially damaging population increases of pests.

d. **Even-aged management** - This includes provisions for management-created opening size and design elements.

e. **Riparian areas** - Management practices should not cause detrimental changes in water temperature, chemical composition, blockages, or sediment.

f. **Soil and water** - Conservation of soil and water resources shall be guided by official technical handbooks.

g. **Diversity** - Management prescriptions shall preserve and enhance the diversity of plant and animal communities as compared to the natural forest condition, except as needed to meet overall multiple-use objectives.

The Blue Mountains Forest Plan Revision analysis assumptions were guided by:

- Preliminary analysis of existing conditions in the Blue Mountains, as compared to historical reference conditions (HRV) and draft desired conditions.
- Draft wildlife viability/diversity modeling results.
- Recommendations and conclusions from the Interior Columbia Basin Ecosystem Management Project (current scientific information).
- Draft process and recommendations from the regional aquatic and riparian conservation strategy.
- Lessons learned from Eastside Screens.

Because of a deficit of old forest structure in the Blue Mountains and viability concerns for species that depend on that resource, even-aged regeneration harvests would not occur within current old forest stands, and only minimal harvest of trees 21 inches d.b.h. and greater was assumed. Under alternatives B, E, and F, all old forest stands would be considered unsuitable for timber production, but still available for harvest to meet objectives other than timber production. With these alternatives, old forest stands could receive treatments to improve ecological resiliency, forest structure, species composition, or other desired conditions. Under alternative D, old forest would be considered suitable for timber production. With alternative C, old forest

stands would be considered unsuitable for timber production and timber harvest; silvicultural treatments in old forest would be limited, consisting mostly of thinning trees smaller than 8 inches d.b.h.

To protect those wildlife species needing solitude, all areas within the inventory meeting the criteria for potential wilderness area designation were identified as unsuitable for timber production and included in the minimal management VDDT model group. Minimal harvest would occur within these areas and no new roads would be built. Harvest would be allowed if used to meet primary objectives other than timber production.

Resource protection/soil and water/vegetation manipulation/silvicultural practices: To protect soil and water resources, no timber harvest would be scheduled within areas determined to be unsuitable for timber production due to concerns about sensitive soils or difficulty regenerating sites within five years.

Other treatment assumptions or highlights between alternatives include:

- Even-aged regeneration harvests (clearcut, shelterwood, and seed tree) would not occur in old forest (allocated or unallocated to a management area), regardless of the VDDT model group in which old forest occurs.
- Even-aged regeneration harvests would only occur in the active forest VDDT model group.
- Burning and harvesting treatments would improve ecological resiliency by favoring early seral species, such as ponderosa pine and western larch, by decreasing stand densities where and as needed, by decreasing the abundance of multi-layered stands on the landscape, and by increasing the percent of the landscape in larger-diameter stands.
- Under alternative A, regeneration harvests would be less than 5 percent of the total acres harvested.
- Under alternatives B, C, D, E, and F, regeneration harvests would increase to approximately 20 to 30 percent of the total acres harvested.
- Under alternative C, all old forest and riparian areas would be placed in the minimal level VDDT model group. However, some understory thinning of trees generally less than 8 inches in diameter would be expected to occur. Additionally, wildland fire would still occur in those areas.

Treatments were prioritized by the following areas:

- Priority/key watersheds (based on ARCS modeling)
- Wildland-urban interface
- Dry upland forest potential vegetation group (or areas most departed from the HRV/desired conditions)
- Areas with established road systems (primarily within MA 4A General Forest)

Areas where multiple factors overlap are a higher priority than those with only a single factor. Depending on cost sharing or other factors, lower priority work may still occur before higher priority work. This prioritization also recognizes the need for maintenance activities to prevent areas from becoming departed from the desired conditions and then needing more extensive restoration treatments.

A primary assumption for active restoration is that activities will occur in areas with established road systems (primarily within MA 4 General Forest). Areas where multiple factors overlap are a higher priority than those with only a single factor. Depending on cost sharing or other factors, lower priority work may still occur before higher priority work. This prioritization also recognizes the need for maintenance activities to prevent areas from becoming departed and then needing more expensive restoration treatments.

Historical Range of Variability (HRV)

Reference conditions for forested vegetation were established using the HRV based on the time period prior to Euro-American settlement (Morgan et al. 1994). Estimates of the HRV (circa 1860) for forested structural stages, species composition, and stand density were developed for this analysis in 2007 through modeling using the Vegetation Dynamics Development Tool (VDDT). VDDT (Beukema et al., 2003) was used to model historic conditions for seven dominant types of forested vegetation occurring within the Blue Mountains. The states within the model are described by combinations of vegetation structure and composition including: structural stage, species composition, number of tree layers, stand density (canopy cover), and tree diameter. The combinations of structure and composition for all of the models produced 403 different states. The transitions part of the model describes how vegetation transitions between the different states through time. The transitions are described as either deterministic or probabilistic. Deterministic transitions are those that occur due to vegetation growth over time. Probabilistic transitions are those that occur due to disturbances, such as fire, insects, and disease. Probabilities and time intervals for the probabilistic transitions were developed through literature searches, expert opinion, and current vegetation survey (CVS) data modeled in the Forest Vegetation Simulator (FVS). Results were summarized for 30 different modeling simulations for years 200-500. The mean value for the 300-year time period was calculated. HRV was calculated as two standard deviations around the mean. Models were summarized into three potential vegetation groups (cold, moist, and dry upland forest) for the purpose of developing the forest plan and effects analysis. The analysis area encompasses approximately 5.4 million acres of land managed by the U.S. Forest Service. The models were run on 4.3 million acres of forested land within the Malheur, Umatilla, and Wallowa-Whitman National Forests. Initial landscape conditions were developed from the Tri-forest existing vegetation layer. Other VDDT models (non-conifer) were developed for the 1.1 million acres of non-conifer lands.

The VDDT models that were used initially were originally developed as a part of the integrated analysis of landscape management scenarios (INLAS) project in the upper Grande Ronde River Subbasin in the late 1990s (Hemstrom et al. 2007). In addition to the 5 models developed as a part of INLAS, two additional models were developed to better describe the full range of forested environments in the Blue Mountains. The models were built around potential vegetation groups found in the Blue Mountains (Powell et al. 2007). The potential vegetation groups are aggregations of plant communities and plant associations as described by Johnson 1987 and 1992. The INLAS VDDT models, which were used both for future projections and estimating HRV, were modified into models that were strictly used for estimating HRV.

The VDDT models were run for 500 years with 30 different simulations (Monte Carlo). The output generally stabilized after 200 to 400 years. We analyzed the output from year 200 to year 500 to develop our ranges of HRV. Results were summarized for 30 different modeling simulations for years 200-500. The mean value, as well as standard deviations, were calculated for each of the 403 states for the 300-year time period. The HRV was calculated as two standard deviations around the mean. A database of the output was setup so that we could summarize the

output for any different combination of structure class that occurred in the data. Models were summarized into three potential vegetation groups (cold, moist, and dry upland forest) for the purpose of developing the forest plan and effects analysis.

The VDDT reference conditions/HRV were used as the primary basis for developing the desired conditions. Broad-scale assessments completed for the Blue Mountains physiographic province and the interior Columbia River basin suggest that upland forest ecosystems could be characterized as healthy, sustainable, and resilient if three of their ecosystem components – species composition, forest structure, and tree density – are within the HRV (Caraher et al. 1992, Gast et al. 1991, Lehmkuhl et al. 1994, Quigley et al. 1996, USDA Forest Service 2002). The underlying assumption of this goal is that ecosystems are most resilient and resistant to disturbance, including climate change, when they exist in a condition closest to that under which they evolved (Morgan et al. 1994). The HRV for forested structural stages, species composition, and stand density was used as the desired conditions for this analysis in order to create and/or maintain forest conditions that more closely resemble the historical conditions that existed prior to interruption of the historical fire regimes. By restoring and/or maintaining the historical forest structure, density, and species compositions that evolved under the historical fire regimes, forest health, sustainability, and ecological resiliency would be improved across the landscape.

Predicted Harvest Levels

The VDDT volume coefficients were applied against the VDDT harvest acres to generate a total volume estimate. The volume coefficients were applied to lands that are suitable for timber production as well as those lands unsuited for timber production but available for timber harvest. The harvest volume estimates were based on the existing forest inventory (CVS plots) data, along with assumptions of how much of the existing volume would be removed for each treatment type. It was assumed that the bulk of the volume removed would be less than 21 inches d.b.h. (we followed the proposed action guideline/standard for harvesting large trees) and follow local utilization standards. There were 403 possible VDDT classes (combination of structural stage and cover class/species composition) and 8 different harvest treatments. Out of the 403 possible classes in VDDT, approximately 250 were represented in the inventory data. This generated approximately 2,000 different combinations of VDDT classes and prescription types with enough data to generate a potential harvest volume. Because of the large number of possible combinations of VDDT classes and prescription types, and the limited number of inventory plots, we only calculated harvest volumes for the Blues as a whole, and did not calculate separate coefficients for each forest. The CVS inventory based estimates of potential harvest volume were compared to actual harvest volumes based on recent timber sales in the Blue Mountains to calibrate the final result. The summary of the predicted harvest volume for each combination of VDDT class and prescription type is in the analysis file. Each combination includes an estimate of cubic feet, board feet, and biomass per acre. The treatment types were combined in a database with the 403 VDDT classes to create a table with 1,989 possible combinations. An average estimated harvest volume was calculated for each state class.

Allowable Sale Quantity

The allowable sale quantity (ASQ) is the upper limit of the amount of timber volume potentially available for harvest on forestlands suitable for timber production during a specified time period, usually a decade, while moving the landscape towards the desired conditions and while meeting other planning rule requirements. This volume is not a guaranteed harvest volume. Allowable sale quantity is the maximum amount of volume potentially available on timber suitable lands

unconstrained by budget. The actual volume offered would be the aggregate of individual project proposals and would be dependent upon a number of factors, including annual budget and organizational capabilities. Actual volumes offered may also include volumes harvested from lands unsuitable for timber production but available for timber harvest, such as riparian management areas and old forest. Allowable sale quantity volume is also described as chargeable volume because it would be applied toward the decadal allowable sale quantity.

Allowable sale quantity includes only those volumes that meet utilization standards and that would be removed from lands suitable for timber production. The calculation of allowable sale quantity assumed any restrictions associated with the current landscape condition. Volume not in the allowable sale quantity includes unsound material, salvageable dead logs (unless included in yield tables), fuelwood, or any volume generated from harvest activities within unsuitable forestland. Yield tables were developed using the forest vegetation simulator (FVS), (Wykoff 1986) and VDDT. Yields were assigned based on a combination of vegetation state class (tree size class and canopy cover) and type of treatment (e.g., commercial thin, selection, and regeneration harvest). Total volume estimates were generated for each alternative by multiplying the total acres treated with a particular prescription, times the yield for a particular vegetation state class.

The base schedule of treatment activities in the model reflects the intensities of management and the degree of timber utilization consistent with the goals, assumptions, and standards contained or used in development of a proposed alternative. The base schedule is a timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade, and that this planned sale and harvest for any decade is not greater than the long-term sustained yield capacity (see following section). This definition expresses the principle of nondeclining flow. In addition to the long-term sustained yield capacity requirements, the first decade allowable sale quantity must meet the nondeclining flow requirements unless departure from the base schedule is determined to be warranted. The need for considering departures has not been identified at this time, so all of the alternatives would be consistent with the nondeclining flow requirements.

Wood product yields from suitable forestlands likely to result from an alternative management strategy depend on several factors, including the mix of allocations, the respective management emphasis, and associated forested vegetation desired conditions.

The VDDT model was used to estimate allowable sale quantity for each of the alternatives based on the assumptions discussed. As a starting point, the treatment acres from the benchmark analysis (nondeclining flow option) were used for the VDDT model. VDDT was run without consideration for budget, but with the same species viability and other considerations as required in each EIS alternative. The starting point treatment acres for each alternative were scaled to be the same proportion as the benchmark treatment acres relative to the benchmark suitable acres. The VDDT model was run for at least 5 decades to demonstrate compliance with the nondeclining flow requirement. The current VDDT model was used to run each alternative, including limitations on even-aged regeneration in old forest. The allowable sale quantity volume was calculated by summing the total VDDT calculated acres of each harvest type within each VDDT state class for the first decade multiplied by the allowable sale quantity yield table volume per acre for each combination of treatment type and VDDT state class. The VDDT output was evaluated for achievement of each of the alternatives' set of desired conditions, harvest volumes, and consistency with nondeclining flow.

Each allowable sale quantity run was completed using the same VDDT model that was used for each EIS alternative. Each allowable sale quantity run had 15 simulations for 5 decades.

Long-term Sustained Yield Capacity

Long-term sustained yield capacity is the maximum amount of timber volume that can be sustainably harvested on lands suitable for timber production once the desired future conditions have been achieved. Long-term sustained yield capacity was summarized for the future time period of year 200 to 300. Generally, long-term sustained yield capacity is equivalent to annual increment. In order for yield or timber harvest to be sustainable in the long term, annual yield or harvest would be equivalent to annual growth. In plain language, once desired conditions are achieved, harvest would not exceed growth so that desired conditions would be maintained over time. Long-term sustained yield capacity is calculated based on the determination of yield by prescription from regenerated stands, including, where appropriate, intermediate yields selected in the solution for a specific alternative. Calculations of long-term sustained yield capacity were not constrained by budget.

The VDDT model was used to estimate the long-term sustained yield capacity. Each long-term sustained yield capacity run was competed using the same VDDT model that was used for each EIS alternative. The acres from the benchmark analysis (nondeclining flow option) were used as a starting point. The VDDT model used in the benchmark model, with associated assumptions for level and types of treatments, was also used in the modeling of long-term sustained yield capacity. Each long-term sustained yield capacity run had 15 simulations for 30 decades. The VDDT model was run for at least 300 years to simulate sustainability over a rotation. The output was evaluated for achievement of desired conditions and sustainability and rerun as needed. Maintenance of desired landscape composition and level of harvest was also evaluated. The final acre output for each treatment type in each VDDT state class was linked to the long-term sustained yield capacity volume yield table through the unique combination of VDDT state class and treatment type. The volumes were accumulated over the period of time from year 200 to 300. This was translated into an average per acre per year volume. The output VDDT structure class distribution (landscape composition) was then summarized for year 200 to 300.

Forested Species Composition

Shade tolerance is a relative measure of a species' ability to grow and regenerate in the shade, in comparison to other tree species. In general, tree species that are more shade intolerant are also more fire tolerant, making them better adapted to low and mixed-severity fire. These species tend to have thicker bark, which insulates the cambium from heat and results in decreased fire-related mortality. Shade intolerant tree species also self-prune their lower branches, which increases their crown base height, increases the wind speed required to initiate crown fire, decreases the likelihood of a ground fire transitioning to a crown fire, and decreases fire hazard. Shade intolerant tree species such as ponderosa pine are also more drought tolerant. Species that better withstand drought and moisture stress are also less susceptible to attack by bark beetles because of natural defense mechanisms, such as the production of pitch. Tree species that are more shade intolerant include ponderosa pine, western larch, western white pine, and whitebark pine. Tree species that are relatively shade tolerant include Engelmann spruce, subalpine fir, and grand fir. Douglas-fir is intermediate along the shade tolerance ranking continuum. Because shade tolerance is a relative ranking, Douglas-fir may be included in either a shade tolerant or a mixed tolerance class, depending on the other tree species used in comparison.

The analysis of species composition for forested vegetation was conducted using the current vegetation survey (CVS) points. Each of the CVS points was classified into a species composition class of shade intolerant, mixed tolerance, and shade tolerant. The species composition was

determined by the dominant tree species based on basal area (see analysis file for a complete definition of species composition classes).

Table B-12 displays a crosswalk of cover type to species composition/shade tolerance classes by potential vegetation group. Because shade tolerance is a relative measure, a species may have been considered shade tolerant in one potential vegetation group but mixed tolerance in another potential vegetation group.

In the dry upland forest potential vegetation group, the shade intolerant species classes included ponderosa pine or western larch, while the shade tolerant species classes included grand fir or Douglas-fir.

In the moist upland forest potential vegetation group, the shade intolerant species classes included western larch, western white pine, or lodgepole pine, while the shade tolerant species classes included Engelmann spruce, grand fir, or subalpine fir. In the moist upland forest potential vegetation group, the mixed tolerance species classes included Douglas-fir.

In the cold upland forest potential vegetation group, the shade intolerant species classes included whitebark pine, lodgepole pine, western white pine, or western larch, while the shade tolerant species classes included subalpine fir or Engelmann spruce. In the cold upland forest potential vegetation group, the mixed tolerance species classes included Douglas-fir.

Table B-12. Crosswalk of cover type to species composition/shade tolerance class

Potential Vegetation Group	Cover type	Species composition/ shade tolerance class
Cold forest	Engelmann spruce	Shade tolerant
Cold forest	Subalpine fir	Shade tolerant
Cold forest	Douglas-fir	Mixed tolerance
Cold forest	Mountain hemlock	Shade tolerant
Cold forest	Whitebark pine	Shade intolerant
Cold forest	Lodgepole pine	Shade intolerant
Cold forest	Western larch	Shade intolerant
Cold forest	Western white pine	Shade intolerant
Moist forest	Douglas-fir	Mixed tolerance
Moist forest	Grand fir	Shade tolerant
Moist forest	Engelmann spruce	Shade tolerant
Moist forest	Subalpine fir	Shade tolerant
Moist forest	Western larch	Shade intolerant
Moist forest	Lodgepole pine	Shade intolerant
Moist forest	Western white pine	Shade intolerant
Dry forest	Douglas-fir	Shade tolerant
Dry forest	Ponderosa pine	Shade intolerant
Dry forest	Grand fir	Shade tolerant
Dry forest	Western larch	Shade intolerant
Dry forest	other	Shade tolerant

Fire Regime Condition Class Vegetation Succession Class Methodology

Vegetation data for each vegetation polygon was then classified into one of the five LANDFIRE succession classes (see table B-13) using a combination of d.b.h. and canopy cover for each potential vegetation group. Classification parameters for vegetation and fuel classes were based on those in the Rapid Assessment Reference Condition Model documentation for each potential vegetation group. In general, canopy cover within the dry upland forest potential vegetation group greater than 40 percent was classified as closed canopy, while canopy cover within the moist and cold upland forest potential vegetation groups greater than 60 percent canopy cover were classified as closed canopy.

Table B-13. Fire regime condition class vegetation succession class

Class	Description	Crosswalk to Blue Mountains Structural Stages*
A	Early seral (less than 5 inches d.b.h.)	SI
B	Mid seral closed (5-20 inches d.b.h. and closed canopy)	SE, UR
C	Mid seral open (5-20 inches d.b.h. and open canopy)	SE, UR
D	Late seral open (greater than 20 inches d.b.h. and open canopy)	OFSS, OFMS
E	Late seral closed (greater than 20 inches d.b.h. and closed canopy)	OFSS, OFMS

*SI – stand initiation; SE – stem exclusion; UR – understory regeneration; OFSS – old forest single story; OFMS – old forest multi-story

New HRV values for succession class were calculated for the Blue Mountains forest plan revision from 2005 to 2007. The VDDT was used to model historical conditions for dominant types of forested vegetation occurring within the Blue Mountains (Hemstrom 2007).

Active management treatments for the Blue Mountains DEIS alternatives were simulated using the VDDT model. The model contains a variety of forested vegetation states (combinations of potential vegetation type, size, species composition, and density) along with different probabilistic transitions (timber harvest, prescribed fire, planting, precommercial thinning, wildfire, and insect/disease) that cause changes between the different states. Natural transitions between different states due to succession through time (deterministic transitions) are also included in the model.

Table B-14 displays the seven different VDDT forested models used to model the DEIS alternatives. The seven VDDT models were summarized into three potential vegetation groups: cold upland forest, moist upland forest, and dry upland forest.

The modeling landscape (forested environment) was further broken into four VDDT model groups in order to allocate different amounts of treatments based on the design of the DEIS alternatives. The VDDT model groups were based on a combination of the management areas in each alternative, and levels and types of treatment assumptions for each alternative (see table B-15). Each of the VDDT models in table B-14 was included in the VDDT model groups in table B-15. Into which model group a particular piece of land fell, as well as the percent of treatment, varied by alternative.

Table B-14. VDDT models descriptions

VDDT Model	Potential Vegetation Group	Model Description
SW	Cold upland forest	Whitebark pine forest
CD	Cold upland forest	Cold dry forest (subalpine, spruce, LP)
CM	Moist upland forest	Moist grand fir, spruce, lodgepole, larch
DG	Dry upland forest	Dry grand fir forest
DD	Dry upland forest	Dry Douglas-fir forest
DP	Dry upland forest	Dry ponderosa pine forest
XP	Dry upland forest	Hot/dry ponderosa pine

Table B-15. VDDT model groups

VDDT Model Group	Primary Management Area or Vegetation Type	Percent of EIS Alternative Harvest Acres Allocated to the Group
Wilderness areas	MA 1 (wilderness areas)	Zero
Minimal management	MA 3A and 3B (backcountry) and MA 2B (RNAs)	1%
Low level management	MA 2s (special areas), MA 4B Old Forest, and MA 4C Riparian Management Areas	10-20%
Active areas	General forest outside of old forest, MA 2s, and riparian areas	80-90%

In addition to the level of harvest within each VDDT model group, assumptions were made about the allocation of treatments between each of the VDDT potential vegetation groups. Table B-16 displays the distribution of treatments between the cold, moist, and dry upland forest potential vegetation groups. The majority of treatments would occur in the dry upland forest potential vegetation group. The dry upland forest potential vegetation group exhibits the greatest degree of departure from the HRV/desired conditions. However, treatments would also occur in the moist and cold upland forest potential vegetation groups.

Table B-16. Treatment distribution by potential vegetation group (percent)

VDDT Potential Vegetation Group	Treatment Distribution between Potential Vegetation Groups
Cold upland forest	5-10%
Moist upland forest	10-30%
Dry upland forest	60-90%

All of the treatments (harvesting, fire, planting, fuels treatments) in the model are assumed to follow the following minimum management requirements (36CFR 219.27). Minimum management requirements are defined as, “The minimum specific management requirements to be met in accomplishing goals and objectives for the National Forest System.” The requirements guide the development, analysis, approval, implementation, monitoring and evaluation of forest plans. The following broad items are discussed in section 219.27 of the 1982 planning rule:

a. **Resource protection** - This includes conserving soil and water resources, providing for diversity of plant and animal communities, and providing for viable populations and habitat for vertebrate species.

b. **Vegetation manipulation** - This includes requirements for adequate restocking, multiple use goals, and avoiding permanent impairment of productivity of the land.

c. **Silvicultural practices** - This includes provisions for harvesting on lands not suited for timber production only to protect other multiple-use values, adequately re-stocking stands within 5 years of final harvest, and using treatments to prevent potentially damaging population increases of pests.

d. **Even-aged management** - This includes provisions for management-created opening size and design elements.

e. **Riparian areas** - Management practices should not cause detrimental changes in water temperature, chemical composition, blockages, or sediment.

f. **Soil and water** - Conservation of soil and water resources shall be guided by official technical handbooks.

g. **Diversity** - Management prescriptions shall preserve and enhance the diversity of plant and animal communities as compared to the natural forest condition, except as needed to meet overall multiple-use objectives.

The Blue Mountains forest plan revision analysis assumptions were guided by:

- Preliminary analysis of existing conditions in the Blue Mountains, as compared to the HRV or other historical/reference conditions and draft desired conditions.
- Draft wildlife viability/diversity modeling results.
- Recommendations and conclusions from the Interior Columbia Basin Ecosystem Management Project (current scientific information).
- Draft process and recommendations from the regional aquatic and riparian conservation strategy.
- Lessons learned from Eastside Screens.

Wildlife

The methods used to assess terrestrial wildlife species are described in general. The methods section of the assessment of the current condition and the proposed action (alternative B) for the Blue Mountains forest plan revision (Wales et al. 2011) discloses further details of the models developed, the processes used to run them, and the analysis methods conducted to analyze the data.

Wisdom et al. (2000) conducted a broad scale analysis of the Interior Columbia Basin to develop an ecosystem-based strategy for managing the 145 million acres within the basin. They identified the habitat requirements for a wide variety of terrestrial species and referred to these requirements as source habitats, which they defined as those macro-vegetative characteristics (cover types and structural stages) that contribute to stationary or positive population growth for a species within its distributional range. Source habitats contribute to source environments, which represent the composite of all environmental conditions that result in stationary or positive population growth

in a specified area and within a specified time range (Raphael et al. 2001, Wisdom et al. 2000). The concept of source habitat is used in this analysis.

Management alternatives and their associated activities may have many effects, either positive or negative, on terrestrial wildlife habitat and species. Viability is a concern for all terrestrial species, but particularly for threatened, endangered, proposed, or sensitive species for which habitat and/or populations are suspected or known to be in decline. Although forest plans have only indirect effects (project implementation at the site-specific level has direct effects), the anticipated results of implementing the various management alternatives to most species in this analysis is measured by changes to habitat, habitat trends, and/or risk factors. For selected species, effects are displayed using outputs from modeling based on anticipated changes to potential vegetation groups or cover types and some combination of the following vegetation components:

- Size class
- Density
- Species composition
- Stand structure
- Snags and coarse woody debris (CWD)

During the reproductive and wintering portions of their life cycles, some wildlife species are sensitive to nearby human activities. Human activities, whether intentional or unintentional, can increase stress to some species and may reduce their reproductive success. Effects to species in this analysis are measured by changes in disruption or vulnerability as follows (Wisdom et al. 2000):

- Risk of human-related disruption to wide-ranging carnivores and other species
- Roadless areas and road densities related to road construction and decommissioning
- Road densities related to loss of snag and down wood habitat

Human activity in the case of bighorn sheep increases the risk of sheep contracting a disease. This species has no ESA status; however, the U.S. Fish and Wildlife Service have expressed concern about their population status and viability (Wisdom et al. 2000). Populations of this species were once common in suitable habitat but have declined during the last 150 years, and speculation for the cause points to disease transmission from domestic sheep. To determine their vulnerability, a combination of the following will be analyzed:

- Identified occupied bighorn sheep habitats (to infer bighorn sheep core herd home ranges)
- Acres suitable for domestic sheep grazing within bighorn sheep source habitat
- Distance of permitted sheep from bighorn sheep core herd home ranges
- Permeability of the landscape for travel by bighorn sheep
- Likelihood of contact between domestic sheep and bighorn sheep based on spatial and temporal overlap between grazing allotments and core herd home ranges

Habitats in the Blue Mountains were identified and summarized into habitat families as described in Suring et al. (2011). For each habitat family, focal species were identified to represent landscape attributes and functions (see the “Focal Species” section in chapter 3). A habitat family is a collection of focal species that share similarities in source habitats, with the similarities

arranged along major vegetative themes. The coarse filter analysis detected dominant trends common to most species in each habitat family (e.g., departure from HRV).

Species of conservation concern were identified using previous species assessments for the Blue Mountains and Columbia Basin (Lehmkuhl et al. 1997, Raphael et al. 2001, Wisdom et al. 2000), Nature Serve Heritage rankings (Andelman et al. 2004), Partners in Flight rankings (Carter et al. 2000), the Regional Forester's Sensitive Species List for Region 6, and state lists for Oregon and Washington. Terrestrial species were grouped by habitat associations, risks and threats were identified for each group, and a representative species (focal species) was selected for each group.

Both coarse and fine filter approaches were used to determine if the needs for focal wildlife species and their habitat would be met. The intent is to select a set of species that represent the full array of wildlife responses to conditions projected for management alternatives. A coarse filter approach assesses the conservation value of ecosystems and landscapes. The purpose of this approach is to maintain and, where needed, restore representative ecosystems and their inherent disturbance processes in order to conserve the majority of species without needing to consider them individually. The coarse filter approach compares habitat families and desired vegetative conditions described in the proposed revised forest plan to determine how well source habitats at the family level would be met.

A fine filter approach uses focal species within the habitat families to assess the ecological functions and habitat elements important to individual wildlife species and validates whether the coarse filter approach would accommodate the habitat needs of all species or if additional management direction is needed. By using this coarse and fine filter approach, species, or groups of species (i.e., habitat families), that require management attention would be less likely to be overlooked.

A number of authors have raised concerns about the conceptual, theoretical, and practical basis of taxon-based surrogate schemes, such as focal species (Andelman and Fagan 2000, Landres et al. 1988, Lindenmayer et al. 2000, Simberloff 1998). Still, it is an approach that has been and still is commonly used (Carignan and Villard 2002, Carroll et al. 2001, Roberge and Angelstam 2004, USDA and USDI 2000, Watson et al. 2001).

Lindenmayer et al. (2002) were concerned that the focal species approach would be the only approach used to guide landscape restoration, and. pointed out some of the limitations of the focal species concept, including that the approach is data intensive, that scientific understanding is lacking for many species, and that there is a lack of testing to validate the approach. However, the focal species approach has recently been tested for some wide-ranging carnivores (Carroll et al. 2001) and birds (Watson et al. 2001) with promising results. Roberge and Angelstam (2004) recently reviewed the umbrella species concept and concluded that the focal species approach seems the most promising because it provides a systematic procedure for selection of umbrella species. Compared to other approaches, the focal species approach is relatively rigorous way to deal with assessments that involve large numbers of species (Andelman et al. 2001, Roberge and Angelstam 2004).

Assessing the viability of focal species requires the development of a credible analysis processes. The Interior Columbia Basin Ecosystem Management Project (ICBEMP) accomplished this through the use of Bayesian Belief Network (BBN) modeling process (Marcot et al. 2001, Raphael et al. 2001). The BBN combines scientific data with information from expert knowledge and experience to assess viability (Marcot et al. 2001, Marcot et al. 2006, Marcot et al. 2006a, Martin et al. 2005, McCann et al. 2006, Raphael et al. 2001). This is important when trying to

assess a multitude of species, many of which have little or no available empirical data. A BBN is an influence diagram that depicts the relationships among ecological factors, such as habitat and risks. These factors influence the likelihood of the outcome of some parameter(s) of interest, such as forest condition or wildlife species viability (Marcot et al. 2001). This approach provides a conceptual model that outlines the interconnections between ecosystem components and how a species is anticipated to respond to risk factors.

Following the model development guidelines in Marcot et al. (2006), focal species assessment models were developed using the BBN for many of the species. A detailed report (Wales et al. 2011) describing species source habitat, risks and threats to the species, and the various inputs used in the model for each focal species is available from the planning record. Five viability outcomes, A through E, were used to describe the environmental outcomes projected by the models (Raphael et al. 2001).The focal species assessment models produced percent likelihoods that a species would be classified into one of the five viability outcomes. The historical viability outcome and the existing viability outcome were calculated for each species. These viability outcomes were then converted into a current “level of concern” rating of low, moderate, or high based on the primary viability outcome (i.e., outcome 60 percent or greater) for the existing condition compared to historical conditions (Mellen-McLean 2011). Viability outcome scores were also computed for alternative B (the modified proposed action) at year 20 and year 50 for nine focal species (Wales et al. 2011) and then converted to a level of concern rating. A qualitative assessment was then conducted for all other alternatives, comparing the change in habitat and risk factors to either the existing condition or alternative B and assigning a level of concern based on whether the trend in these factors was positive, negative, or stable.

Some species were analyzed to establish historical and existing conditions but for a variety of reasons were not modeled for any alternative (Wales et al. 2011). For example, several species are associated with very limited habitat on National Forest System lands (e.g., northern harrier) or have habitats that have little active management within them (ash-throated flycatcher). There also is a group of species that were not modeled for existing conditions. These species were addressed through a qualitative analysis considering four criteria:

3. Distribution of habitat
4. Amounts of habitat
5. Risk factors
6. Current knowledge of populations

The snag analysis utilizes the concept of tolerance levels from DecAID (Mellen-McLean et al. 2009), a database of deadwood literature. A tolerance level is the specific value at the edge of a tolerance interval. For example, a 30 percent tolerance level for a habitat type of 2.5 snags greater than 10 inches d.b.h./acre means that 30 percent of the landscape would contain densities of these snags up to 2.5/acre. An 80 percent tolerance level of 30 snags greater than 10 inches d.b.h./acre means that 80 percent of the landscape would contain densities of these snags up to 30/acre. Mason and Countryman (2010) conducted a snag analysis using CVS plots, made comparisons with the results from DecAID, and then condensed snag distribution into fewer categories. Based on these condensed categories, a density of 2.5 for snags 20 inches d.b.h. in ponderosa pine that would be in the category of 2 to 4 trees per acre in DecAID will be in the 2 to 6 trees per acre using Mason and Countryman (2010). Both Mason and Countryman (2010) and DecAID used tolerance levels from unharvested inventory plots as a representation of HRV.

Caution should be exercised for those areas where tolerance levels were identified as being zero snags per acre and where the ranges given for current and historical levels start with zero. It is unlikely that a large area of the landscape is devoid of snags due to the various disturbance regimes (fire and insects and disease) that historically were at work. It follows then that where 75 percent of the landscape is identified as being in the range of zero to 2 snags per acre, it should not be interpreted as 75 percent of the landscape has zero snags, but rather that snags exist in low numbers for much of the landscape.

Rocky Mountain elk habitat was analyzed within the Blue Mountains during the 1990 planning effort using a habitat model developed by Thomas et al. (1979, 1988). Though the winter habitat model developed by Thomas et al. (1988) was never intended for application on spring-summer-fall ranges, it has been widely applied on non-winter ranges. Elk management on National Forest System lands has centered on providing hiding and thermal cover (ODFW 1989, Sally 2000, Smith and Long 1987, Thomas et al. 1988, Winn 1985). A large body of research has been conducted during the 27 years since publication of these models and this research needs to be incorporated into a new model. For example, Cook et al. (2005) saw little justification for retaining thermal cover as a primary component of habitat evaluation models for elk, and postulated that it may be time to shift attention towards the relationships between herd productivity and nutrition-based attributes of habitat.

The 1990 forest plans recognize that the Habitat Effectiveness Index (HEI) model was designed for habitat analysis at the subwatershed level or 3,000 to 15,000 acres in size but stated that for "planning purposes and analysis and comparison of alternatives, the HEI has been used to give a forestwide picture of habitat conditions for elk. Forestwide application of the model has masked the more subtle differences between alternatives during the 50 year planning horizon. However, generalized differences between alternatives can be addressed and are discussed below…" (USDA Forest Service 1990). The 1990 forest plans also recognized that the forestwide analysis did not account for the size or distribution of habitat components, but assumed that forage and cover areas were properly distributed throughout the national forest and were of usable size (USDA Forest Service 1990a). All three 1990 forest plans recognized that only those lands that have the potential for active management would be modeled. Since the 1990 forest plans were implemented, the HEI model has gone from being a computer model in DOS (Ager and Hitchcock 1994) to a model in ARCgis. The ARCgis model developed for the national forests in the Blue Mountains was used for this analysis.

Plant Species Diversity, Including Threatened, Endangered, and Sensitive Plants

Threatened and endangered plant species are designated by the US Fish and Wildlife Service and published in the Federal Register. There are two federally threatened plant species: MacFarlane's four-o'clock (*Mirabilis macfarlanei*) and Spalding's catchfly (*Silene spaldingii*). These two species are evaluated separately, with the results of the analysis reported in the EIS. Sensitive plant species are designated by the regional forester. The 2008 Regional Forester's Special Status Species List was the list in effect at the time the analysis of plan components was initiated. To facilitate analysis, sensitive plant species are grouped into habitats following the approach used in the Analysis of Vascular Plants for the Interior Columbia Basin Ecosystem Management Project (Croft et al. 1997). This analysis identified six broad habitat types: alpine, aquatic/riparian, forests, grasslands, rock, and shrublands, which were further subdivided into habitat subgroups based on specific cover types or elevation zones. For this analysis, sensitive plant species were

assigned to one of the six broad habitat types, and then further subdivided if more distinct habitat groups were necessary to analyze forest plan components. This resulted in identifying 14 habitat groups. Table B-17 displays these habitat groups and their corresponding broad habitat type from the Interior Columbia Basin Ecosystem Management Project Analysis of Vascular Plants.

For each habitat group, forest plan components (goals, standards, guidelines and objectives), by alternative, are evaluated for their predicted ability to meet the direction set forth in Sections 219.26 and 219.27 of the 1982 planning rule and in their ability to achieve the desired conditions for federally listed plants and Pacific Northwest Region sensitive plants.

Table B-17. Habitat group for the sensitive plant species analysis

Blue Mountains Forest Plan Revision Group	ICBEMP Vascular Plant Habitat Type
Alpine fellfields and subalpine parkland	Alpine
Conifer forest	Forests
aspen, cottonwood	Forests
Sagebrush shrubland	Shrublands
Basalt lithosol	Shrublands
Grassland	Grasslands
Talus, Cliffs & rock outcrops	Rock
Aquatic	aquatic/riparian
Fen	aquatic/riparian
Seep/spring	aquatic/riparian
Riparian	aquatic/riparian
Intermittent stream	aquatic/riparian
Moist meadow	aquatic/riparian
Wet meadow	aquatic/riparian

Two underlying assumptions are central to the plant assessment process (Holmes, et al. 2009):

1. Diversity objectives will be achieved for all native plant species through ecosystem diversity plan components except for federally listed species and Pacific Northwest Region sensitive species. Species other than federally listed species and Pacific Northwest Region sensitive species have Natureserve global and state ranks which indicate that they are secure or they are demonstrably widespread and abundant.
2. A diversity outcome for any grouping of Pacific Northwest Region sensitive species via stratification on specialized habitats reflects the diversity outcome for each species in that group.

The results of this analysis are found in chapter 3 of the EIS.

Invasive Species

The methodology supports analysis to answer two central questions:

1. Do the alternatives achieve the desired condition?
2. How do the alternatives vary in the degree to which planned activities would create ground disturbances that may favor an introduction or spread of invasive species?

Assumptions:

1. Plan objectives to "reduce current infestations of invasive plant species," as measured in acres, would be funded and achieved.
2. Control measures, whether manual, chemical, or biological control, may need to be applied more than once to invasive plant sites. The percent control, the reduction in the ability of the invasive plant to propagate, is assumed to be 80% (USDA Forest Service 2005, Desser 2006).

Table 362 (chapter 3) displays the average annual acres that have been treated during a three-year period (2009-2011) on the three national forests compared to the acres that would hypothetically need to be treated each year to make progress toward achieving the desired condition for invasive plants containment, control, and eradication. The objectives are for a five-year period because of the time it takes to control invasive plants given the existing soil seed bank, the typical need for retreatment, weather, and funding. The acreage needed to be effectively treated annually in table 362 was adjusted to account for need for retreatment (USDA Forest Service 2005, Desser 2006).

To compare alternatives in the degree to which ground disturbing activities could lead to further introduction and spread of invasive plants, an index was created to display the relative amount of soil disturbing activities (timber harvest and associated actions, fuels reductions, and animal unit months for livestock grazing) for each alternative for each national forest. The index equals the sum of annual projected acres of soil disturbing activities divided by the sum of these values for alternative B. The index value for alternative B is 1. No standard exists for measuring soil disturbance as a predictor of nonnative plant invasion, either as an observable measurable value or as a percent of managed lands. The index serves only to compare alternatives and suggest which alternatives are more or less likely to create conditions favorable to the invasion of nonnative invasive plants.

Recreation

Survey data for Forest Service related recreation were collected and analyzed for the National Visitor Use Monitoring (NVUM) system. Data for the first survey were collected between 2000 and 2003. The second round of National Visitor Use Monitoring data were collected for the three national forests in 2009. The scientists conducting the National Visitor Use Monitoring survey state that comparisons of the first and second round results are not appropriate due to changes in the study protocols. Only round 2 results are presented in table B-18.

Table B-18. Total national forest site visits for 2009

National Forest	Number of Visits
Malheur	261,400
Umatilla	379,800
Wallowa-Whitman	447,400

Special Areas

Wild and Scenic River Analysis Process

The wild and scenic river study process requires a determination to be made regarding a river's eligibility, classification, and suitability. Eligibility and classification represent an inventory of existing conditions. Eligibility is an evaluation of whether a river is free-flowing (without major dams, diversions, or channel modifications) and possesses one or more outstandingly remarkable values. These values should be a unique or exceptional representation for the area studied and must be related to the river or its immediate environment.

As per the Wild and Scenic River Act at 5(d) (1) and Forest Service Manual policy (FSM 1924.03) a systematic inventory was completed on the Malheur, Umatilla, and Wallow-Whitman National Forests. Each forest examined their rivers and streams for eligibility.

Tables B-19, B-20, and table 380 display the miles of designated, eligible, and suitable rivers, respectively, and the length of their classification segments. The management area, however, is measured in acres. The management area extends one-quarter mile from the river on each side for eligible rivers. For designated rivers, the management area boundary was established following formal designation.

Designated Rivers

All of the river segments that have been designated as part of the Wild and Scenic Rivers System under the authority of the Wild and Scenic Rivers Act, as amended (1968) and the Oregon Omnibus River Act (1988) have comprehensive river management plans (CRMP) in the Blue Mountains national forests, with the exception of the Wenaha River. The Forest Service continues work on the environmental impact statement (EIS) for the Wenaha comprehensive river management plan.

Each river's comprehensive river management plan was reviewed for consistency with revised forest plan components, in addition to determining if the comprehensive river management plan direction was protecting the outstandingly remarkable values for each river. The complete review of forest plan components for each river is available in the project record.

In addition, where visitor use management was required to protect outstandingly remarkable values, river managers were consulted to determine if visitation had increased during the life of the comprehensive river management plan. Monitoring records for the 1990 forest plans were consulted for changes in visitation in wild and scenic rivers corridors. No river segments were identified as having increases in visitor use that were impacting outstandingly remarkable values.

Eligible Rivers

The Wild and Scenic River Act provides specific direction in Section 5(d)(1) regarding the identification of potential wild and scenic rivers in Federal agency planning processes. Forest Service policy requires that rivers identified as potential wild and scenic rivers be evaluated as to their eligibility/ineligibility with the finding documented in the forest plan (Land and Resource Management Planning Handbook, Forest Service Handbook 1909.12, Chapter 80 Wild and Scenic River Evaluation).

A river is defined by the Wild and Scenic Rivers Act (P.L. 90-542, as amended) as, "a flowing body of water or estuary or a section, portion, or tributary thereof, including rivers, streams,

creeks, runs, kills, rills, and small lakes." The National Wild and Scenic Rivers System: Guidelines for Eligibility, Classification and Management of River Areas (FR vol. 47, no. 173, 9/7/1982, Interagency Guidelines), also allows the consideration of intermittent rivers as eligible, if the volume of flow is sufficient enough to sustain or complement the outstandingly remarkable values identified within a river segment.

For each ranger district, the Forest Service created an eligibility inventory (located in the project record) as to whether a river is free flowing and possesses one or more outstandingly remarkable value(s). The following eligibility criteria were used to foster greater consistency within the agency and other Federal river-administering agencies. They are intended to set minimum thresholds to establish outstandingly remarkable values and are illustrative and not all-inclusive.

Table B-19. Designated wild and scenic rivers for each national forest

National Forest	River Name	Wild	Scenic	Recreational	Outstanding Remarkable Values
MAL	Malheur River	6.0	6.0	0.0	Scenery, geology, wildlife habitat, history
	North Fork Malheur River	0.0	25.5	0.0	Scenery, geology, wildlife, fisheries
	Totals	6.0	31.5	0.0	
UMA	Wenaha River	18.7	2.7	0.2	Recreation, scenery, wildlife, fisheries
	Grande Ronde River*	17.4	0.0	1.5	Recreation, fisheries, wildlife
	North Fork John Day River*	24.3	10.5	8.9	Scenic, recreation, fisheries, wildlife, cultural
	Totals	60.4	13.2	10.6	
WAW	Eagle Creek	4.0	6.0	17.0	Fish, recreation, scenery, cultural resources, geology/paleontology
	Grande Ronde River*	17.4	0.0	1.5	Recreation, fisheries, wildlife
	Joseph Creek	8.6	0.0	0.0	Scenic, recreation, geology, fish, water quality, wildlife, cultural resources
	Imnaha River	15.0	0.0	0.0	Scenic, recreation, fisheries, wildlife, historic, botanical, cultural resources
	Lostine River	5.0	11.0	0.0	Scenic, recreation, fisheries, wildlife, botanical
	Minam River	39.0	0.0	0.0	Scenic, recreation, geology, fisheries, wildlife
	North Fork John Day River*	3.5	0.0	6.9	Scenic, recreation, fisheries, wildlife, cultural
	North Powder River	0.0	6.0	0.0	Recreation, scenery
	Totals	104.3	23.0	25.4	

* The Grande Ronde and North Fork John Day rivers are listed above for both the Umatilla and Wallowa-Whitman National Forests as administration is shared. Mileage for the North Fork John Day River is divided within the table to reflect the mileage within and administered by each national forest. The Grande Ronde River is part of the administrative boundary between the Umatilla and Wallowa-Whitman National Forests, and the mileage is displayed equally for each of the national forests.

1. **Scenic:** The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions. When analyzing scenic values, additional factors such as seasonal variations in vegetation, scale of cultural modifications, and the length of time negative intrusions are viewed may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment.
2. **Recreational:** Recreational opportunities are, or have the potential to be, unique enough to attract visitors from outside of the region of comparison. Visitors are willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing, hunting, and boating/rafting.
3. **Geological:** The river or the area within the river corridor contains an example(s) of a geologic feature, process, or phenomena that is rare, unusual, or unique to the region of comparison. The feature(s) may be in an unusually active stage of development, represent a "textbook" example and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial and other geologic structures).
4. **Fish:** Fish values may be judged on the relative merits of either fish populations or habitat, or a combination of these river-related conditions.
    a. Populations: The river is nationally or regionally an important producer of resident and/or anadromous fish species. Of particular significance is the presence of wild stocks and/or Federal or state listed or candidate threatened, endangered and sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of outstandingly remarkable.
    b. Habitat: The river provides exceptionally high quality habitat for fish species indigenous to the region of comparison. Of particular significance is habitat for wild stocks and/or Federal or state listed or candidate threatened, endangered and sensitive species. Diversity of habitats is an important consideration and could, in itself, lead to a determination of outstandingly remarkable.
5. **Wildlife:** Wildlife values may be judged on the relative merits of either wildlife populations or habitat, or a combination of these conditions.
    a. Populations: The river or area within the river corridor contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species considered to be unique or populations of Federal or state listed or candidate, threatened, endangered, and sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of outstandingly remarkable.
    b. Habitat: The river or area within the river corridor provides exceptionally high quality habitat for wildlife of national or regional significance, or may provide unique habitat or a critical link in habitat conditions for Federal or state listed or candidate threatened, endangered and sensitive species. Contiguous habitat conditions are such that the biological needs of the species are met. Diversity of habitats is an important consideration and could, in itself, lead to a determination of outstandingly remarkable.
6. **Cultural:** The river, or area within the river corridor, contains important evidence of occupation or use by humans. Sites may have national or regional importance for interpreting history or prehistory.

a. Prehistoric: The river or area within the river corridor contains a site(s) where there is evidence of occupation or use by Native Americans. Sites must have rare or unusual characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes.

b. Historic: The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare, unusual or one-of-kind in the region. A historic site(s) and/or feature(s) in most cases are 50 years old or older.

7. **Other Values:** While no specific national evaluation guidelines have been developed for the "other similar values" category, assessments of additional river-related values consistent with the foregoing guidance may be developed, including, but not limited to, hydrologic, paleontological, ecologic and botanic resources.

The potential classification of a river found to be eligible is based on the condition of the river and the adjacent lands as they currently exist. The Wild and Scenic River Act specifies three classification categories for eligible rivers: wild rivers, scenic rivers, and recreational rivers. Section 2(b) of the Wild and Scenic River Act defines each category (see "Affected Environment – MA 2A Designated, Eligible, and Suitable Wild and Scenic Rivers" section in chapter 3 of the draft EIS for definitions of each classification). Table B-20 lists the eligible wild and scenic rivers for each national forest.

Suitable Rivers

The final step in the river assessment process is the determination of suitability. This step provides the basis for the determination of which rivers to recommend to Congress as components of the National Wild and Scenic Rivers System. Suitability addresses two questions:

1. What is the best use of the river corridor? Should the outstanding values be fully protected, or are one or more other uses important enough to warrant not maintaining the river's free-flow or fully protecting identified values?
2. Assuming the values are to be protected, what is the best method to protect the river corridor? Wild and Scenic River designation is one approach. In answering this question, the benefits and impacts of Wild and Scenic River designation must be evaluated and alternative protection methods considered.

A suitability study to assess the potential inclusion of a river within the wild and scenic river designation is conducted and considers the following questions:

- Should the river's free-flowing character, water quality, and outstandingly remarkable values be protected; or are one or more other uses important enough to warrant doing otherwise?
- Will the river's free-flowing character, water quality, and outstandingly remarkable values be protected through designation? Is it the best method for protecting the river corridor? In answering these questions, the benefits and impacts of Wild and Scenic rivers designation must be evaluated and alternative protection methods considered.
- Is there a demonstrated commitment to protect the river by any nonfederal entities that may be partially responsible for implementing protective management?

Table B-20. Eligible wild and scenic rivers for each national forest

National Forest	River Name	Wild	Scenic	Recreational	Outstanding Remarkable Values
MAL	Lake Creek	3.3	0.0	0.0	Scenery
UMA	Bear Creek	4.6	0.0	0.0	Fisheries
	Butte-West Fork Creek	13.9	0.0	0.0	Scenery, fisheries
	Desolation Creek	0.0	0.0	21.4	Recreation, botanical
	Lookingglass Creek	8.7	0.0	0.0	Fisheries, hydrological
	North Fork Desolation Creek	0.0	0.0	6.8	Botanical
	North and South Fork Wenaha River	26.3	0.0	0.0	Scenery, fisheries, botanical
	Sheep Creek (in Washington)	0.0	0.0	0.5	Scenery, fisheries, botanical
	South Fork Desolation Creek	8.9	0.0	0.0	Fisheries, botanical
	Tucannon River	9.1	4.6	8.7	Recreation, fisheries, cultural, botanical
	Totals	**71.5**	**4.6**	**37.4**	
WAW	Big Sheep Creek	10.0		39.1	Recreation, fisheries, cultural
	Dutch Flat Creek/Van Patton Creek*	5.3	0.0	0.0	Scenery, recreation, geological, hydrological, botanical
	East Eagle Creek*	9.0	2.1	4.5	Scenery, recreation, fisheries, hydrological, geological, cultural
	Five Points Creek*	0.0	12.1	0.0	Scenery, fisheries, wildlife
	Killamacue/Rock Creek	10.2	8.6	0.0	Scenery, recreation, geologic, botanical
	North Fork Catherine Creek	11.1	0.0	2.6	Scenery, recreation, fisheries, wildlife
	Swamp Creek	7.6	0.0	9.2	Fisheries, wildlife, cultural
	Upper Grande Ronde River	11.7	0.0	18.0	Recreation, fisheries, wildlife, cultural
	Totals	**64.9**	**22.8**	**73.4**	
	Total All	**139.7**	**27.4**	**110.8**	

* These rivers have been determined suitable in Dutch Flat Creek, Killamacue Creek and Rock Creek Wild and Scenic River Study Report (1996) and Wild and Scenic River Study Report and Final Legislative EIS for Eight Rivers (1997).

As provided in the Wild and Scenic River Act, Sections 4(a) and 5(c), the following factors were considered and documented as a basis for the suitability determination for each river in the suitability environmental impact statements:

1. Characteristics, which do or do not make the area a worthy addition to the national system
2. The current status of land ownership and use in the area
3. The reasonably foreseeable potential uses of the land and water that would be enhanced, foreclosed, or curtailed if the area were included in the system
4. The Federal agency that will administer the area, should it be added to the system
5. The extent to which the agency proposes that administration of the river, including the costs thereof, be shared by state and local agencies
6. The estimated cost to the United States of acquiring necessary lands and interests in land and of administering the area, should it be added to the system
7. A determination of the degree to which the state or its political subdivisions might participate in the preservation and administration of the river, should it be proposed for inclusion in the system
8. State/local government's ability to manage and protect the outstandingly remarkable values on non-Federal lands
9. The consistency of designation with other agency plans, programs or policies
10. Support or opposition to designation
11. Contribution to river system or basin integrity
12. Potential for water resources development
13. Contribution to other regional objectives/needs

Appendix C: Cumulative Effects

Cumulative effects are those impacts on the environment that result from the incremental effects of an action when it is added to other past, present, and reasonably foreseeable future actions, regardless of which agency or person undertakes them (see 40 CFR 1508.7.). Analysis of cumulative effects informs the public and decision makers of possible effects resulting from cumulative actions on and off National Forest System lands which would not otherwise be disclosed. As addressed in the introduction of chapter 3 of the Environmental Impact Statement (EIS) this cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis.

In order to evaluate cumulative effects at a landscape scale consideration of reasonably foreseeable future actions include programmatic documents, such as plans and policies that overlap in time and space with the indirect effects from the proposed forest plan. Spatial and temporal boundaries of effects vary by the affected resource and are indiscriminate of land ownership; however for consideration of forest planning they are generally limited to the geographic region of the Blue Mountains and the anticipated life of the proposed plan (15 to 20 years). Cumulative effects for individual resources are addressed within their respective section in chapter 3 of the EIS. In coordination with local land owners, other Federal agencies, State and local governments, and Indian tribes the following actions and plans were considered for cumulative effects:

Land Management Plans

- Hells Canyon Comprehensive Management Plan
- Bureau of Land Management Draft Travel Management Plans
- Bureau of Land Management Resource Management plans for Vale, Burns, and Prineville

Climate Change & Air Quality

- USDA Forest Service Pacific Northwest Region action plan for climate change
- State air quality regulations

Wildland Fire

- National Fire Plan and forest Fire Management Plans
- Community Wildfire Protection Plans

Ecosystems

- Oregon and Washington statewide conservation strategies
- Interior Columbia Basin Ecosystem Management Project (ICBEMP)

Fish and Wildlife

- Inland Native Fish Strategy Environmental Assessment and Finding of No Significant Impact. Interim strategies for managing fish-producing watersheds in eastern Oregon and Washington, Idaho, western Montana and portions of Nevada, USDA Forest Service
- Endangered Species Act - Section 7 Consultation, Biological Opinion - Implementation of interim strategies for managing anadromous fish-producing watersheds in Eastern Oregon and Washington, Idaho, and portions of California (PACFISH). National Marine Fisheries Service
- Endangered Species Act - Section 7 Consultation - Biological Opinion. Land and Resource Management Plans for the: Boise, Challis, Nez Perce, Payette, Salmon, Sawtooth, Umatilla, and Wallowa-Whitman National Forests, National Marine Fisheries Service
- Partners in Flight assessments

Species Recovery and Conservation Planning

- Snake River - Oregon Salmon and Steelhead Recovery Planning: The Expert Panel Process.
- Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment
- Bull trout recovery: monitoring and evaluation guidance. Report prepared by The Bull Trout Recovery Monitoring and Evaluation Technical Group (RMEG), Version 1
- Salmon habitat recovery plan with multi-species habitat strategy, Wallowa County and Nez Perce Tribe
- Oregon Subregion Greater Sage-Grouse Draft Regional Management Plan Amendment and EIS.

Watersheds

- Sub basin plans for Asotin, Burnt, Grande Ronde, Imnaha, John Day, Malheur, Powder, Snake Hells Canyon, Tucannon, Umatilla, Walla Walla rivers
- Water quality management plans for the Upper and Lower Grande Ronde, John Day, Malheur, Umatilla, Walla Walla, Asotin, Oregon Closed Basins, and Hell’s Canyon
- Umatilla River Vision. Pendleton, Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources
- Watershed prioritization documents, USDA Forest Service
    - Umatilla National Forest, 2001
    - Wallowa-Whitman National Forest, 2002
- Aquatic/watershed restoration strategy for the Malheur National Forest
- Aquatic and riparian conservation strategy (ARCS), USDA Forest Service
- Pacific Northwest Region Aquatic Restoration Strategy, USDA Forest Service

Appendix D: Laws and Regulations Relevant to Forest Planning

There is a complex legal framework within which planning takes place for management actions proposed within National Forest System lands. The following list, while not comprehensive, will provide some guidance as to the laws, regulations, handbooks, and other guiding direction applied to planning for multiple uses and a range of resource needs. This list is intended to provide some context for the development of desired conditions, standards, guidelines, proposed management activities, and the decision making process.

Economic and Social Well-being

Multiple-Use Sustained Yield Act of 1960: Identifies principles for managing the resources of the National Forest Service. The direction to manage these resources for the greatest good over time includes the use of economic and social analysis to determine management of the National Forest System.

National Environmental Policy Act of 1969: Mandates consideration of the consequences to the quality of the human environment from proposed management actions. The agency must examine the potential impacts to physical and biological resources as well as potential socioeconomic impacts (40 CFR 1508.14).

Forest and Rangeland Renewable Resources Planning Act of 1974: As amended by the National Forest Management Act of 1976, requires consideration of potential economic consequences of land management planning.

Federal Land Policy and Management Act of 1976

Office of Management and Budget Circular A-116 (issued August 16, 1978): Requires executive branch agencies to conduct long range planning and impact analysis associated with major initiatives.

Executive Order No. 12898 on Environmental Justice (issued February 11, 1994): Mandates federal agencies to make achieving environmental justice part of their mission. This includes identification and response to disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

Civil Rights Act (Titles VI, VII, and IX)

1982 Planning Rule Procedures: The procedures of the 1982 National Forest System Land and Resource Management Planning Rule requires the comprehensive consideration of economic benefits and costs, specifically identifying the social sciences, economic considerations, cost-efficient alternatives, impacts on present net value, and impacts on local employment.

Livestock Grazing and Grazing Land Vegetation

Organic Administration Act of 1897: Gives regulatory authority to the President to establish National Forests. Authorizes the Secretary of Agriculture to promulgate rules and regulations for the use and occupancy of National Forests.

Taylor Grazing Act of 1934: Intended to "stop injury to the public grazing lands [excluding Alaska] by preventing overgrazing and soil deterioration; to provide for their orderly use, improvement, and development; [and] to stabilize the livestock industry dependent upon the public range".

Granger-Thye Act of 1950: Provides for the issuance of term grazing permits for up to 10 years. It also provides for the use of grazing receipts for range improvement work.

Multiple-Use Sustained-Yield Act of 1960: Provides that national forests are established and administered for several purposes, including livestock grazing. This act also authorizes the Secretary of Agriculture to develop the surface renewable resources of national forests for multiple uses and sustained yield of the services and products to be obtained from these lands, without impairment of the productivity of the land.

Wilderness Act of 1964: Provides that livestock grazing, and the activities and facilities needed to support it, are allowed to continue in wilderness areas when such grazing was established before designation.

National Environmental Policy Act of 1970: Directs all federal agencies to consider and report the potential environmental impacts of proposed federal actions.

Wild Horses and Burros Act of 1971: Protects wild free-roaming horses and burros from capture, branding, harassment, or death; and states they are to be considered in the area where presently found an integral part of the natural system of the public lands.

Forest and Rangeland Renewable Resource Planning Act of 1974: Directs the Secretary of Agriculture to develop a process for the revision of national forest land and resource management plans, including the identification of the suitability of lands for resource management.

Federal Land Policy and Management Act of 1976: States that public lands will be managed in a manner that will provide food and habitat for fish, wildlife, and domestic animals.

National Forest Management Act of 1976: Reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on National Forest Lands. The NFMA requires the Secretary of Agriculture to assess forest lands, develop a management plan for each unit of the National Forest System. It is the primary statute governing the administration of National Forests.

Public Rangelands Improvement Act of 1978: Establishes and reaffirms the national policy and commitment to inventory and identify current public rangeland conditions and trends; manage, maintain and improve the condition of public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process; charge a fee for public grazing use which is equitable; continue the policy of protecting wild free-roaming horses and burros from capture, branding, harassment, or death, while at the same time facilitating the removal and disposal of excess wild free-roaming horses and burros which pose a threat to themselves and their habitat and to other rangeland values.

Rescission Act of 1995: Directs the Forest Service to complete site-specific NEPA analyses and decisions on allotments on a scheduled basis.

36 CFR 222

Forest Service Manual 2200: This manual summarized laws and regulations governing rangeland management and forest planning.

Forest Service Handbook 2209.13: Grazing Permit Administration Handbook

Allotment Management Plans: Developed through site-specific environmental analysis, an allotment management plan uses Forest Plan direction and current issues to determine desired conditions, areas suitable for grazing, and a broad strategy on how to meet desired conditions. They describe site-specific grazing strategies, stocking, structural and nonstructural range improvement needs, and coordination with other resources. The output, or animal unit months (AUMs), is a result of the allotment management plan requirements, range improvements, and the ability of the permit holder to manage forage and livestock.

Non-Use for Resource Protection Agreements: These agreements may be entered into to provide long term non-use needed to address recovery of rangeland resource conditions, provide forage on a temporary basis to allow resource recovery on other area grazing units, provide temporary resolution of conflicts created by bighorn sheep or wolf predation on livestock, or provide supplemental forage in times of drought to assist area livestock operators and lessen the resource impacts of grazing.

Preliminary Administrative Recommended Additions to the National Wilderness Preservation System (PARWA)

The statues listed below, along with other land use laws, executive orders, and policies guide management of designated wilderness in National Forest System lands. Forest Service Manual (FSM) 2320 - Wilderness Management provides additional direction pertinent to wilderness management of National Forest System lands.

The Wilderness Act, 1964 (P.L. 88-577): This act provides the statutory definition of wilderness and management requirements for these congressionally designated areas. This act established a National Wilderness Preservation System to be administered in such a manner as to leave these areas unimpaired for future use and enjoyment as wilderness. This act designated the Eagle Cap Wilderness and the Strawberry Mountain Wilderness as part of the National Wilderness Preservation System.

Public Law 94-199, 1975: This act established the Hells Canyon National Recreation Area in the States of Oregon and Idaho, and designated the Hells Canyon Wilderness as part of the National Wilderness Preservation System.

National Forest Management Act (NFMA) of 1976, **(P.L. 94-588)**: Provides that management direction for wilderness be incorporated into Forest Plans and sets minimum standards for the content of the Plans.

The Endangered American Wilderness Act, 1978 (P.L. 95-237): This act designated certain undeveloped national forest lands as wilderness and also included the Oregon Omnibus Wilderness Act of 1978. By passing the Endangered Wilderness Act, Congress further established that areas previously modified or influenced by man should not be precluded from wilderness designation, nor should roadless areas near major cities since they provide primitive recreation opportunities close to population concentrations. The act designated the Wenaha-Tucannon Wilderness as part of the Nation Wilderness Preservation System.

The Oregon Wilderness Act, 1984 (P.L. 98-328): This act designated certain national forest system lands in the State of Oregon for inclusion in the National Wilderness Preservation System. The act designated the Monument Rock Wilderness, North Fork John Day Wilderness, North Fork Umatilla Wilderness, and designated additions to the Eagle Cap Wilderness, Hells Canyon Wilderness, and Strawberry Mountain Wilderness.

Regulations and policies have been passed in support of these laws, including the following:

- Forest Service Manual (FSM) 2320 Wilderness Management

Code of Federal Regulations (CFR)

- 36 CFR 293: Wilderness–Primitive Areas
- 36 CFR Part 294: Special Areas; Roadless Area Conservation: this final rule established prohibitions on road construction, road reconstruction, and timber harvesting in inventoried roadless areas on National Forest System lands.

Soils

The National Forest Management Act (NFMA) of 1976 requires that forest service management not result in substantial and permanent impairment of the productivity of the land and allows for timber harvest only where soil, slope, or other watershed conditions will not be irreversibly damaged.

FSM 2550 requires land managers to evaluate the effects of land management on soil quality. FSH 2509.18 directs forest service regions to develop soil quality standards, defines soil productivity as the inherent capacity of soil to support the growth of specified plants, plant communities, or a sequence of plant communities, and sets a threshold value of 15 percent reduction in inherent soil productivity as a basis for measurable or observable changes to soil properties or conditions

Air Quality

The **Federal Clean Air Act** of 1970 is designed to protect public health and welfare from air pollution. The Act requires the Forest Service to:

- Protect air quality related values in Class I areas, defined as National Parks and wilderness areas larger than 5,000 acres in existence as of August 7, 1977, and includes provisions for Prevention of Significant Deterioration of air quality from new pollution sources.
- Establishes National Ambient Air Quality Standards for six criteria pollutants: ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead.

- Limits the emission of airborne particulate matter smaller than 10 micrometers in diameter (PM_{10}) and smaller than 2.5 micrometers in diameter ($PM_{2.5}$), that are known to affect human health

The **Regional Haze Rule of 1999** requires the states to develop implementation plans intended to reach the goal of natural background air quality in Class I areas by 2064.

Smoke Management Plans in Oregon and Washington, developed by Oregon Department of Forestry and Washington Department of Natural Resources, require the Forest Service to identify smoke sensitive areas, including communities, hospitals, nonattainment areas, and highways, and use appropriate mitigation and evaluation techniques to minimize smoke impacts to these areas from prescribed fires.

Watershed Function, Water Quality, and Water Uses

Executive Order 11988 directs federal agencies to avoid adverse impacts associated with the occupancy and modification of floodplains; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural values served by floodplains.

Executive Order 11990 directs federal agencies to take action to minimize the destruction, loss, or degradation of wetlands; to preserve and enhance the natural beneficial values of wetlands; and to avoid adverse impacts to wetlands where practicable.

Executive Order 12580 requires federal agency compliance with water pollution control legislation, including the Clean Water Act.

The Clean Water Act of 1972, as amended provides the primary authority for water pollution control programs at the state and national level. The objective of these programs is to “restore and maintain the chemical, physical, and biological integrity of the nation’s waters.” The act provides specific controls for the protection of wetlands, as well as the reduction of point and non-point sources of pollution.

The Safe Drinking Water Act of 1974 requires protection of water systems that provide water for human consumption and have at least 15 service connections, or provide water to at least 25 people. Smaller systems may be regulated under state law. An amendment to the act in 1996 requires source water protection zones for groundwater wells. Current forest service policy directs the national forests to identify watersheds providing the principal sources of community water during land management planning (FSM 2542.03).

Forest Service Manual (FSM) 2500 outlines Forest Service policy regarding watershed management including the implementation of all applicable federal laws and legislation.

Aquatic Species Diversity and Viability

Multiple-Use Sustained-Yield Act of 1960 (MUSYA) requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a

short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown again if the productivity of the land is not impaired.

National Forest Management Act of 1976 (NFMA) requires development of a planning rule for the development of management plans for national forests. This act guides development and revision of such National Forest Land Management Plans and directs that such plans provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives of the MUSYA.

1982 Planning Rule (1982 Planning Rule)

Section 219.19, Fish and Wildlife Resources (*Species Viability*) requires that "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired nonnative vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area".

This section of the Rule contains seven requirements for meeting the objectives of maintaining viable vertebrate populations. The seven requirements are:

1. In order to estimate the effects of each alternative on fish and wildlife populations, certain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to indicate the effects of management activities. In the selection of management indicator species, the following categories shall be represented where appropriate: Endangered and threatened plant and animal species identified on State and Federal lists for the planning area; species with special habitat needs that may be influenced significantly by planned management programs; species commonly hunted, fished, or trapped; nongame species of special interest; and additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality. On the basis of available scientific information, the interdisciplinary team shall estimate the effects of changes in vegetation type, timber age classes, community composition, rotation age, and year-long suitability of habitat related to mobility of management indicator species. Where appropriate, measures to mitigate adverse effects shall be prescribed.
2. Planning alternatives shall be stated and evaluated in terms of both amount and quality of habitat and of animal population trends of the management indicator species.
3. Biologists from State fish and wildlife agencies and other Federal agencies shall be consulted in order to coordinate planning for fish and wildlife, including opportunities for the reintroduction of extirpated species.
4. Access and dispersal problems of hunting, fishing, and other visitor uses shall be considered.
5. The effects of pest and fire management on fish and wildlife populations shall be considered.

6. Population trends of the management indicator species will be monitored and relationships to habitat changes determined. This monitoring will be done in cooperation with State fish and wildlife agencies, to the extent practicable.
7. Habitat determined to be critical for threatened and endangered species shall be identified, and measures shall be prescribed to prevent the destruction or adverse modification of such habitat. Objectives shall be determined for threatened and endangered species that shall provide for, where possible, their removal from listing as threatened and endangered species through appropriate conservation measures, including the designation of special areas to meet the protection and management needs of such species.

Section 291. 27(g) (*Species Diversity***).** This section of the act recognizes the importance of invertebrates and plants, in addition to vertebrate species addressed in the above section. This section requires that management prescriptions maintain full species diversity within the planning area, i.e., "shall preserve the diversity of plant and animal communities including endemics and desirable naturalize plant and animal species so it {diversity] is at least as great as that which would be expected in a natural forest. Reductions of plant and animal communities and tree species from that which would be expected in a natural forest, or from that similar to the existing diversity in the planning area, maybe prescribed only where needed to meet overall multiple-use objectives."

National Environmental Policy Act (NEPA) of 1969 as amended encourages "productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nations; and to establish a Council on Environmental Quality" (42 USC Sec. 4321). The law further states "it is the continuing policy of the Federal Government, in cooperation, to use all practical means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the present and future generation of Americans." This law essentially pertains to public disclosure and participation, environmental analysis, and documentation.

Endangered Species Act of 1973, as amended (ESA) provides "a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such tests as may be appropriate to achieve the purpose of the treaties and conventions set forth in subsection (a) of this section." The Act also states "It is further declared to be the policy of congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act."

Under Section 7 of the 1973 Endangered Species Act (ESA) and related Secretarial Order 3206 (USDI/USDC 1997), federal activities that may have an effect on threatened and endangered species or their Designated Critical Habitats are subject to consultation with the U.S. Fish and Wildlife Service (USFWS) or the National Oceanic and Atmospheric Administration (NOAA Fisheries). These consultations typically result in Biological Opinions (BOs) from the consulting agencies and include terms and conditions for implementing management programs on national forest system lands.

Pursuant to the Act, a Recovery Plan has been adopted for Middle Columbia River steelhead trout (74FR50165, September 30, 2009) and a draft Plan has been published in the Federal Register for Snake River steelhead and Snake River Chinook salmon in southeastern Washington State (71FR13094, March 14, 2006). Other draft recovery plans are in various stages of preparation for bull trout by the U.S. Fish and Wildlife Service, and a combined draft Recovery Plan is in progress for Snake River Basin steelhead, Snake River Basin fall Chinook salmon, Snake River Basin Sockeye Salmon and Snake River Basin spring/summer Chinook salmon in the state of Oregon and will be finalized by National Marine Fisheries Service. These recovery plans, where completed, will constitute some of the best available science for these species.

Magnuson-Stevens Fishery Conservation and Management Act, Public Law 104-297 and the Sustainable Fisheries Act of 1996. (MSA) Under authority of the Magnuson-Stevens Fishery Conservation and Management Act and Public Law 104-297, the Sustainable Fisheries Act of 1996, the Pacific Fishery Management Council has identified all subbasins in the planning area within the historic range of Pacific salmon as Essential Fish Habitat (EFH) for both Chinook and coho salmon, with the exception of subbasins upstream of Hells Canyon, Oxbow and Brownlee dams on the Snake River. The Pacific Fishery Management Council defines EFH as "all currently viable waters and most of the habitat historically accessible to Chinook and coho salmon within the USGS hydrologic units identified…"

The Magnuson-Stevens Act mandates a consultation process for federal agencies whose activities may adversely affect EFH. This consultation process is intended to provide those agencies with technical assistance in making their activities consistent with conservation of EFH.

Forest Service Manual (FSM) 2600 outlines Forest Service policy regarding fisheries management, including the implementation of all applicable federal laws and legislation.

Forested Vegetation, Timber Resources, and Wildland Fire

These acts, along with other land use laws, executive orders, and policies guide the management of forested vegetation, timber resources, and wildland fire in National Forest System lands. Other pertinent laws can be found in Forest Service Manual (FSM) 2400 and 5100.

Organic Administration Act – June 4, 1897 (U.S.C.551): Authorizes the Secretary of Agriculture to establish regulations governing the occupancy and use of national forests and to protect the forests from destruction. Forests are established "to improve and protect the forest within the boundaries, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States."

The Knutson-Vandenberg Act of 1930 (16 U.S.C. 576-576b): as amended by the National Forest Management Act of 1976 (16 U.S.C. 472a), directs the Secretary to provide for improvement of the productivity of renewable resources within National Forest System timber sale areas. The act also authorizes the collection and use of timber receipts for these purposes.

Economy Act of 1932 – June 30, 1932 (41 U.S.C. 686): Provides for the procurement of materials, supplies, equipment, work, or services from other Federal agencies.

Sustained Yield Forest Management Act of 1944 and the Multiple Use Sustained Yield Act of 1960: allow for the production of multiple quality goods and resources at sustained levels over time, including forest products.

Reciprocal Fire Protection Act – May 27, 1955 (42 U.S.C. 1856): Authorizes reciprocal agreements with Federal, state, and other wildland fire protection organizations.

Multiple-Use Sustained Yield Act of 1960 – recognizes timber as one of five major resources for which national forests are to be managed. "It is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed and wildlife and fish purposes…The Secretary of Agriculture is authorized and directed to develop and administer the renewable surface resources of the National Forests for multiple-use and sustained yield of several products and services obtained there from…the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land."

The National Forest Roads and Trails Act of 1964 (16 U.S.C. 532-538): directs the Secretary to provide for the existence of an adequate system of roads and trails within and near national forests.

The Small Business Act of 1953, as amended (15 U.S.C. 644): provides for agencies to participate in programs with the Small Business Administration (SBA). This is the authority for the Small Business Timber Sale Set-Aside program (FSM 2439).

Wilderness Act – September 3, 1964 (16 U.S.C. 1131, 1132): Authorizes the Secretary of Agriculture to take such measures as may be necessary in the control of fire within designated wilderness.

The **Endangered Species Act (ESA) of 1973**: Requires Federal agencies to conserve threatened and endangered species.

Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976 – directs the Secretary to periodically assess the forest and rangeland resources of the Nation and to submit to Congress at regular intervals recommendations for long-range Forest Service programs essential to meet future resource needs. These acts set forth the requirements for Land and Resource Management Plans for the National Forest System. 36 CFR 219 regulations require the Forest Service to identify areas suitable and available for timber harvest and the allowable sale quantity (ASQ) from those lands. In addition, regulations require us to analyze the supply and demand for resource commodities. Provides for maintenance of land productivity and the need to protect and improve the soil and water resources.

Federal Noxious Weed Act of 1974: Authorizes the Secretary to cooperate with other Federal and state agencies and individuals in carrying out measures to eradicate, suppress, control or prevent the spread of noxious weeds.

The National Environmental Policy Act (NEPA) of 1969 (16 U.S.C. 4321): requires agencies to analyze the physical, social, and economic effects associated with proposed plans and decisions, to consider alternatives to the action proposed, and to document the results of the analysis.

The National Forest Management Act (NFMA) of 1976: sets forth the requirements for land and resource management plans for the National Forest System. It also amends several of the basic acts applicable to timber management. It specifically addresses most aspects of timber management and how it is related to other resources. It is the primary authority governing the management and use of timber resources on National Forests System lands. Directs the Secretary of Agriculture to specify guidelines for land management plans to ensure protection of forest resources. The NFMA requires assessment of alternative management actions to facilitate balanced, integrated approaches to resource protections and development and implementation of sound management practices to prevent excessive losses due to pests. “It is the policy of the congress that all forested lands in the National Forest System shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yields. Plans developed shall provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet the overall multiple-use objectives, and within the multiple-use objective.”

The Forest Resources Conservation and Shortage Relief Act of 1990: as amended by the Forest Resources Conservation and Shortage Relief Act of 1997 (16 U.S.C. 620), sets forth restrictions on export of unprocessed timber originating from Federal lands. It addresses certain exceptions to export restrictions and establishes reporting requirements.

Section 323 of Public Law 108-7 (16 U.S.C. 2104 note) grants the Forest Service authority until September 30, 2013, to enter into stewardship contracting projects with private persons or public or private entities, by contract or agreement, to perform services to achieve land management goals for national forests or public lands that meet local and rural community needs.

Clean Air Act of 1977 (42 U.S.C. 1857): Provides for the protection and enhancement of the nation’s air resources.

Cooperative Forestry Assistance Act of 1978: Sets forth the basic Federal authority for forest insect and disease management and provides for cooperation with states and private individuals.

Healthy Forests Restoration Act – December 3, 2003 (16 U.S.C. 6501): provides processes for implementing hazardous fuel reduction projects on certain types of "at-risk" National Forest System (NFS) and Bureau of Land Management (BLM) lands, and also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships.

Tribal Forest Protection Act – 2004 (P.L. 108). This act authorizes the Secretary of Agriculture (with respect to land under the jurisdiction of the Forest Service) to carry out a project to protect Indian forest land or rangeland (including a project to restore Federal land that borders on or is adjacent to such land) under the Secretary’s jurisdiction and bordering or adjacent to the Indian forest land or rangeland under the Indian tribe’s jurisdiction.

Federal Land Assistance, Management and Enhancement Act of 2009. Authorizes a supplemental funding source for catastrophic emergency wildland fire suppression activities on Department of the Interior and National Forest System lands and requires the Secretary of the Interior and the Secretary of Agriculture to develop a cohesive wildland fire management strategy.

Executive Order 13112: Directs Federal agencies whose actions may affect the status of invasive species to (1) prevent the introduction of invasive species, (2) detect and respond rapidly to and control populations of such species in a cost effective and environmentally sound manner, as appropriations allow.

Key policies and guidance that have been developed in support of enacted laws include the following:

- The National Forest Directives System (Manuals, Handbooks and their current amendments) outlines the administrative framework for fire management activities, which includes protecting resources and other values from wildfire and using prescribed fire to meet land and resource management goals and objectives. The framework in these manuals and handbooks provides for cost-efficient wildfire protection and embraces the positive roles that fire plays on National Forest System lands. Specifically, fire management guidance can be found in Forest Service Manual 5100, chapters 10 through 90, and Forest Service Handbooks 5109.14, 5109.17, 5109.18, and their subsequent amendments.
- Review and Update of the 1995 Federal Wildland Fire Management Policy (2001)
- Guidance for Implementation of Federal Wildland Fire Management Policy (2008)
- A National Cohesive Wildland Fire Management Strategy (2011)

1982 Planning Rule Procedures: The procedures of the 1982 National Forest System Land and Resource Management Planning Rule require the identification of areas suitable for timber production and the allowable sale quantity from those lands. In addition, the procedures require the analysis of the supply and demand situation for resource commodities.

26 CFR 219.27 sets the minimum specific management requirements to be met in accomplishing goals and objectives for the National Forest System.

36 CFR 219.27(a)(3) requires that all management prescriptions utilize principles of integrated pest management to prevent or reduce serious, long lasting hazards and damage from pest organisms, consistent with the relative resource values involved.

36 CFR 219.27(c)(2) discusses the ASQ (allowable sale quantity) and states: “Nothing in this paragraph prohibits salvage or sanitation harvesting of timber stands which are substantially damaged by fire, windthrow, or other catastrophe, or which are in imminent danger of insect or disease attack and where such harvests are consistent with silvicultural and environmental standards.”

36 CFR 219.27(c)(7) states: “Timber harvest and other silvicultural treatments shall be used to prevent potentially damaging populations increases of forest pest organisms. Silvicultural treatments shall not be applied where such treatments would make stands susceptible to pest-caused damage levels inconsistent with management objectives.”

36 CFR 217 Requesting Review of National Forest Plans and Project Planning

36 CFR 219 Planning

36 CFR 219.16 (a) (2) (iii) allows for the harvesting of stands of timber that have not reached CMAI (Culmination of Mean Annual Increment) “which are in imminent danger from insect or disease attack.”

36 CFR 221 Timber Management Planning

36 CFR 223.1: Trees, portions of trees, and other forest products on National Forest System lands may be sold for the purpose of achieving the policies set forth in the Multiple Use Sustained Yield Act as amended and the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended and the Program there under.

36 CFR 261.6(a): Cutting or otherwise damaging a forest product except as authorized by a permit or Federal law.

36 CFR 261.6(e): Loading, removing, or hauling a forest product acquired under any permit unless such product is identified as required in such permit.

36 CFR 261.10(c): Selling or offering for sale any merchandise or conducting any kind of work activity or service unless authorized by a Federal law, regulation, or permit.

36 CFR 261.10(l): Violating any condition or term of a permit.

FSM 2467: Sales of special forest products

FSM 2467.01: Authority: Forest officers may sell other forest products under provisions set out at 36 CFR 223.1.

FSM 2467.02: Objective: To sell other forest products where it would serve local needs and meet land management objectives.

FSM 2467.03: Policy: Use management measures that perpetuate or increase the production of miscellaneous forest products within applicable objectives, standards, and guidelines of the Shoshone National Forest land and resource management plan. Recover the fair market value of such products when it is practical to do so.

FSM 2467.04: Responsibility: See FSM 2404.2 for delegations of authority and assignments of responsibility to agency officials by organizational level. Regional Foresters shall develop appraisal and sale procedures, including defining the conditions of sale for forest products.

FSM 2467.1: Conditions of Use for Miscellaneous Forest Products: Conditions for use of miscellaneous forest products are set forth in FSH 2409.18, section 87.

FSM R6 Supplement No. 2430-2007-2: Minimum and Standard Rates

2431.31a - Standard Rates. Standard rates may be established by the Forest Supervisor for certain products, but may be no lower than minimum rates established in FSM 2431.31b and c. Standard rates should be based on current appraised rates, delivered product prices or bid prices adjusted to average conditions where the rates shall be applied. Rates are usually established for the forest as a whole. However, where significant variations in conditions and markets exist, forests may establish rates on a unit or zone basis. Consultation and coordination between adjoining forests is encouraged in order to standardize rates and to the extent practicable coordinate with Bureau of Land Management. Standard rates are governed by the guidelines outlined in FSM 2431.31a.

2431.31b - Minimum Rates. Minimum rates are the lowest rate for which the Region will sell forest products, except to provide for the removal of insect-infested, diseased, dead, or distressed timber in accordance with contract provisions specifically provided for catastrophically affected timber. Minimum rates are governed by the guidelines outlined in FSM 2431.31b.

Policy direction from the Forest Service Directives System in Forest Service Manuals (FSM)

2400 Timber Sale Management in Forest Service Handbooks (FSH) is listed here but not limited to:

- Timber Resource Planning Handbook
- Timber Management Information System Handbook
- Timber Sale Administration Handbook
- Silviculture Practices Handbook
- Timber Sale Preparation Handbook
- R-2 2409.26 Silvicultural Practice Handbook

There are numerous forest wide and management area standards and guidelines that apply to forested vegetation, timber resources, and wildland fire. All alternatives provide for satisfactory regeneration of harvested areas, for treatment of activity-related fuels, management of insects and diseases, and various wildland fire management strategies. Specific standards and guidelines designed to avoid or mitigate the effects from fire and fuels management activities, as well as provide direction regarding the use and management of fire, are addressed in the forest plan or Forest Service manuals and handbooks.

The Master Cooperative Fire Protection Agreement for the states of Oregon and Washington (2013) is an inter-agency agreement by which the Forest Service cooperates with its interagency partners regarding all aspects fire management. Participants in the agreement include Federal, State, and local agencies.[39]

Terrestrial Wildlife Species Diversity and Viability

Below is a summary list of major laws, regulations, and policies that apply to wildlife management on National Forest System lands.

National Forest Management Act (NFMA) of 1976 requires that habitat be managed to support viable populations of native and desirable nonnative vertebrates. The 1982 National Forest Management Act Regulations (planning regulations) at 36 CFR 219 set forth a process for developing, adopting, and revising land and resource management plans for the National Forest System (36 CFR 219.1) and identifies requirements for integrating fish and wildlife resources in forest land management plans (36 CFR 219.13). For planning purposes, a viable population shall be regarded as one that has the estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area (36 CFR 219.19). Also, the 1982 planning provisions require that “Forest planning shall provide for diversity of plant and animal communities and tree species consistent with the over-all multiple-use objectives of the planning area” (36 CFR 219.26). Finally, 36 CFR 219.35 of the 2000 planning rule that allows the use of the 1982 rule requires the Forest Service to use best available science during analysis to inform the planning process.

NFMA regulations also require the identification of management indicator species (MIS) to assess how plan alternatives may affect wildlife populations (1982 planning rule section 219.19 (a)(1)) and as a monitoring tool upon plan implementation (219.19(a)(6)).

[39] http://www.fs.fed.us/r1/fire/nrcg/Op_plans/2013%20AOP%20FINAL%20PNWCG%20Approved%20with%20Signature%20Pages.pdf

Some of the key elements of 39 CFR 219.19 related to MIS are:

> "Each alternative shall establish objectives for the maintenance and improvement of habitat for MIS—to the degree consistent with overall multiple use objectives of the alternative" 219.19(a)
>
> "In order to estimate the effects of each alternative on fish and wildlife populations, certain vertebrate and/or invertebrate species present in the area shall be identified and selected as MIS and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to indicate the effects of management activities." 219.19(a)(1)
>
> "Planning alternatives shall be stated and evaluated in terms of both amount and quality of habitat and animal population trends of MIS." 219.19(a)(2)
>
> "Populations trends of the MIS will be monitored and relationships to habitat determined. This monitoring will be done with State fish and wildlife agencies, to the extent practicable." 219.19(a)(6)

Essentially, the National Forest Management Act requires MIS to be selected "because their population trends are believed to indicate the effects of management activities."

National Environmental Policy Act (NEPA) of 1970, as amended, provides regulations for implementing the procedural provisions of the Act. NEPA requires analysis and public disclosure of the effects to wildlife species and habitats from proposed federal actions in an Environmental Impact Statement or Environmental Assessment and/or supporting Specialist Reports that clearly describe the potential impacts of the alternatives.

NEPA implementing regulations gives specific direction concerning information and scientific data, "Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements. They shall identify any methodologies used and shall make explicit reference by footnote to the scientific and other sources relied upon for conclusion in the statement." [40 CFR 1502.24]

The Endangered Species Act of 1973 requires Federal agencies to conserve threatened and endangered species and the ecosystem on which they depend. Section 7(a)(1) outlines the procedures for Federal interagency cooperation designed to conserve federally listed species and their designated critical habitats. Section 7(a)(2) outlines the consultation process to ensure that the requirement that any action authorized, funded, or carried out by a Federal agency would not likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat be met.

The **Migratory Bird Treaty Act of 1918** (16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The Migratory Bird Treaty Act was enacted in 1918. A 1972 agreement supplementing one of the bilateral treaties underlying the Migratory Bird Treaty Act had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define "take" under the Migratory Bird Treaty Act as "pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect." The original 1918 statute implemented the 1916 Convention between the U.S. and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the U.S. and Mexico, the U.S. and Japan, and the U.S. and the Soviet Union (now Russia). This

law was originally intended as a hunting statute. Removal and/or destruction of vegetation are not a taking under the Migratory Bird Treaty Act.

The **Bald and Golden Eagle Protection Act** (16 U.S.C. 668-668c), enacted in 1940 and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal and civil penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

> "Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously-used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits, and causes, or is likely to cause, a loss of productivity or nest abandonment.

The Fish and Wildlife Service has new regulations (Federal Register 74:46835-46879; 11 September 2009) that allow permits to take eagles under the Bald and Golden Eagle Protection Act (50 CFR 22.26). The regulations provide for individual and programmatic permits that are consistent with the goal of stable or increasing eagle breeding populations.

Treaty of 1855: Big game and managed species such as elk are an important source of subsistence food for tribal members. The rights to hunt and fish are key reserved rights in the Treaty of 1855 between the United States and The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Nez Perce "*the privilege of hunting, gathering roots and berries and pasturing their stock on unclaimed lands in common with citizens, is also secured to them*". Therefore the Forest Service has certain legal responsibilities to American Indian tribes and whenever the Forest Service takes actions which adversely affect the habitat of big game, the treaty rights of these tribes are affected.

Treaty of 1868: The rights to hunt and fish are key reserved rights in the Treaty of 1868 between the United States and The Eastern band of Shoshoni and Bannock "… *they shall have the right to hunt on the unoccupied lands of the United States so long as game may be found thereon…*". Therefore, the Forest Service has certain legal responsibilities to American Indian tribes and whenever the Forest Service takes actions which adversely affect the habitat of big game, the treaty rights of the Shoshoni and Bannock are affected.

Executive Order 13186: On January 10, 2001, President Clinton signed Executive Order 13186 for the "Responsibilities of Federal Agencies to Protect Migratory Birds" which directed federal agencies to develop an MOU with the US Fish and Wildlife Service to promote conservation of migratory birds. The MOU between the Forest Service and USFWS was signed by the Chief of the Forest Service in December 2008.

The MOU directs the agency to address the conservation of migratory bird habitat and populations when developing, amending, or revising management plans for national forests and grasslands, consistent with NFMA, the Endangered Species Act (ESA), and other authorities. When developing the list of species to be considered in the planning process, the Forest Service must:

- Consult the current USFWS Birds of Conservation Concern list, state lists, and comprehensive planning efforts for migratory birds
- Evaluate and consider management objectives and recommendations from conservation planning efforts for migratory birds
- Acknowledge special designations that may apply to all or part of the planning area, such as Globally Important Bird Areas in the United States
- Acknowledge such designations in the appropriate plan documents

Additionally, within the NEPA process, the Forest Service must evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Executive Order 11990: On May 24, 1977, President Carter signed Executive Order11990 for the "Protection of Wetlands" which required federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Executive Order 13443: On August 16, 2007, President Bush signed Executive Order13443 for the "Facilitation of Hunting Heritage and Wildlife Conservation" which required federal agencies to (consistent with agency missions):

(a) Evaluate the effect of agency actions on trends in hunting participation and, where appropriate to address declining trends, implement actions that expand and enhance hunting opportunities for the public;

(b) Consider the economic and recreational values of hunting in agency actions, as appropriate;

(c) Manage wildlife and wildlife habitats on public lands in a manner that expands and enhances hunting opportunities, including through the use of hunting in wildlife management planning;

(d) Work collaboratively with State governments to manage and conserve game species and their habitats in a manner that respects private property rights and State management authority over wildlife resources;

(e) Establish short and long term goals, in cooperation with State and tribal governments, and consistent with agency missions, to foster healthy and productive populations of game species and appropriate opportunities for the public to hunt those species;

(f) Ensure that agency plans and actions consider programs and recommendations of comprehensive planning efforts such as State Wildlife Action Plans, the North American Waterfowl Management Plan, and other range-wide management plans for big game and upland game birds;

(g) Seek the advice of State and tribal fish and wildlife agencies, and, as appropriate, consult with the Sporting Conservation Council and other organizations, with respect to the foregoing Federal activities.

USDA regulation 9500-004, adopted in 1983 and revised in 2008, reinforces the NFMA viability regulation by requiring that habitats on national forests be managed to support viable populations of native and desired nonnative plants, fish, and wildlife. For planning purposes, a viable population shall be regarded as one that has the estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area.

Forest Service Manual 2600 provides directives regarding wildlife, fish, and rare plant management. FSM 2620 includes direction regarding habitat planning and evaluation, including specific forest planning direction for meeting biological diversity requirements:

"A forest plan must address biological diversity through consideration of the distribution and abundance of plant and animal species, and communities to meet overall multiple-use objectives." [FSM 2622.01]

"Management of habitat provides for the maintenance of viable populations of existing native and desired nonnative wildlife, fish, and plant species, generally well-distributed throughout their current geographic range" [FSM 2622.01(2)]

"Maintain viable populations of all native and desired nonnative wildlife, fish and plant species in habitats distributed throughout their geographic range on National Forest System lands." [FSM 2670.22(2)]

"Management Indicators: Plant and animal species, communities, or special habitats selected for emphasis in planning, and which are monitored during forest plan implementation in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent." [FSM 2620.5]

"Select management indicators for a forest plan or project that best represent the issues, concerns, and opportunities to support recovery of Federally-listed species, provide continued viability of sensitive species, and enhance management of wildlife and fish for commercial, recreational, scientific, subsistence, or aesthetic values or uses. Management indicators representing overall objectives for wildlife, fish, and plants may include species, groups of species with similar habitat relationships or habitats that are of high concern." [FSM 2621.1]

Document, in the permanent planning records for a forest plan, the rationale, assumptions, and procedures used in selecting management indicators." [FSM 2621.1(4)]

"Review, through the biological evaluation process, actions and programs authorized, funded, or carried out by the Forest Service to determine their potential for effect on threatened and endangered species and species proposed for listing." [FSM 2670.31(3)]

"Review programs and activities as part of the National Environmental Policy Act of 1969 process through a biological evaluation, to determine their potential effect on sensitive species." [FSM 2670.32(2)]

The Interior Columbia Basin Strategy: "The Strategy will be used to guide the amendment and revision of land and resource management plans for administrative units of the Forest Service and BLM within the Basin…"

"Management plans shall address ways to maintain and secure terrestrial habitats that are comparable to those classified by the science findings as "source" habitats that have declined substantially in geographic extent from the historical to the current period and habitats that have old-forest characteristics."

Plant Species Diversity and Threatened, Endangered, and Sensitive Plants

The Forest Service has a legal requirement to maintain or improve habitat conditions for threatened, endangered, proposed or candidate species under the ESA. Species covered under ESA are those listed by the USDI, U.S. Fish and Wildlife Service. Sensitive species are protected under the Regional Forester's Sensitive Species Program. The Blue Mountains national forests are required to identify and mitigate potential effects to these species from federal land-disturbing actions. In order to comply with the ESA and the Sensitive Species Program, forest botanists conduct inventories during project planning to locate and protect any threatened, endangered, proposed, candidate, and sensitive plant species.

The National Forest Management Act (NFMA) of 1976: "It is the policy of the Congress that all forested lands in the National Forest System shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth and conditions of stand designed to secure the maximum benefits of multiple use sustained yield. Plans developed shall provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet the overall multiple-use objectives, and within the multiple-use objective."

The Endangered Species Act (ESA) of 1973: Requires federal agencies to conserve threatened and endangered species.

Nonnative Invasive Species

Federal Noxious Weed Act of 1974: States that each federal agency shall establish and adequately fund an undesirable plants management program, complete and implement cooperative agreements with State agencies regarding the management of undesirable plant species on Federal lands under the agency's jurisdiction; and establish an integrated management system to control or contain undesirable plant species targeted under cooperative agreements.

Executive Order 13112: Directs Federal agencies to prevent the introduction of invasive species; detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; to monitor invasive species populations accurately and reliably; to provide for restoration of native species and habitat conditions in ecosystems that have been invaded; to conduct research on invasive species and develop technologies to prevent introduction; and to provide for environmentally sound control of invasive species; and promote public education on invasive species and the means to address them. All of these actions are subject to the availability of appropriations.

Tribal and Treaty Resources

American Indian Religious Freedom Act (AIRFA) as amended (42 U.S.C. 1996): Protects and preserves for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use, and possession of sacred objects and the freedom to worship through ceremonial and traditional rites.

Tribal Forest Protection Act of 2004 (Public Law 108-278): Authorizes the Secretary of Agriculture and the Secretary of the Interior to enter into an agreement or contract with Indian tribes meeting certain criteria to carry out projects to protect Indian forest land.

Congressional Acts: National Historic Preservation Act Sections 106 and 110; The Native American Grave Protection and Repatriation Act; American Indian Religious Freedom Act, 1978; Archaeological Resources Protection Act, 1979; Food Conservation and Energy Act of 2008 (The Farm Bill).

Heritage Program

Heritage resources are an important aspect of our country's history and cultural values, are nonrenewable resources, and are protected for present and future generations. A series of Federal laws have been enacted to protect heritage resources on Federal lands from damage or loss due to Federal programs and/or federally funded or permitted activities.

The following acts, along with other land use laws, executive orders, and policies, guide management of cultural resources on National Forest System lands. Other laws pertinent to historic property management on National Forest System lands can be found in Forest Service Manual (FSM) 2300 – Recreation, Wilderness, and Resource Management; Chapter 2360 – Heritage Program Management.

Antiquities Act of 1906 (16 U.S.C. 431) – This act protects historic or prehistoric remains or any object of antiquity on Federal lands and applies to both cultural and paleontological resources. It imposes criminal penalties for unauthorized destruction or appropriation of antiquities without a permit.

National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470) – This act protects historic and archaeological values during the planning and implementation of Federal projects (CFR 36.800 and CFR 36.60). The law requires the following: (1) location and identification of cultural resources during the planning phase of a project, (2) a determination of "significance" for potentially affected resources, and (3) provisions for mitigation of any significant sites that may be affected.

National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321-4346) – This act establishes the national policy for the protection and enhancements of the environment. NEPA establishes that part of the function of the Federal government is to "preserve important historic, cultural, and natural aspects of our natural heritage."

The Archaeological and Historic Preservation Act (AHPA) of 1974 (16 U.S.C. 469) – This act requires Federal agencies to collect, protect, and preserve historic and archaeological data that result from agency undertakings and actions. This act also applies to agencies' actions that fund or license projects and the effects these projects have on heritage resources.

Federal Land Policy and Management Act (FLPMA) of 1976 (43 U.S.C. 1701 § 102(8)) – This act requires that "public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource and archeological values; that, where appropriate will preserve and protect certain public lands in their natural condition …" This law applies to cultural and paleontological resources.

American Indian Religious Freedom Act of 1978 (AIRFA) – This act protects American Indian rights to exercise traditional religions including access to sites and freedom to worship through ceremonial and traditional rites.

Archaeological Resources Protection Act (ARPA) of 1979 (16 U.S.C. 470) – This act imposes civil penalties for the unauthorized excavation, removal, damage, alteration, or defacement of archaeological resources.

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (25 U.S.C. 3001) – American Indian burials and sacred items are protected by this act. If human remains or objects of cultural patrimony are discovered, this law requires consultation with the Indian tribe most closely related to the individual. The tribe then determines the appropriate treatment of the remains. This may include repatriation or scientific study and curation at a university.

Executive Order 11593: Protection and Enhancement of the Cultural Environment (1971) – This order directs Federal agencies to inventory cultural resources under their jurisdiction and nominate all federally owned properties that meet the criteria to the National Register of Historic Places.

Executive Order 13007: Indian Sacred Sites (1997) – This order directs Federal agencies to accommodate access to and ceremonial use of American Indian sacred sites by tribal religious practitioners, to avoid adversely affecting the physical integrity of such sacred sites, and, where appropriate, to maintain the confidentiality of sacred sites.

Executive Order 13175: Consultation and Coordination with Indian Tribal Governments (2000) – This order directs Federal agencies to establish regular and meaningful consultation and collaboration with Tribal officials in the development of Federal policies that have Tribal implications.

Executive Order 13287: Preserve America (2003) – This order establishes Federal policy to provide leadership in preserving America's heritage by actively advancing the protection, enhancement, and contemporary use of the historic properties owned by the Federal government. The order also requires agencies to review and report their policies and procedures for compliance with the National Historic Preservation Act § 110 and 111 and improve Federal stewardship of historic properties.

Regulations and policies have been passed in support of these laws including the following:

- 16 U.S.C.G 432-433 – Uniform Rules and Regulations.
- 36 CFR 261.9 (g), (h) – Code of Federal Regulations: Property
- 36 CFR part 800 – Protection of Historic Properties
- 36 CFR part 60 – National Register of Historic Places
- 36 CFR part 296 – Protection of Archaeological Resources Uniform Regulations

- 43 CFR part 10, Subpart B – Native American Graves Protection and Repatriation Regulations
- Forest Service Manual 2360 – Recreation, Wilderness, and Resource Management

Programmatic Agreement among the United States Department of Agriculture, Forest Service, Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historical Preservation Officer Regarding Cultural Resource Management in the State of Oregon by the USDA Forest Service.

Recreation and Access

Term Permit Act of March 4, 1915 (P.L. 63-293, Ch. 144, 38 Stat. 1101, as amended; 16 U.S.C. 497): This act provides direction to the National Forest System lands to authorize occupancy for a wide variety of uses through permits not exceeding 30 years.

Rehabilitation Act of September 26, 1973 (P.L. 93-112, Title V, 87 Stat. 390, as amended; 29 U.S.C. 791, 793-794, 794a, 794b): This act requires that programs and activities conducted by Federal agencies and by entities that receive funding from, or operate under a permit from Federal agencies. This act requires these entities to provide an equal opportunity for individuals with disabilities to participate in an integrated setting, as independently as possible. The only exception to the requirement is when the program would be fundamentally altered if changes were made solely for the purpose of accessibility.

Multiple-Use Sustained-Yield Act of June 12, 1960 (P.L.86-517, 74 Stat.215): This act provides direction to the National Forest System lands to provide access and recreation opportunities. The act states, "The policy of Congress is that national forests are established and administered for outdoor recreation…."

L**and and Water Conservation Fund Act of 1965 (P.L. 88-578, 78 Stat. 897 as amended; 16 U.S.C. 460l-4(note); 460l-4 thru 6a, 460l-7 thru 460l-10, 460l-10a-d, 460l-11)**: "The purposes of this act are to assist in preserving, developing, and assuring accessibility to all citizens of the United States of America…such quality and quantity of outdoor recreation resources…providing funds for: 1. States for acquisition, planning, and development of recreation facilities and; 2. Federal acquisition and development of certain lands and other areas."

Highway Safety Act of September 9, 1966 (P.L. 89-564, 80 Stat. 731, as amended): This act authorizes state and local governments and participating Federal agencies to identify and survey accident locations; to design, construct, and maintain roads in accordance with safety standards; to apply sound traffic control principles and standards; and to promote pedestrian safety.

Architectural Barriers Act of August 12, 1968 (P.L. 90-480, 82 Stat. 718 51 U.S.C. 4151-4154, 4154a, 4155-4157): This act establishes additional requirements to ensure that buildings, facilities, rail passenger cars, and vehicles are accessible to individuals with disabilities. It covers architecture and design, transportation, and communication elements of recreational site planning and development.

National Trails System Act of October 2, 1968 (P.L. 90-543, 82 Stat.919, as amended): This act establishes the National Trails System and authorizes planning, right-of-way acquisition, and construction of trails established by Congress or the Secretary of Agriculture.

Federal Land Policy and Management Act of October 21, 1976 (P.L. 94-579, 90 Stat. 2742, as amended): This act declares (per Sec. 102) that "…the public lands be managed in a manner that…will provide for outdoor recreation and human occupancy and use."

Surface Transportation Assistance Act of 1978 (P.L. 95-599, as amended). Supersedes the Forest Highway Act of 1958: Authorizes appropriations for forest highways and public lands highways. Establishes criteria for forest highways; defines forest roads, forest development roads and forest development trails (referred to as "system roads" and "system trails" in Forest Service regulations and directives); and limits the size of projects performed by Forest Service employees on forest roads. Establishes the Federal Lands Highway Program.

Federal Lands Recreation Enhancement Act of December 8, 2004 (P.L. 108-447, as amended): This act gives the Secretaries of Agriculture and Interior the authority to establish, modify, charge, and collect recreation fees at Federal recreational lands where a certain level of amenities have been developed.

Ski Fees, Omnibus Parks and Public Lands Management Act of November 12, 1996 (P.L. 104-333, div. I, Title VII, Sec. 701, 110 Stat. 4182; 16 U.S.C. 497c): Section 701 of this act:

- Establishes a system to calculate fees for ski area permits issued under the National Forest Ski Area Permit Act of 1986 (16 U.S.C. 497b);
- Provides for holders of ski area permits issued under other authorities to elect this permit fee system (FSH 2709.11, sec. 38.03a);
- Includes provisions concerning compliance with NEPA when issuing permits for existing ski areas (FSM 2721.61f and FSH 2709.11, sec. 41.61b); and
- Withdraws leasable and locatable minerals, subject to valid existing rights (FSH 2709.11, sec. 41.61c).

Ski Area Recreational Opportunity Enhancement Act of November 7, 2011 (H.R. 765 ENR) The purpose of this act is to amend the National Forest Ski Area Permit Act of 1986 (16 U.S.C. 497b):

- (1) to enable snow-sports (other than nordic and alpine skiing) to be permitted on National Forest System land subject to ski area permits issued by the Secretary of Agriculture under section 3 of the National Forest Ski Area Permit Act of 1986 (16 U.S.C. 497b); and
- (2) to clarify the authority of the Secretary of Agriculture to permit appropriate additional seasonal or year-round recreational activities and facilities on National Forest System land subject to ski area permits issued by the Secretary of Agriculture under section 3 of the National Forest Ski Area Permit Act of 1986 (16 U.S.C. 497b)

Executive Order 12862: Setting Customer Service Standards requires information about quantity and quality of recreation visits for national forest plans.

Regulations and policies have been passed in support of these laws and require the following:

- Forest Service Handbook (FSH) 1909.15-Environmental Policy and Procedures Handbook
- Forest Service Manual (FSM) 2300-Recreation, Wilderness, and Related Resource Management
- Forest Service Handbook (FSH) 2709.11-Special Uses Handbook

- Forest Service Manual (FSM) 7300-Buildings and Other Structures
- Forest Service Manual (FSM) 7700-Travel Management

Special Areas

The acts listed below, along with other land use laws, executive orders, and policies guide management of both designated and potential Wild and Scenic Rivers on National Forest Service lands. Other direction pertinent to Wild and Scenic River management of National Forest Service lands can be found in Forest Service Manual (FSM 2354) 'River Management'.

Organic Administration Act of June 4, 1897 (30 Stat. 11, as amended; 16 U.S.C. § 473 et seq.): This act provides the Secretary of Agriculture the authority to regulate the occupancy and use of National Forest System lands.

Multiple-Use Sustained-Yield Act of June 12, 1960 (P.L. 86-517, 74 Stat.215): This act provides direction to the National Forest System lands to provide access and recreation opportunities. The act states, "The policy of Congress is that national forests are established and administered for outdoor recreation…"

Wild and Scenic Rivers Act of October 2, 1968 (P.L. 90-542, Stat. 906, as amended; 16 U.S.C. § 1271(note), 1271-1287): This act established a policy for preserving selected rivers or sections thereof in a free-flowing condition. The intent was to protect water quality of such rivers and to fulfill other vital national conservation measures that would balance the development of water, power, and other resources for the benefit and enjoyment of present and future generations.

Federal Land Policy and Management Act of October 21, 1976 (P.L. 94-579, 90 Stat. 2742, as amended): This act declares (per Sec. 102) that "…the public lands be managed in a manner that…will provide for outdoor recreation and human occupancy and use."

National Forest Management Act (NFMA) of October 22, 1976 (P.L. 94-588, 90 Stat. 2949; 16 U.S.C. § 1600 et seq.): The act requires the Forest Service to establish a comprehensive system of land and resource planning, including the development and maintenance of a comprehensive and detailed inventory of lands and resources. The act also specifies the use of a systematic interdisciplinary approach to achieve integrated consideration of the physical sciences into planning for the management and use of National Forest System lands and resources.

Omnibus Oregon Wild and Scenic Rivers Act of 1988 (P.L. 100-577, 102 Stat. 2782; 16 U.S.C. § 1271(note), 1271-1276): This act amends the Wild and Scenic Rivers Act of 1968 by adding 40 rivers totaling 1,500 river miles in the State of Oregon to the National Wild and Scenic River system.

Policies and regulations that guide agency management of eligible, suitable, and designated Wild and Scenic Rivers include the following:

- Forest Service Manual (FSM) 2354 River Management
- 36 CFR 297 — Wild and Scenic Rivers

Appendix E: Wild and Scenic Rivers

Introduction

This report documents the wild and scenic river eligibility evaluation for the Blue Mountains forests plan revision. The direction to conduct an eligibility evaluation comes from the Wild and Scenic Rivers Act of 1968 (Act). To manage the river for its potential inclusion into the National System, the land management plan (LMP) should provide direction using other authorities to protect its free-flowing character, water quality, outstandingly remarkable values, and preliminary or recommended classification. The identification of a river for study through the land management planning process does not trigger the protections under the Act.

Rivers are added to the National System by act of Congress or by the Secretary of the Interior. Secretarial designation requires that a river be a part of a state river protection system and the state governor to make application to the Secretary.

Background

Congress enacted the Wild and Scenic Rivers Act (WSRA) in 1968 to preserve select river's free-flowing condition, water quality and outstandingly remarkable values. The most important provision of the WSRA is protecting rivers from the harmful effects of water resources projects. To protect free-flowing character the Federal Energy Regulatory Commission (which licenses nonfederal hydropower projects) is not allowed to license construction of dams, water conduits, reservoirs, powerhouses, transmission lines, or other project works on or directly affecting wild and scenic rivers (WSR). Other federal agencies may not assist by loan, grant, license or otherwise any water resources project that would have a direct and adverse effect on the values for which a river was designated.

The WSRA also directs that each river in the National Wild and Scenic Rivers System (National System) be administered in a manner to protect and enhance a river's outstanding natural and cultural values. It allows existing uses of a river to continue and future uses to be considered, so long as existing or proposed use does not conflict with protecting river values. The WSRA also authorizes managing agencies to build partnerships among landowners, river users, tribal nations, and all levels of government.

Beyond the immediate protection afforded to the eight rivers in the enabling legislation, the WSRA established a process for building a legacy of protected rivers. Rivers may be identified for study by an act of Congress under Section 5(a) or through federal agency-initiated study under Section 5(d)(1). Section 5(d)(1) directs federal agencies to consider the potential of wild, scenic and recreational rivers in their planning processes and its application has resulted in numerous individual river designations and state and area-specific legislation.

Both Sections 5(a) and 5(d)(1) studies require determinations to be made regarding a river's eligibility, classification and suitability. Eligibility and classification represent an inventory of existing conditions. Eligibility is an evaluation of whether a river is free-flowing and possesses one or more outstandingly remarkable values (ORVs). If found eligible, a river is evaluated to determine its current level of development (water resources projects, shoreline development, and

accessibility) and a recommendation is made that it be placed into one or more of three classes—wild, scenic or recreational.

The final procedural step, suitability, provides the basis for determining whether to recommend a river as part of the National System. A suitability analysis provides information to answer the following questions:

- Should the river's free-flowing character, water quality, and outstandingly remarkable values be protected, or are one or more other uses important enough to warrant doing otherwise?
- Will the river's free-flowing character, water quality, and outstandingly remarkable values be protected through designation? Is it the best method for protecting the river corridor? In answering these questions, the benefits and impacts of wild, scenic and recreational designation must be evaluated and alternative protection methods considered.
- Is there a demonstrated commitment to protect the river by any nonfederal entities that may be partially responsible for implementing protective management?

Rivers authorized for study by Congress are protected under the Wild and Scenic Rivers Act; specifically, Sections 7(b)—prevents the harmful effects of water resources projects; 8(b)—withdraws public lands from disposition under public land laws; 9(b)—withdraws locatable minerals from appropriation under mining laws; and 12(a)—directs actions of other federal agencies to protect river values. These protections last through the study process, including a three-year period following transmittal of the final study report by the President to Congress. The integrity of the identified classification must also be maintained during the protection period.

Past Planning Efforts: Wallowa-Whitman National Forest

As result of an agreement between American Rivers and Oregon Rivers Council, the Forest performed evaluations of eleven rivers on the forest. These rivers were studied for their potential eligibility and suitability as wild, scenic and recreational rivers. The results have been documented in two final legislative environmental impact statements (FLEIS). The FLEIS document the analysis of eligibility and suitability of the rivers for inclusion within the National Wild and Scenic River System. Based on the analysis contained in the two FLEIS, three rivers would be further recommended for inclusion in the national system. These recommendations have yet to be forwarded to Congress for action.

Past Planning Efforts: Malheur National Forest

In 1994 an appeal decision was reached with American Rivers and the Oregon Rivers Council of the existing forest plan. As part of the appeal resolution the Forest was required to further document the potential eligibility of 10 rivers. The Forest was also required to review rivers for eligibility that had been identified in the Pacific Northwest Rivers Study (FSH 1090.12, chapter 8, Section 8.11, no. 4) and to protect eligible segments of the John Day River, Murderer's Creek, and Little Malheur River, pending analysis of suitability. Forest staff completed this analysis in 1995.

Past Planning Efforts: Umatilla National Forest

Similar to the Wallowa-Whitman National Forest, through agreement between American Rivers and Oregon Rivers Council, 14 rivers of the Umatilla National Forest, including the Tucannon River, were studied for eligibility. Six of the rivers were found to be eligible. If a river was eligible, classification determinations were completed for those rivers and documented in a resource report that was prepared as a "Working Paper" by the Forest. This paper has not been

made available for public review; however, the Forest has provided interim protection and management since that time for the six eligible rivers.

Existing Designated Rivers

Across the Blue Mountains National Forests, there are 11 rivers designated by Congress as Wild and Scenic Rivers. Of those 11 rivers, 201 miles are classified as wild, 95 miles as scenic, and 104 miles are classified as recreational rivers. Two of these rivers are located in Oregon and Idaho and were included in the national system through passage of the Hells Canyon National Recreation Area Act of December 31, 1975, to be managed in accordance with the provisions of the (amended) Wild and Scenic Rivers Act. In 1988, 40 rivers in Oregon were added to the Wild and Scenic River System with the passage of the Omnibus Oregon Wild and Scenic Rivers Act. The Act specified that a comprehensive management plan be prepared for each river included in the Act.

Management areas for each wild and scenic river have been developed for the proposed LMP of the Blue Mountains forests. Those rivers designated by Congress which are part of the National Wild and Scenic River System are allocated to Management Category (MC) 2a – Designated and Eligible WSR. The designated rivers of the Malheur, Umatilla, and Wallowa-Whitman National Forests are shown in table E-1 (next page). Eligible rivers are shown in table E-3.

Identification of Potentially Eligible Rivers

In accordance with the Wild and Scenic River Act at 5(d) (1) and Forest Service Manual policy (FSM 1924.03) a systematic inventory was completed on the Malheur, Umatilla and Wallowa-Whitman NF. Each Forest examined their rivers and streams for eligibility. To be eligible for designation, the river or stream must be perennial, free-flowing and possess one or more outstandingly remarkable values. Thus, the eligibility analysis consisted of an examination of the hydrology, including any human-made alterations, and an inventory of its natural, cultural, and recreational resources.

Free-flowing Rivers

A Forest wide inventory of hundreds of perennial streams and rivers on the Blue Mountains National Forests resulted in the identification of candidate rivers and streams. An eligibility assessment of these candidates was conducted to identify any potential outstandingly remarkable values, as directed by the Forest Service Manual, and to determine the rivers free-flowing characteristics. Based on this assessment 21 rivers and streams (9 on the Umatilla, 11 on the Wallowa-Whitman and 1 on the Malheur National Forests) are eligible for inclusion in the National System.

Outstandingly Remarkable Values

In order to be assessed as outstandingly remarkable, a river-related value must be a unique, rare or exemplary feature that is significant to the Blue Mountains region. Dictionary definitions of the words “unique” and “rare” indicate that such a value would be one that is a “conspicuous example from among a number of similar values that are themselves uncommon or extraordinary.”

The values, which must be directly river-related, include:

- are located in the river or on its immediate shore lands (generally within 1/4 mile on either side of the river);
- contribute substantially to the functioning of the river ecosystem; and/or
- owe their location or existence to the presence of the river.

Table E-1. Miles of and outstandingly remarkable values for designated wild and scenic rivers on each national forest

River Name	Wild	Scenic	Recreational	Outstandingly Remarkable Values
MAL				
Malheur River	6	6	0	Scenery, geology, wildlife habitat, history
North Fork Malheur River	0	25.5	0	Scenery, geology, wildlife, fisheries
Totals	6	31.5	0	
UMA				
Wenaha River	18.7	2.7	0.2	Recreation, scenery, wildlife, fisheries
Grande Ronde River*	17.4	0	1.5	Recreation, fisheries, wildlife
North Fork John Day River*	24.3	10.5	8.9	Scenic, recreation, fisheries, wildlife, cultural
Totals	60.4	13.2	10.6	
WAW				
Eagle Creek	4	6	17	Fish, recreation, scenery, cultural resources, geology/paleontology
Grande Ronde River*	17.4	0	1.5	Recreation, fisheries, wildlife
Joseph Creek	8.6	0	0	Scenic, recreation, geology, fish, water quality, wildlife, cultural resources
Imnaha River	15	0	0	Scenic, recreation, fisheries, wildlife, historic, botanical, cultural resources
Lostine River	5	11	0	Scenic, recreation, fisheries, wildlife, botanical
Minam River	39	0	0	Scenic, recreation, geology, fisheries, wildlife
North Fork John Day River*	3.5	0	6.9	Scenic, recreation, fisheries, wildlife, cultural
North Powder River	0	6	0	Recreation, scenery
Totals	104.3	23	25.4	

* The Grande Ronde and North Fork John Day rivers are listed above for both the Umatilla and Wallowa-Whitman National Forests as administration is shared. Mileage for the North Fork John Day River is divided within the table to reflect the mileage within and administered by each national forest. The Grande Ronde River is part of the administrative boundary between the Umatilla and Wallowa-Whitman National Forests, and the mileage is displayed equally for each of the national forests.

Determining that a river area contains outstandingly remarkable values was a professional judgment that was made by the interdisciplinary team of Forest-level resource specialists, and was based on existing objective, comparative, scientific information.

The following eligibility criteria were used during the Blue Mountains forest plan revision process to evaluate outstanding and remarkable values. A brief question about the value was included to foster comparison and establish common criteria used by the Forests.

Scenery

- Is there a high degree of landscape diversity?
- Has the landscape been modified?
- Is the scenic value unique to the region?

Recreation

- Are the recreation opportunities unique enough to attract visitors from outside the geographic region and would visitors be willing to travel long distances to do so?
- Are interpretive opportunities exceptional?
- Are there opportunities for national or regional competitive events?

Wildlife

- Does the stream contain nationally or regionally important populations of wildlife species?
- Are there known populations of unique or federal- or state-listed wildlife species?
- Are there known populations of candidate, threatened, endangered, and sensitive species?
- Is the diversity of species unique to the region?
- Does the stream corridor provide exceptionally high quality of unique habitat or a critical link in habitat conditions for wildlife of national or regional significance or federal- or state-listed or candidate, threatened, endangered, and sensitive species?
- Is the diversity of habitat unique to the region?

Fisheries

- Is the stream a nationally or regionally important producer of resident and/or anadromous fish species?
- Does the stream contain wild stocks and/or federal- or state-listed threatened, endangered, or sensitive species?
- Is the diversity of species or habitat unique to the region?
- Does the stream provide or have the potential to provide exceptionally high quality habitat for indigenous fish species?

Heritage Resources

- Does the stream corridor contain known occupation sites used by Native Americans that are unusual, have exceptional human interest value, have national or regional importance for interpreting pre-history, been used for sacred purposes, or listed or eligible for listing on the National Register of Historic Places?
- Does the stream corridor contain known site(s) or feature(s) associated with a significant event, important person, or cultural activity from the past that was rare or unusual? Of

particular importance are sites or features that are listed in, or eligible for inclusion in the National Register of Historic Places.

Geologic/Hydrologic

- Does the stream contain an example(s) of rare or unusual geologic or hydrologic features?

Botany/Ecologic

- Does the stream corridor contain nationally or regionally important populations of indigenous plant species that are rare or unique or significant populations of federal- or state-listed or candidate threatened, endangered, or sensitive species?
- Is the diversity of plant communities unique?

Water Quality

- Does the stream have exceptionally pure, clear, and/or clean water when compared to other similar streams in the basin?
- Is this tributary recognized as providing exceptionally high quality water critical for fish, wildlife, recreation, or community uses?

Classification

Once a river or stream was determined eligible, a second determination or "classification" was prepared. This classification identified the level of human alteration and water quality of the river within ¼ mile of the bed and bank. The social and physical setting of the river in its current state determined the classification. Classification does not need to be consistent for the entire eligible stretch of river. An eligible river can have multiple segments each classified differently. The WSRA requires that eligible rivers be classified as one of the following:

- Wild river areas - Those rivers or sections of river that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- Scenic river areas - Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- Recreational river areas - Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

The appropriate classification was assessed from the perspective of each attribute/topic defined in table E-2. This framework was established by the 1982 guidelines developed jointly by the Secretaries of Agriculture and Interior. Individual determinations were considered as a whole to determine classification as a wild, scenic, or recreational river.

Table E-2. Classification attributes for wild, scenic and recreational river status

Attribute	Wild	Scenic	Recreational
Water Resource Development	Free of impoundment.	Free of impoundment.	Some existing impoundment or diversion.
			The existence of low dams, diversions, or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in appearance.
Shoreline Development	Essentially primitive. Little or no evidence of human activity.	Largely primitive and undeveloped. No substantial evidence of human activity.	Some development. Substantial evidence of human activity.
	The presence of a few inconspicuous structures, particularly those of historic or cultural value, is acceptable.	The presence of small communities or dispersed dwellings or farm structures is acceptable.	The presence of extensive residential development and a few commercial structures is acceptable.
	A limited amount of domestic livestock grazing or hay production is acceptable.	The presence of grazing, hay production, or row crops is acceptable.	Lands may have been developed for the full range of agricultural and forestry uses.
	Little or no evidence of past timber harvest. No ongoing timber harvest.	Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank.	May show evidence of past and ongoing timber harvest.
Accessibility	Generally inaccessible except by trail.	Accessible in places by road.	Readily accessible by road or railroad.
	No roads, railroads or other provision for vehicular travel within the river area. A few existing roads leading to the boundary of the area are acceptable.	Roads may occasionally reach or bridge the river. The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	The existence of parallel roads or railroads on one or both banks as well as bridge crossings and other river access points is acceptable.
Water Quality	Meets or exceeds criteria or federally approved state standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the river, and for primary contact recreation (swimming) except where exceeded by natural conditions.	No criteria are prescribed by the Wild and Scenic Rivers Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States are made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable federal and state laws.	No criteria are prescribed by the Wild and Scenic Rivers Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States are made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable federal and state laws.

Summary Evaluation Form

The following is an example of the summary evaluation form used by each Forest to evaluate the rivers and streams in the Blue Mountain Planning area. A report has been completed for each eligible river and is contained within the plan revision files at the Wallowa-Whitman Forest Headquarters

STUDY AREA SUMMARY – Provide locational information and include a map.

Name of River: xxxx

Location: Describe the entire length studied; e.g., from its headwaters to confluence with xx. Additionally, describe each segment:

Segment x – Define termini (including legal description, as necessary). Indicate river miles.

River Mileage: Indicate the entire miles of river studied and portion determined eligible.

Studied: xx miles

Eligible: xx miles

ELIGIBILITY – Include determination of river's free-flow and whether it possesses one or more outstandingly remarkable values

Determination of Free-flow: Describe the assessment of the river's free-flow, by segment, if necessary.

Determination of Outstandingly Remarkable Values: Utilize established guidelines to evaluate specific river resource values and determine which are outstandingly remarkable. Include the criteria, the description of the particular resource value and a finding.

Summary of Outstandingly Remarkable Values: Summarize the individual resource findings by listing the values identified as outstandingly remarkable with a brief rationale.

CLASSIFICATION – Details the inventoried classification. Describe the basis for the classification of each river segment; i.e., the level of development.

Eligibility Summary

As part of the forest plan revision process, the three Forests reviewed their full documentation regarding eligibility and suitability of all perennial streams and rivers located with the planning area. Table F-3 summarizes the potential wild, scenic, or recreational river, their classification, and outstandingly remarkable values for rivers located on each Forest.

The Umatilla National Forest found that some of the study rivers previously identified as eligible were not now found to meet the minimum criteria. Clear Creek is not free-flowing. North Fork Umatilla River, South Fork Umatilla River, Shimmiehorn Creek, South Fork Cable Creek, North Fork Meacham Creek, and South Fork Walla-Walla River are free-flowing but do not have outstandingly remarkable values as defined by the criteria outlined in the Wild and Scenic Rivers Act.

All previously identified study rivers on the Wallowa-Whitman met the established Wild and Scenic Rivers Act criteria, however new candidate rivers were not identified.

The Malheur National Forest revisited the 1995 river resource evaluation to determine if unforeseen or uncontrollable changes had occurred within the watersheds, thus affecting the eligibility of the streams for wild, scenic, or recreational river designation. All streams on the Forest were affected in some way by either uncontrolled wildland fire or by the listing of federally designated anadromous fish species. Fire changed the conditions of many watersheds drastically; impacting habitat, scenery, and water quality to a level which affected the significance of the resource with the exception of one stream. Also the federal listing of anadromous fish species as threatened or endangered was determined to be so regionally broad that the mere presence of a species was no longer regionally significant. The populations and habitat were now recognized under wild, scenic, or recreational river direction at a lesser level of significance when compared within the Columbia/Snake River systems, and thus this singular characteristic did not now exceed the threshold of regional significance that is required for outstandingly remarkable value status. After the 2005 review, the Malheur National Forest determined that one stream located on the Forest met the minimal criteria for designation.

Suitability

The final phase of study addresses the suitability of a river for inclusion in the National Wild and Scenic Rivers System. The Wallowa-Whitman National Forest prepared suitability studies for eleven rivers determined eligible on that national forest. The eleven rivers studied are all or portions of the Big Sheep Creek, Dutch Flat- Van Patton Creek, East Eagle Creek, Five Points Creek, Killamacue/ Rock Creek, Granite Creek, North Fork Catherine Creek, Sheep Creek, Swamp Creek, Upper Grande Ronde River and the Snake River. Of these three were found to be suitable and recommended to congress for inclusion within the Wild and Scenic Rivers System. These recommendations have yet to be forwarded to Congress for action.

A description of the alternatives, including river classification and miles recommended, can be found in The Dutch Flat Creek, Killamacue Creek, and Rock Creek Wild and Scenic River Study Report and EIS (1996) and the Wild and Scenic River Study Report and Final Legislative Environmental Impact Statement for Eight Rivers Administered by the Wallowa-Whitman National Forest (1996).

The suitability study phase will be initiated at a later date for the 10 eligible rivers on the Umatilla and Malheur National Forests. However, the forest plan will provide management direction to protect the free-flowing character, potential classification, and outstandingly remarkable values of eligible rivers until a suitability study is completed and final recommendation to Congress regarding river designation is made.

Each of the 47 candidate rivers evaluated has a Summary Information Document that provides a synopsis of the pertinent information related to eligibility, classification and/or suitability (as applicable). All summary information documents are available in the project record.

Table E-3. Eligible wild and scenic river summary with classification recommendation

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
Lake Creek		
	Wild – 3.3	SCENARY Starting at High Lake the creek is considered a scenic and popular destination in the Strawberry Mountain Wilderness featuring unique rock escarpments and meadows, creating contrast in landform, vegetation, color, climate, and sound. The scenery within view of Lake Creek is an outstandingly remarkable value.
		GEOLOGY The creek flows over large slabs of bed rock with several high mountain meadows, with high concentrations of springs feeding the creek. It is unique geologically: the drops are dramatic with waterfalls and slot canyons all through the rock portions. Based on these factors, the geology is an outstandingly remarkable value.
		VEGETATION/BOTANICAL High meadow systems have created unique features with spruce bogs present along the creek, further influencing the creek and meadow systems. The vegetation/botanical resources of Lake Creek is an outstandingly remarkable value.
Bear Creek		
From the headwaters to confluence with Tucannon River	Wild – 3	FISHERIES - Bear Creek contains native Chinook, bull trout and steelhead, which are federally-listed as threatened under ESA. Bull trout populations in the Tucannon River are considered isolated and unique. Habitat is limited but pristine. The assessment finds the fisheries habitat and populations to be outstandingly remarkable values.
Butte Creek		
From headwaters to confluence with the mainstem Wenaha River	Wild – 8	SCENERY - The Wenaha River and surrounding Wenaha -Tucannon Wilderness, including Butte Creek, is recognized nationally for its scenic qualities. The mosaic of vegetation and stark ruggedness of the landscape contribute to an exceptional scenic quality. Scenery qualifies as an outstandingly remarkable value.
		FISHERIES - Butte Creek contains native Chinook, which have been identified as unique and bull trout and steelhead, which are listed as threatened under the ESA. Bull trout populations are considered one of the healthiest in the Grande Ronde subbasin. The habitat is pristine. The assessment finds the fisheries habitat and populations to be outstandingly remarkable values.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
Desolation Creek		
The mainstem of Desolation Creek from the confluence of the north and south forks to the confluence with the North Fork John Day River	Recreational – 21.5	RECREATION - Combined amenities of a large big game population, good roaded access to trailhead locations, adjacency to large, remote backcountry areas and desirable campsites within the river corridor make this a desirable destination. Conditions of the river-related setting make recreation an outstandingly remarkable value.
		BOTANICAL/ECOLOGICAL - Regionally unique and rare plant species have been identified in Desolation Meadow. The stream corridor displays a broad range of botanic diversity due to its size and broad change in elevation. The ecological diversity is exceptional and exhibits outstandingly remarkable values for botany and plant ecology.
Granite Creek		
From the confluence with Clear Creek to the confluence with North Fork John Day River	Recreational – 7.9	FISHERIES - Granite Creek supports bull trout, steelhead, Chinook Salmon, and redband trout and is one of the few high quality spawning habitats for Chinook Salmon. The fisheries resources are important to the health of the ecosystem and to bolster the populations of Chinook salmon within the John Day Basin. This stream is one of the few high quality spawning habitats for Chinook Salmon. The assessment finds the fisheries habitat and populations to be outstandingly remarkable values.
Lookinglass Creek		
From the unnamed tributary in section 3 near Bald Mountain lookout to the forest boundary	Wild – 7	FISHERIES - Lookinglass Creek contains wild stocks of three federally-listed species, provides exceptionally high quality habitat for indigenous fish species, and is designated critical habitat for bull trout, the fisheries resource in Lookingglass. The assessment finds the fisheries habitat and populations to be outstandingly remarkable values.
		HYDROLOGIC - The impact that the springs near Summer Creek have on the water quantity and quality is rare in the Blue Mountains. The temperature and condition of the water that enters the stream course from this source provides the foundation for fisheries resources in the creek. Lookingglass Springs is visually impressive with the flow of the springs gushing from the bank and streambed growing forty-fold over a distance of a couple of hundred yards. The hydrology of Lookingglass is an outstandingly remarkable value.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
North Fork Desolation Creek		
Headwaters to confluence with Main Desolation Creek	Scenic – 7	BOTANICAL/ECOLOGICAL - Regionally unique and rare plant species have been identified in the meadows along the stream corridor which displays a broad range of botanic diversity due to its size and broad change in elevation. The ecological diversity is exceptional and exhibits outstandingly remarkable values for botany and plant ecology.
North Fork Wenaha and South Fork Wenaha River		
North Fork Wenaha from headwaters to confluence with mainstem Wenaha River, and South Fork Wenaha from headwaters to confluence with mainstem Wenaha River	Wild – 18	SCENERY - The Wenaha River and surrounding Wenaha -Tucannon Wilderness is recognized nationally for its scenic qualities. The mosaic of vegetation and stark ruggedness of the landscape contribute to an exceptional scenic quality. Scenery qualifies as an outstandingly remarkable value.
		FISHERIES – The Wenaha River system contains native Chinook, bull trout, and steelhead which are listed as threatened under ESA. Bull trout populations are considered as one of the healthiest in the Grande Ronde subbasin. The habitat is pristine. The assessment finds the fisheries habitat and populations to be outstandingly remarkable values.
		BOTANICAL/ECOLOGICAL - The large elevational range, little disturbance to bank vegetation, and presence of old growth habitat are special attributes. High likelihood of sensitive or threatened species located within the corridor. The area contains outstandingly remarkable value botanic resources.
Sheep Creek (Washington)		
Upstream from the confluence with Tucannon River	Recreation – 0.5	SCENERY - Sheep Creek Falls is a scenic location that specifically attracts visitors to this area and has been long noted for its unusual vegetation. Flora accompanied by rock walls of overhanging moss and spring water creates an aesthetic environment and scenery within the corridor is special and unique. Scenery qualifies as an outstandingly remarkable value.
		FISHERIES - Sheep Creek contains native Chinook, bull trout, and steelhead, which are federally-listed as threatened under the ESA. Bull trout populations in Tucannon River are considered isolated and unique. Habitat is limited but pristine. The assessment finds the fisheries habitat and populations to be outstandingly remarkable values.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		BOTANICAL/ECOLOGICAL - The plant communities are unusually diverse and represent some uncommon species. The Sheep Creek Falls refugia is a botanical Special Interest Area and is a recreation attraction. The area contains outstandingly remarkable value botanic resources.
South Fork Desolation Creek		
Headwaters to confluence with main Desolation Creek	Scenic – 9	FISHERIES - Isolated fish populations in the upper portion have significance as a genetic resource and the lower portion provides spawning habitat for steelhead, Chinook, redband trout, and Columbia River bull trout. The diversity of habitat is unique to the region. The populations and habitat comprise an outstandingly remarkable value fisheries.
		BOTANICAL/ECOLOGICAL - Regionally unique and rare plant species have been identified in the high elevation meadows along the stream corridor. The stream corridor displays a broad range of botanic diversity due to the fire-dependent ecosystems. The ecological diversity is exceptional and exhibits outstandingly remarkable values for botany and plant ecology.
Tucannon River		
From headwaters to the Tucannon Guard Station	Wild – 9.1, Scenic – 4.6, Recreation – 8.6	RECREATION - Because of this river setting, most use originates outside the local area. The river-related environment is the focal attraction, particularly attractive to visitors seeking sightseeing, camping, fishing, wildlife viewing, photography, hiking, and other outdoor activities in a natural appearing landscape. Camp Wooten instills a lifelong allegiance to the corridor for many youth. Potential interpretive opportunities are varied and could reach a wide audience. Conditions of the river-related setting make recreation an outstandingly remarkable value.
		FISHERIES - Each drainage has some distinct genetic traits. Endangered and sensitive listed fish are present and the complex habitat is exemplary. The populations along with the habitat comprise an outstandingly remarkable value for fisheries.
		CULTURAL/HISTORIC - The Tucannon River corridor has a long history of settlement, resource use, and recreation and some historic evidence exists. Early maps show homesteads, a sawmill, schoolhouse, trail system, roads, telephone lines, camps, and a ranger station. Interpretation may enhance the value of recognized heritage resources. The presence of old structures, along with the likelihood of other historic finds, make the historic resource an outstandingly remarkable value.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		BOTANY/ECOLOGY - The general condition, health, and stability of the riparian vegetation is among the highest in the Blue Mountains. The plant community is unusually diverse representing some uncommon species. Sheep Creek Falls is the basis for a Botanical Special Interest Area. The complex riparian habitat is critical for survival of endangered and sensitive fish species. The area contains outstandingly remarkable value botanic resources.
Big Sheep Creek		
From the headwaters (and including) the North Fork, Middle Fork and South Fork to the Imnaha WSR boundary.	Wild – 9.5 Recreation – 38.5	RECREATION - The quality, variety, and year-round recreation opportunities available along middle and upper Big Sheep Creek make it a popular area with local and regional visitors. The stream corridor is an excellent area for viewing wildlife. Conditions of the river-related setting make recreation an outstandingly remarkable value upstream from Carrol Creek.
		FISHERIES – Populations of Chinook salmon; steelhead; native rainbow trout; and established bull trout are present. Big Sheep Creek supports populations of fish species that are regionally and nationally important, and has a great potential for high-quality fisheries habitat for indigenous stocks. The populations along with the habitat comprise an outstandingly remarkable value fisheries value.
		CULTURAL/PREHISTORIC – There are known sites that are either named to the National Register of Historic Places or are eligible and the stream corridor contains a unique concentration of prehistoric sites. The presence of old structures and historical human interest make the historic resource an outstandingly remarkable value.
Dutch Flat/ Van Patton Creek		
From the Headwaters of Dutch Flat Creek to the forest boundary including Van Patton Creek from Van Patton Lake to its confluence with Dutch Flat Creek.	Wild – 9.1	SCENERY - Plant diversity, mountain meadows, and mountain vistas of rugged Elkhorn Ridge provide year long, high-quality scenic values in the stream corridor. Natural patterns created by topography and natural processes such as lightning fires, avalanches, and rock slides, dominate the landscape character. The scenic diversity in landform, color, and vegetation qualifies as an outstandingly remarkable value.
		RECREATION - The Dutch Flat Creek system offers a diversity of remote, semi-primitive recreation opportunities including hunting, fishing, hiking, mountain biking, sightseeing and horseback riding. The variety and remoteness of opportunities in the corridor provide an outstandingly remarkable value for recreation.
		GEOLOGIC - Excellent examples of glacial plucking, striation, and polish, and exfoliation features that in some locations rival features preserved in Yosemite National Park. Dutch Flat Creek and Van Patton Creek are determined to contain outstandingly remarkable value for geologic features.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		HYDROLOGY - The high gradient reaches below Dutch Flat Lake are characterized by steep riffles and water cascading over boulders. Dutch Flat Creek provides excellent examples of several distinct types of distinctive stream channels not represented by other established northeastern Oregon Wild and Scenic Rivers. The hydrology of Dutch Flat Creek was considered to be outstandingly remarkable value from its confluence with Van Patton Creek to its headwaters.
		BOTANICAL/ECOLOGICAL – Sensitive plants species occur in the upper reaches of Dutch Flat Creek including *Allium madidum* and *Lycopodium annotinum*. The ecological diversity is exceptional and exhibits outstandingly remarkable value for botany and plant ecology in the upper reaches of Dutch Flat Creek.
East Eagle Creek		
Headwaters in the Eagle Cap Wilderness to the confluence of Eagle and East Eagle Creeks.	Scenic – 2.0 Wild – 9.0 Recreation – 4.5	SCENERY - Attractions that combine to create East Eagle Creek's scenic beauty are the glaciated landscape; the steep, forested canyon with numerous waterfalls, rapids, and deep pools; and the views of Granite Cliff and Krag Peak. Vegetation diversity includes lush meadows; subalpine fir and spruce; larch, fir, and ponderosa pine forests; and grassy openings. East Eagle Creek has been a focus of human interest since the turn of the century, however visual impacts remain relatively minor and the drainage presents an overall natural landscape. The scenic diversity in landform, water, color, and vegetation qualifies as an outstandingly remarkable value.
		RECREATION - The quality and diversity of dispersed recreation opportunities available along the East Eagle Creek make it a popular area almost year-round. There are exceptional opportunities to develop interpretive sites or tours to explain the area's unique natural and cultural history. Interpretation of the area's gold mining history could be developed to complement the other nearby historic sites such as the Oregon Trail Interpretive Center, potentially attracting visitors from outside the geographic region. Conditions of the river-related setting make recreation an outstandingly remarkable value.
		FISHERIES - East Eagle Creek is known for its excellent trout fishing and supports significant fishing activity throughout the season. The importance of the existing good-to-high-quality habitat which supports native trout, possibly including bull trout is notable. The populations along with the habitat comprise an outstandingly remarkable value for fisheries.
		HYDROLOGIC – East Eagle Creek's excellent water quality and near-natural hydrologic regime are important factors. The water quality is determined to be an outstandingly remarkable value.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		GEOLOGIC - The variety of rare and exemplary geologic features in the corridor, particularly in the middle and lower reaches of East Eagle Creek merit the recognition. The quality, variety, and importance of the geology qualify as an outstandingly remarkable value.
		CULTURAL/HISTORIC - The settlement of northeast Oregon is tied to the discovery of gold and East Eagle Creek still has much evidence of this history. Outstanding opportunities exist to interpret a number of features located in fairly close proximity within the corridor. The presence of old structures and historical human interest make the historic resource an outstandingly remarkable value.
Five Points Creek		
Headwaters north of the confluence with the Middle Fork of Five Points Creek to the NF boundary about ¼-mile southwest of Blacksmith Canyon.	Wild – 12	SCENERY - The combination of distinctive landscape elements, lack of cultural modifications, and the primitive and undisturbed nature of the view shed are notable. Scenery qualifies as an outstandingly remarkable value.
		FISHERIES - The presence of summer steelhead and native rainbow trout populations and the existing “high quality” of fisheries habitat (specifically water quality, low temperatures, low turbidity) for indigenous stocks and for spring/summer Chinook salmon in the Grande Ronde River. The populations along with the habitat comprise an outstandingly remarkable value for fisheries.
		WILDLIFE – The existing habitat is significant and the presence of wildlife species of interest, including the bald eagle and a significant population of elk are notable. The quality, variety, and importance of existing wildlife habitat, comprise an outstandingly remarkable value for wildlife.
Granite Creek (Idaho)		
Headwaters in the Seven Devils Mountains to the Snake WSR boundary.	Wild – 12.5	SCENERY - The variety in the landscape in Granite Creek is dramatic and memorable. Transcending from glaciated landscape to steep forested canyon to dry bunchgrass canyon and then to green riparian vegetation. The contrast between the lush green meadows, subalpine forests of the upper portion and the grass-covered slopes with prickly pear and greenbush in the lower portion is notable. The entire drainage, for its whole length from rim to rim, is essentially undeveloped, presenting a vestige of primitive America. The scenic diversity in landform, water, color, and vegetation qualifies as an outstandingly remarkable value.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		FISHERIES - The presence of spring Chinook, steelhead, and native rainbow trout along with the possibility of native cutthroat and bull trout populations are notable. In addition, Granite Creek supports populations of fish species that are regionally and nationally important, and has high quality fisheries habitat for indigenous stocks. The populations along with the habitat comprise an outstandingly remarkable value for fisheries.
		WILDLIFE - The diversity of habitat, inaccessibility, and quality of the habitat as well as the present and potential use of the area by threatened and endangered species including peregrine falcon, wolf, and grizzly bear. The quality, variety, and importance of existing wildlife habitat, comprise outstandingly remarkable value for wildlife.
		BOTANICAL/ECOLOGAL - Unique to Granite Creek is the diversity of plant species and the number of plant communities found in the corridor, which encompass at least four major habitat types. And the habitat for six potential threatened and endangered plant species exists. – A portion of a Research Natural Area is also located in the corridor. The ecological diversity is exceptional and exhibits outstandingly remarkable values for botany and plant ecology.
Killamacue/ Rock Creek		
Killamacue Creek from its headwaters to the diversion ditch near the confluence with Rock Creek, and Rock Creek from below the outlet of Rock Creek Dam to the NF boundary including North Fork and South Fork Rock Creek.	Wild – 11.9 Scenic – 7.0	SCENERY - High-quality scenic values include plant diversity, mountain meadows, and mountain vistas of the Elkhorns, a rocky and rugged range with aspen groves scattered among granite outcroppings. Other outstanding scenery associated with rock forms, timber stands and open alpine and subalpine vistas exhibit an overall natural and undeveloped character. Scenery in these drainages qualifies as an outstandingly remarkable value.
		RECREATION - The Rock Creek corridor offers a unique opportunity in northeast Oregon to access a relatively primitive setting by four-wheel drive vehicle. The amount of semi-primitive roads in an area this large makes it unique to the region and important for semi-primitive motorized travel recreational opportunities with easy access from Interstate 84 and the Baker Valley. The Killamacue and Rock Creek system offer a diversity of semiprimitive recreation opportunities in a remote relatively primitive setting with low use. The variety and remoteness of recreation opportunities in the corridor provide an outstandingly remarkable value for recreation.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		GEOLOGIC - The upper drainages of the North Fork of Rock Creek and of Killamacue Creek contain exposures of a rare rock type called lamprophyre. Study of these rocks will provide outstanding and critical contributions to understanding the tectonic history of northeast Oregon. Killamacue Creek drainage contains a narrow glacial hanging valley and the polished outcrops and rounded glacial forms are easily visible, easy to access, and major in scope. The quality, variety, and importance of the geology qualify as an outstandingly remarkable value.
		BOTANICAL/ECOLOGICAL - Killamacue Creek has nine different wetland types along the relatively short study reach and the number and diversity of wetland types is unique in such a small area. Because the plants, meadows, riparian areas, and plant associations are common in northeast Oregon, Rock Creek does not contain ecological/botanical outstandingly remarkable value values, although some sensitive plant species are present. Killamacue Creek exhibits outstandingly remarkable values for ecological and botanical values.
North Fork Catherine Creek		
From its headwaters in the Eagle Cap Wilderness to the National Forest boundary near its confluence with South Fork Catherine Creek.	Wild- 10.5 (from headwaters to Catherine Creek Campground) Recreation – 2.5 (from Catherine creek campground to NF boundary)	SCENERY - The North Fork Catherine Creek drainage possesses scenic features notable in the geographic region. Some of the attributes that contribute to the scenic value of the area include the diversity of landforms from the glaciated headwaters to the dissected basalt uplands found lower in the corridor, the free-flowing river, and the diversity of vegetation. The scenery of the area qualifies as an outstandingly remarkable value.
		RECREATION - The quality and diversity of recreational opportunities available in the North Fork Catherine Creek corridor makes it a popular area with local residents and draws a substantial number of visitors from outside the region. Conditions of the river-related setting make recreation an outstandingly remarkable value.
		FISHERIES - The presence of stable habitat supporting four salmonid species, including three federally listed species, is highly significant regionally. Critical spring/summer Chinook salmon spawning habitat is found in this portion of the river. The populations along with the habitat comprise an outstandingly remarkable value for fisheries.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		WILDLIFE - The presence of high-quality wildlife habitat; the number of kinds of habitat; the presence of unique habitat; the juxtapositions of habitats; the contiguous nature of riparian corridors; all contribute to an ecosystem component unmatched in diversity. The diversity of vegetation, number of natural edges utilized by big-game and nongame species, and presence of old-growth mixed conifer stands in the corridor, provide important habitat for a variety of wildlife species. The diversity of habitat found in the corridor supports a finding of outstandingly remarkable value.
Sheep Creek (Idaho)		
Headwaters in the Seven Devils Mountains to the Snake WSR boundary.	Wild – 15.6	SCENERY - The corridor possesses a great deal of diversity in landform, water, color, and vegetation. Scenic attributes include glaciated landscapes, numerous waterfalls, steep forested canyons, and dominant views of the Seven Devils as well a an abrupt change to grass-covered slopes with associated prickly pear cactus zone. The beauty of Sheep Creek can be viewed from the trails within the drainage as well as from the Heavens Gate Scenic Overlook. The scenic diversity in landform, watercolor, and vegetation qualifies as an outstandingly remarkable value.
		BOTANICAL/ECOLOGICAL - Unique to Sheep Creek is the diversity of plant species and the number of plant communities found in the corridor encompassing at least four major habitat types. In addition, habitat for six potential threatened and endangered plant species. The ecological diversity is exceptional and exhibits outstandingly remarkable value for botany and plant ecology.
		FISHERIES - Sheep Creek supports populations of fish species that are regionally and nationally important including Chinook Salmon and steelhead, and high-quality fisheries habitat for indigenous stocks such as native rainbow and bull trout. The populations along with the habitat comprise an outstandingly remarkable value for fisheries.
		WILDLIFE – The area's inaccessibility as well as the diversity and quality of the habitat and potential use of the area by threatened and endangered species such as peregrine falcon, wolf, and grizzly bear provide excellent wildlife values in the Sheep Creek corridor. The quality, variety, and importance of existing wildlife habitat, comprise an outstandingly remarkable value for wildlife.
		CULTURAL/PREHISTORIC - The Sheep Creek corridor contains a unique concentration of prehistoric sites including a large village and other known significant sites. Known cultural resources present in the corridor and potential future discoveries, make the cultural and historic resource an outstandingly remarkable value.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
Snake River		
North end of designated waterway to forest boundary near Cache Creek	4.29 miles	SCENERY - The river corridor is recognized nationally for its scenic qualities. Great contrasts in landform, vegetation, color, climate and sound are found. The scenery within view of the Snake River is an outstandingly remarkable value.
		RECREATION - The wide range of available recreation activities, the unique backcountry river setting, and the diversity of users combine to make recreation an outstandingly remarkable value value.
		GEOLOGIC - The geological research potential of the river corridor and adjacent canyon is significant. The canyon has been the source of numerous research projects. Based on these factors, the geology is an outstandingly remarkable value.
		WILDLIFE - The number and diversity of wildlife species that inhabit the corridor establishes its importance as wildlife habitat. The area incorporates significant migration, wintering, and year-round habitat for numerous wildlife species and provides opportunities for human interactions. Wildlife and wildlife habitat are outstandingly remarkable values of the river corridor.
		FISHERIES - The diverse fish stocks are important internationally, nationally, and regionally for their sport fishing, commercial, historic values, and contribution to river ecology. The anadromous fisheries are important as producers for high seas commercial fish harvest. Nationally and regionally, the river is known for its abundant, unique, and diverse sport fishery. The Snake River supports stocks of anadromous fish as well as resident species of native fish. Federally listed threatened, endangered, and sensitive species occur throughout the segment. Fisheries is an outstandingly remarkable value of the Snake River.
		CULTURAL/HISTORIC and PREHISTORIC - The river corridor contains one of the richest accumulations of riverine archaeological resources in western North America. Historic site types include the remnants of subsistence homesteads, mining sites, shipwrecks, and steamboat landings. Prehistoric site types include pithouse village sites, rock shelters, and rock art sites. The research potential of the river corridor is unlimited and has been the basis for numerous professional publications. The historic and prehistoric cultural resources within the Snake River corridor represent an outstandingly remarkable value.
		VEGETATION/BOTANICAL - Few locations in the Pacific Northwest, or western North America, equal the Snake River canyon in the concentration and number of rare or endemic plant species. The vegetation/botanical resource of the Snake River corridor is an outstandingly remarkable value.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		ECOLOGICAL - The special river environment that reflects the values inherent in the scenic, geologic, fisheries and wildlife resources indicate the uniqueness and importance of the river corridor. Unusual and specific relationships in the flora and fauna of the river corridor make ecological aspects of the Snake River an outstandingly remarkable value.
Swamp Creek		
From the National Forest boundary to the WSR boundary.	Wild – 8.5 Recreation – 9.5	FISHERIES - In addition, Swamp Creek supports a wild summer steelhead population that is regionally important, and has potential for high-quality fisheries habitat for indigenous stocks including native rainbow trout populations. The populations along with the habitat comprise an outstandingly remarkable value for fisheries
		WILDLIFE - The inaccessibility, diversity, and significance of the wildlife populations in Swamp Creek along with the presence of bald eagles and the large stretch of riparian habitat make the area important. The quality, variety, and importance of existing wildlife habitat, comprise outstandingly remarkable value for wildlife.
		CULTURAL/HISTORIC - The Swamp Creek stream corridor plays a vital role in Nez Perce tribal history. Most important is the proximity to the gathering place for Chief Joseph and his band at the confluence of the Grande Ronde River and Joseph Creek. In addition, the old homesteads and evidence of railroad logging add to the interpretive potential of the area. Important cultural resources along with the presence of old structures and historical human interest make the cultural and historic resource an outstandingly remarkable value.
Upper Grand Ronde River		
Headwaters to the National Forest boundary near the mouth of Fly Creek	Wild – 11 Recreation – 19	RECREATION - The quality and variety of recreation opportunities available along the Upper Grande Ronde River make it a popular area with local and regional visitors. The river corridor is an excellent area for viewing wildlife and is one of the most heavily used areas in the state during the fall big game hunting seasons. Conditions of the river-related setting make recreation an outstandingly remarkable value.
		FISHERIES – This river provides critical spring and summer spawning habitat for Chinook salmon, steelhead, and bull trout species. The fish populations along with the habitat comprise an outstandingly remarkable value for fisheries.
		WILDLIFE - The presence of suitable habitat for bald eagles and their use of the river corridor; high quality and quantity of wildlife habitat; the presence of unique habitat; the juxtapositions of habitats and contiguous nature of riparian corridors, all contribute to an uncommon ecosystem. The quality, variety, and importance of existing wildlife habitat, comprise an outstandingly remarkable value for wildlife.

Description of Segment Potential	Potential Classification (miles)	Summary of Outstandingly Remarkable Values
		CULTURAL/HISTORIC - There are several features of historical human interest in the corridor. The splash dam in Vey Meadows is a relatively unique feature for northeast Oregon as well as the Camp Carson historic mining district which is potentially eligible for the National Register of Historic Places. Interpretive opportunities are excellent. The presence of old structures and historical human interest make the historic resource an outstandingly remarkable value.

Appendix F: Wilderness Evaluation

Introduction

When revising a land management plan, the national forests are required by the National Forest Management Act (NFMA) to evaluate potential wilderness areas and to determine whether these areas should be recommended to Congress for wilderness designation. This document describes the process used to evaluate the wilderness potential of 76 areas within the Blue Mountains forests plan revision area.

The forest plan revision team determined suitability of potential wilderness areas for Wilderness designation by evaluating capability, availability and need. There were are 76 potential wilderness areas identified within the Blue Mountains national forests, and each was evaluated for these attributes. The Wilderness Need Evaluation (March 25, 2010) was completed for the entire Blue Mountains forests plan revision area and many of these areas were determined to have capacity and availability for wilderness designation; however, a need was not identified to be present. While an area may not 'need' to be formally designated to protect resources, there may be other reasons for proposing designation. Political and social factors also play a part in deciding whether to propose areas for inclusion in the wilderness system; these factors are not addressed in this evaluation.

The following documents are available in the project record and provide more detailed information on the wilderness evaluation:

- Wilderness Area Need Evaluation (March 2010)
- Malheur National Forest Review of Areas with Wilderness Potential (March 2010)
- Umatilla National Forest Review of Areas with Wilderness Potential (March 2010)
- Wallowa-Whitman National Forest Review of Areas with Wilderness Potential (March 2010)

Potential Wilderness Areas

The analysis first examined the current inventoried roadless areas (areas identified in Appendix C --Inventoried Roadless Areas, of each forest's 1990 Land and Resource Management Plan Final EIS) to determine if these areas met the criteria for potential wilderness areas. Some areas in the inventory did not meet the criteria for wilderness designation. In addition, the remaining forest system lands in the three forests were examined to see if there are other areas with wilderness potential. Several areas were found that met the wilderness criteria stipulated in FSH 1909.12 71.1 – Inventory Criteria. Both these efforts followed direction outlined in the implementing regulations for the NFMA (36 CFR 219.18) and Forest Service Handbook (FSH 1909.12, Chapter 70) which states: "Areas qualify for placement on the potential wilderness inventory if they meet the statutory definition of wilderness. Include areas that meet either criteria 1 and 3, or criteria 2 and 3 below.

1. Areas contain 5,000 acres or more.
2. Areas contain less than 5,000 acres, but can meet one or more of the following criteria:

- Areas can be preserved due to physical terrain and natural conditions;
- Areas are self-contained ecosystems, such as an island, that can be effectively managed as a separate unit of the National Wilderness Preservation System; and
- Areas are contiguous to existing wilderness, primitive areas, administration-endorsed wilderness, or potential wilderness in other Federal ownership, regardless of their size.

3. Areas do not contain forest roads (36 CFR 212.1) or other permanently authorized roads, except as permitted in areas east of the 100th meridian (sec. 71.12)."

All areas meeting the criteria for wilderness designation were considered potential wilderness areas and evaluated as possible recommendations for designation as wilderness.

Through this process, 76 potential wilderness areas were identified within the Blue Mountains national forests. These areas cover 705,310 acres or 13 percent of the National Forest System lands. Refer to individual forests Review of Areas with Wilderness Potential for a complete list of each of the 76 areas by national forest.

Suitability Analysis

Three tests—capability, availability, and need—were used to determine suitability as described in Forest Service Handbook 1909.12, chapter 70. In addition to the inherent wilderness qualities an area might possess, the area must provide opportunities and experiences that are dependent on and enhanced by a wilderness environment. The area and boundaries must allow the area to be managed as wilderness.

- Capability is the degree to which the area contains the basic characteristics that make it suitable for wilderness recommendation without regard to its availability for or need as wilderness. All areas that are determined to be capable are evaluated for availability. (FSH 1909.12 Chapter 70 subpart 72.1)
- Availability of the area for wilderness designation is conditioned by the value of and need for wilderness resource compared to the value of and need for other resources. (FSH 1909.12 Chapter 70, subpart 72.2)
- Need for wilderness designation is determined through an analysis of the degree to which an area contributes to the National Wilderness Preservation System based on several factors on both a regional and a local basis. (FSH 1909.12 Chapter 70 subpart 72.3)

Capability and Availability Evaluation

Determining the capability of an area to provide a wilderness experience considers elements, activities, or features that describe the basic characteristics of wilderness. Criteria were established to consider existing as well as future conditions within and adjacent to the inventoried roadless area. The criteria are shown in table F-1.

Table F-1. Area capability assessment criteria

High	Moderate	Low
Environmental Elements		
Opportunity for Solitude		
• Feeling of being alone or remote from civilization. • The possibility of meeting another party is remote. • Recreation use is light.	• Feeling of being alone is possible but signs of civilization are likely. • The possibility of meeting or not meeting another party is about equal. • Recreation use is moderate.	• Little opportunity of feeling alone. • It would be rare NOT to meet another party. • Recreation use is high.
Natural Integrity of the Area		
• Free of human disturbance, or appears to be natural. • Area visible (outside of the area) human disturbances do not dominate the view. • Only minor improvements such as a trail. • Noxious weeds not evident	• Mostly free of human disturbance, Natural Disturbance evident but does not dominate the area. • Area visible (outside of the area) has signs of human activities such as roads or structures. • Several minor improvements. • Noxious weeds evident in isolated spots	• Signs of human disturbances, natural disturbance dominates the landscape, such as a stand replacing wildfire. • Area visible in surrounding foreground shows obvious human activity such as clearcuts or a town. • Major improvements such as a powerline, dam or road. • Noxious weeds common or scattered throughout the area
Provides Challenge and Adventure		
• Terrain generally rugged. • Requires above average physical ability, knowledge, or skill to recreate safely in the area.	• Terrain typical for general forest area. • Requires similar physical ability, knowledge, or skill as the general forested area.	• Terrain more gentle and rolling. • Area easily accessible; requires average physical ability, limited knowledge and skill as compared to the abilities required in the general forested area.
Primitive Outdoor Recreation Opportunities		
Hiking Opportunities		
• Two or more trails, class 3 or higher, routinely maintained. • Terrain is gentle and vegetation open to allow easy cross-country travel.	• At least one trail, class 2 or higher, routinely maintained. • Terrain that is moderate or vegetation brushy that impedes cross-country travel.	• No system trails that are maintained. • Terrain is steep or vegetation too dense that cross-country travel is difficult.
Backpacking Opportunities		
• Two or more trails, class 3 or higher, routinely maintained. • Area has several dispersed campsites that are routinely used.	• At least one trail, class 2 or higher, routinely maintained. • Area has at least one dispersed campsite that is occasionally used.	• No system trails that are maintained. • Area does not have dispersed campsites, but progressive camping may occur.

High	Moderate	Low
Horseback Riding/Saddle Stock		
• At least one trail, class 3 or higher, designed for saddle stock and routinely maintained. • Trailhead with stock facilities, such as unloading ramp.	• At least one trail, class 2 or higher, suitable for saddle stock and routinely maintained. • Trailhead has room to turn around stock truck or stock trailer.	• No system trails that are maintained. • Trailhead does not support use of stock.
Hunting		
• Good populations of the big game animals or fair population of permitted animals such as bighorn sheep or mountain goats. • Terrain is gentle and vegetation open to allow easy hunting access off trails and ridges.	• Fair populations of game animals. • Terrain is moderately steep or vegetation brushy that limits hunting on much of the area.	• Has scattered small herds of big game animals. • Terrain is steep or vegetation too dense that hunting is limited to trails or ridges.
Fishing		
• Good populations of native game fish. • Stream bottoms are generally gentle with minor brush allowing access to water.	• Fair populations of native game fish. • Stream channel has enough brush to limit access; channel bottom or side slopes not overly steep.	• Low populations of native game fish. • Stream channel steep, or steep rocky side slopes, or brush along channel makes access difficult.
Cross-country Skiing/Snowshoeing		
• Terrain is gentle and vegetation open to allow easy cross-country travel. • Area is easily accessible in winter by motorized wheeled vehicles.	• Terrain is moderate or vegetation brushy that impedes cross-country travel. • Snow keeps wheeled vehicles several miles from area but access is possible by snowmobile.	• Terrain is steep, or vegetation too dense that cross-country travel is difficult. • Area difficult or rarely accessed by snowmobile
Special Features		
Unique Fish, Wildlife, Plants and/or Plant Associations		
• Diverse community of native mammals, birds and fish. • There is a known high variety of threatened, endangered and sensitive species within the area. • Overall habitat integrity rating of high. • Provides critical linkage between wildlife areas or habitats.	• Moderate variety of native mammals, birds and fish. • There is a known moderate variety of threatened, endangered and sensitive species within the area. • Overall habitat integrity rating of moderate. • Provides linkage between wildlife areas or habitats.	• Community of native mammals, birds and fish is not diverse. • There is a known low variety of threatened, endangered and sensitive species within the area. • Overall habitat integrity rating of low. • Does not provide linkage between wildlife areas or habitats.
Potential or Existing Research Natural Area		
• Area contains an established special area such as a research natural area.	• Area contains a candidate or eligible research natural area.	• Area does not contain potential or eligible area for research natural area.

High	Moderate	Low
Scenic Features		
• Area has peaks or rocky formations considered spectacular from the rest of the Forest and/or special vegetative features that are considered very scenic.	• Area has a peak or formation that stands out from surrounding terrain and/or vegetative features considered scenic.	• Terrain is typical of the forest or surrounding area and the vegetation is common to the surrounding area.
Significant Cultural Resources		
• IRA contains several historic or prehistoric areas or sites such as those eligible as National Register Historic Sites. • Identified values are unique to the Blue Mountain area.	• IRA contains at least one historic or prehistoric area or site such as those eligible as National Register Historic Sites. • Identified values are common in Northwestern U.S., but are uncommon in the Blue Mountain area.	• IRA contains no historic or prehistoric areas or sites such as those eligible as National Register Historic Sites. • Identified values are common to the northwest U.S. and to the Blue Mountain area.
Manageable Boundaries		
Recognizable Boundaries or conform to terrain		
• Vast majority of boundary follows features that can be identified on the ground such as dominant ridge, creek, road or trail. • Boundary can be easily adjusted to follow locatable and identifiable features without significantly modifying the area boundaries.	• More than half of the boundary follows a feature that can be easily found on the ground. • Boundary can be adjusted to follow locatable and identifiable features but will modify the general size and shape of the IRA. Boundary may be identified with minimal signing.	• Boundary generally lies across the hillside and can rarely be located without equipment, such as GPS unit. • Boundary cannot be adjusted to follow locatable and identifiable features, or requires extensive signing.
Boundary isolates area from Influence by outside activities		
• Area accessed by trail or closed and revegetated road; adjacent area has natural setting. • No active disturbance near boundary. • Natural processes take place undisturbed and unmanipulated.	• May be accessed by narrow or two track open road that is lightly traveled; minimal human presence is evident. • May have disturbance near boundary, but it is short term such as a logging operation. • Minimal disturbance of natural processes.	• Boundary adjacent to heavily used road or along area showing high human presence, such as private lands with structures or cultivated land. • Boundary adjacent to long-term disturbance like farmland or mining operations. • Natural processes cannot occur without human intervention.
Boundaries are Manageable		
• Boundary total on National Forest and not adjacent to private lands. • No inholdings.	• Boundary follows property line forming irregular shape. • Few small inholdings may be present.	• Boundary crosses private property so there are inholdings along the boundary. • Several small or large inholdings.

High	Moderate	Low
Boundaries are a barrier to prohibited uses		
• Topographic features provide a natural barrier, such as major stream of steep hillside. • Human improvement is significant to physically provide a barrier, such as a road cut slope.	• Topography generally makes it difficult to participate in prohibited uses. • Human improvement places user on notice of prohibited use, such as a sign.	• Topography not a deterrent to prohibited uses. • Human improvement not a deterrent; may provide a point of access of prohibited uses.

Using these criteria, the capability of each area was rated by the forest plan interdisciplinary revision team as high, moderate/high, moderate, moderate/low, or low. Moderate/high and moderate/low ratings were only used when an inventoried roadless area did not clearly fit into one or the other category or was considered in transition between two established ratings. Tables F-2, F-3, and F-4 summarize the results for each potential wilderness area by forest.

Table F-2. Capability results for the Malheur National Forest

Malheur Areas	Capability Rating	Availability Rating
Aldrich Mountain	Moderate	Available
Baldy Mountain	Moderate	Available
Cedar Grove	Low	Available
Dixie Butte	Moderate/Low	Not Available
Dry Cabin	Moderate/High	Available
Flag Creek	N/A	N/A
Fox Creek	N/A	N/A
Glacier Mountain	Moderate	Available
Greenhorn Mountain	Moderate/Low	Not Available
Jumpoff Joe	Moderate	Available
Malheur River	Moderate	Available
McClellan Mountain	Moderate	Available
Myrtle Silvies	Low	Not Available
Nipple Butte	Low	Available
North Fork Malheur River	N/A	N/A
Pine Creek	Low	Available
Shaketable	Moderate	Available
Silver Creek	N/A	N/A
Strawberry Mountain Additions	Moderate	Available
Utley Butte	Low	Available

Table F-3. Capability results for the Umatilla National Forest

Umatilla Areas	Capability Rating	Availability Rating
Asotin Creek	Moderate	Available
Grande Ronde	Moderate	Available
Greenhorn Mountain	Moderate/Low	Not Available
Hellhole	High	Not Available
Horseshoe Ridge	Moderate/Low	Available
Jaussaud Corral	Low	Not Available
Jumpoff Joe	Moderate	Available
Lookingglass	Moderate	Not Available
Meadow Creek	Low	Not Available
Mill Creek Watershed	Moderate	Not Available
North Fork John Day Additions	Unknown	Unknown
North Fork Umatilla Additions	Moderate	Not Available
North Mount Emily	Low	Available
Owsley	Moderate	Not Available
Potamus	Moderate	Available
Skookum	Low	Available
South Fork - Tower	Low	Not Available
Spangler	Moderate	Not Available
Squaw (Little Fly)	Low	Not Available
Texas Butte	Moderate	Not Available
Tiger Creek	Moderate	Available
Upper Tucannon	Moderate	Available
W - T Three	High	Available
Walla Walla River	Moderate	Available
Wenatchee Creek	High	Available
Willow Springs	Moderate	Available

Table F-4. Capability results for the Wallowa-Whitman National Forest

Wallow-Whitman Areas	Capability Rating	Availability Rating
Beaver Creek	Moderate	Not Available
Big Canyon Id	Moderate	Available
Boulder Park	Moderate	Available
Buckhorn	Moderate	Available
Castle Ridge	Moderate	Not Available
Cook Ridge	Moderate	Available
Deadhorse	Low	Available
Dunns Bluff	Low	Available
Grande Ronde	Moderate	Available
Greenhorn Mountain	Moderate/Low	Not Available
Hellhole	High	Not Available
Homestead	Low	Available
Huckleberry	Moderate	Available
Hurricane Creek	Low	Available
Imnaha Face	Moderate	Available
Joseph Canyon	Moderate	Available
Klopton-Corral Creek	Moderate	Available
Lake Fork	Moderate	Not Available
Lick Creek	Moderate	Not Available
Little Creek	High	Not Available
Little Eagle Meadows	Moderate	Available
Little Sheep	Low	Not Available
Lord Flat Somers Point	Moderate	Available
Marble Point	Moderate	Not Available
Monument Rock	Low	Available
Mountain Sheep	Moderate	Not Available
Mt. Emily	Low	Not Available
North Mount Emily	Low	Available
Reservoir	Low	Not Available
Sheep Divide	Low	Available
Snake River	Moderate	Available
Squaw	Low	Not Available
Tope Creek	Low	Available
South Fork/Tower	Low	Not Available
Twin Mountain	Moderate	Not Available
Upper Catherine Creek	Moderate	Not Available
Upper Grande Ronde	Moderate	Available
Wildhorse	Moderate	Available

Need Evaluation

A Wilderness Needs Assessment was completed in 2010 by the forest plan interdisciplinary team. This evaluation determined the need to include these areas as part of the overall National Wilderness Preservation System. This assessment covered the Blue Mountains national forests planning area as whole, not individual potential wilderness areas. The need for additional wilderness in the Blue Mountains was assessed using the following factors from the Forest Service Handbook (FSH 1902.12, Chapter 70 Subpart 72.31):

8. The location, size, and type of other wilderness areas in the general vicinity and their distance from the proposed area. Considering accessibility of areas to population centers and user groups. Public demand for wilderness may increase with proximity to growing population centers.
9. Present visitor pressure on other wilderness areas, the trends in use, changing patterns of use, population expansion factors, and trends and changes in transportation.
10. The extent to which nonwilderness lands on the national forests or other federal lands are likely to provide opportunities for unconfined outdoor recreation experiences.
11. The need to provide a refuge for those species that have demonstrated an inability to survive in less than primitive surroundings or the need for a protected area for other unique scientific values or phenomena.
12. Within social and biological limits, management may increase the capacity of established wildernesses to support human use without unacceptable depreciation of the wilderness resource.
13. An area's ability to provide for preservation of identifiable landform types and ecosystems. Consideration of this factor may include utilization of Edwin A. Hammond‟s subdivision of landform types and the Bailey-Kuchler ecosystem classification. This approach is helpful from the standpoint of round out the National Wilderness Preservation System and may be further subdivided to suit local, subregional, and regional needs.

The evaluation provides decision makers with information on the resources and uses of each area, and a regional context for making wilderness designation proposals. Proposing wilderness through the Wilderness Evaluations and the completed revised Forest Plan is not the only route for making wilderness proposals. A wilderness recommendation may also be made based on needs brought forward through public comment. Therefore, the decision to propose a wilderness recommendation is not entirely based on need, but may be made based on various land management strategies and factors which include maintaining biological and natural function and diversity within and on the natural landscape. The following is a summary of the findings from the need evaluation.

Factor 1 – Location, Size, Type of Wilderness; Demographics; and Accessibility

Designated wilderness areas in the Blue Mountains are more remote and less accessible to major population centers than other wilderness areas in the general vicinity. While the current designated wilderness areas offer opportunities for solitude, the time and expense needed to visit the Blue Mountains limits the number of out-of-area visitors that utilize current wilderness. Only a small percentage of the use in current wilderness occurs by other than local residents. Given the expected population growth in the general vicinity over the next 15 years, this is not expected to change.

Factor 2 – Use, Visitors, and Changing Patterns of Use

Currently, use of the Blue Mountains wilderness areas account for only a small part (8 percent) of the overall use on the Blue Mountains and even a smaller proportion (4 percent) of the use of national forest lands in the general vicinity. Use trend data suggests that aging populations and shifts in the type of activities younger people are interested in will result in a 2 to 8 percent increase in demand for activities over the next 15 years. This increase will primarily be in day uses from non-wilderness areas. Current wilderness areas in the Blue Mountains reach capacity only in specific areas during brief, high use periods.

Factor 3 - Opportunities for Unconfined Outdoor Recreation Experiences

The Blue Mountains provide high potential opportunities for unconfined recreation experiences and solitude, regionally and locally. The social demand for these unconfined experiences is related to general dispersed settings, not specifically wilderness areas that provide both motorized and nonmotorized activities.

Factor 4 – Refuge for Species or Protected Areas

The draft revised land management plan will identify a variety of plan components (existing designated wilderness, management areas, desired conditions, objectives, guidelines, and monitoring). The arrangement of these areas on the landscape and the objectives and guidelines through which they are managed will set the stage for the Malheur, Umatilla and Wallowa-Whitman National Forests contribution to the diversity of native plant, animal, and fish species. Based on this conclusion, no recommendations for additional designated wilderness are needed to provide refuge for native species.

Factor 5 – Capacity of Established Wildernesses to Support Human Use

Although social desires exist for more wilderness areas across the Blue Mountains, there is not a social need to designate additional wilderness because the current wilderness areas are not exceeding capacity, except in site-specific locations on limited occasions. Alternative sites exist within and adjacent to these areas and within other wilderness areas in the Blue Mountains to accommodate visitor responses to these instances. Based on current uses, trends, primary market zones, demographic changes, crowding levels, visitor pressures, projected uses, existing opportunities for unconfined recreation, and social values. Wilderness use is unlikely to exceed the capacity of the existing wilderness areas and is not likely to result in a need for more wilderness in the next 15 years.

Factor 6 – Ability to Provide for Preservation of Landform Types and Ecosystems

Desired conditions, objectives for treatments, and guidelines for management in the draft revised land management plan insure that natural process will predominate and that ecosystems will be preserved across the landscape. While there are opportunities to increase representation of under-represented vegetation types in the wilderness system, given the management direction outlined in the draft revised land management plan, wilderness designation is not needed for “preservation of landform types and ecosystems.”

Appendix G:
Suitable Acres within Range Allotments for Each Alternative

The following tables display the total acres suitable for cattle or sheep grazing in each allotment. Suitability and capability for grazing within allotments is determined by factors that include canopy closure, steepness of slopes, plant production level, and soil condition (land type associations).

Suitability by alternative varies with proximity to bighorn sheep, proximity to federally listed and species at risk plants, riparian management areas, research natural areas, botanical areas, grazing after wild fire, sage grouse habitat, wild and scenic river corridors, and proximity of grazing to federally listed fish.

Acres listed in the following tables were generated using geographic information systems data for comparison purposes between alternatives. The Forest Service cannot assure the reliability or suitability of this information for another purpose.

Table G- 1. Suitable acres for cattle grazing in active cattle allotments for each alternative on the Malheur National Forest

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Aldrich	8,237	8,858	1,315	8,237	8,237	8,237	20,351
Alkali	24,844	24,815	20,464	24,844	24,844	24,844	26,397
Allison	19,671	19,775	15,997	19,671	19,671	19,671	21,077
Antelope (Silvies)	26,131	26,238	22,500	26,131	26,131	26,131	28,194
Antelope (Upper Malheur)	4,297	4,299	3,777	4,297	4,297	4,297	4,519
Balance Creek	122	124	0	122	122	122	150
Bear Creek	1,271	1,274	0	1,271	1,271	1,271	1,477
Beech Creek	1,290	1,273	60	1,290	1,290	1,290	1,632
Big Sagehen	20,327	20,177	17,686	20,327	20,327	20,327	21,373
Blue Creek	15,953	15,849	13,278	15,953	15,953	15,953	17,422
Blue Mountain	0	18,748	0	18,746	0	0	22,670
Bluebucket	17,611	18,218	5,190	17,611	17,611	17,611	23,500
Bridge Creek	7,247	7,231	6,300	7,247	7,247	7,247	7,621
Buck Mountain	40,236	40,215	33,224	40,236	40,236	40,236	41,478

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Calamity	18,691	18,660	15,306	18,691	18,691	18,691	22,412
Camp Creek (Silvies)	12,192	12,164	10,239	12,192	12,192	12,192	13,684
Central Malheur	9,125	9,484	579	9,125	9,125	9,125	10,727
County Road	127	129	127	127	127	127	135
Crooked Creek	4,931	4,924	4,212	4,931	4,931	4,931	5,076
Dark Canyon	26,272	26,318	9,687	26,272	26,272	26,272	31,733
Deadhorse	8,246	8,038	912	8,246	8,246	8,246	15,507
Deardorff	5,686	5,639	0	5,686	5,686	5,686	10,984
Deer Creek	1,806	1,797	38	1,806	1,806	1,806	2,177
Devine	23,602	23,594	18,835	23,602	23,602	23,602	25,010
Dixie	9,661	9,538	1	9,661	9,661	9,661	16,824
Dollar Basin	14,133	14,101	205	14,133	14,133	14,133	16,395
Donaldson	6,034	6,010	911	6,034	6,034	6,034	7,809
Fawn Spring	5,775	5,781	0	5,775	5,775	5,775	6,289
Ferg	81	82	81	81	81	81	108
Fields Peak	18,198	18,104	46	18,198	18,198	18,198	30,451
Flag Prairie	24,101	24,820	11,535	24,101	24,101	24,101	28,746
Flagtail	13,768	13,742	11,008	13,768	13,768	13,768	14,890
Fox	18,007	17,912	1,456	18,007	18,007	18,007	26,125
Frenchy	484	486	355	484	484	484	500
Green Butte	42,851	44,200	34,201	42,851	42,851	42,851	45,155
Hanscomb	7,385	7,320	3,392	7,385	7,385	7,385	9,233
Highway	705	705	40	705	705	705	784
Hot Springs	1,343	1,332	2	1,343	1,343	1,343	2,283
House Creek	2,824	2,819	2,507	2,824	2,824	2,824	3,252
Hughet Valley	1,820	1,798	1,412	1,820	1,820	1,820	1,877
Hunter Cabin	13,117	13,120	6,004	13,117	13,117	13,117	15,599

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Indian Creek	951	1,206	344	951	951	951	1,285
Izee	15,369	15,262	12,264	15,369	15,369	15,369	18,434
Jack Creek	9,376	9,345	7,407	9,376	9,376	9,376	9,802
Joaquin	19	17	0	19	19	19	35
Justice	422	422	20	422	422	422	499
Keeney Meadows	220	219	0	220	220	220	295
Koehler	90	88	47	90	90	90	115
Lewis Creek	365	361	198	365	365	365	392
Little Mowich	286	289	274	286	286	286	317
Logan Valley	3,706	3,685	0	3,706	3,706	3,706	3,762
Lonesome	29,560	29,532	24,888	29,560	29,560	29,560	31,875
Long Creek	35,272	35,228	0	35,272	35,272	35,272	49,472
Lower Middle Fork	37,754	37,995	0	37,754	37,754	37,754	57,426
Lower Nicoll	3,928	3,928	3,142	3,928	3,928	3,928	3,966
Mcclellan	412	366	0	412	412	412	2,808
Mccoy Creek	978	956	0	978	978	978	980
Mt. Vernon/John Day	34,196	33,753	7,839	34,196	34,196	34,196	45,941
Muddy	5,927	5,899	4,940	5,927	5,927	5,927	6,552
Murderers Creek	52,575	52,948	1,241	52,575	52,575	52,575	73,518
Myrtle	24,416	24,311	20,700	24,416	24,416	24,416	29,313
North Fork	23,280	25,315	14,843	23,280	23,280	23,280	31,036
Ott	26,234	26,265	14,725	26,234	26,234	26,234	29,868
Pearson	59	60	43	59	59	59	65
Pine Creek	35,053	35,697	29,260	35,053	35,053	35,053	39,663
Poison	57	57	14	57	57	57	74
Rail Creek	9,341	9,276	334	9,341	9,341	9,341	17,022
Rainbow	24,569	24,552	19,681	24,569	24,569	24,569	26,277

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Reynolds Creek	11,680	10,778	0	11,680	11,680	11,680	21,608
Rosebud	4,462	4,420	3,622	4,462	4,462	4,462	6,370
Roundtop	10,653	10,644	0	10,653	10,653	10,653	13,212
Sawmill	20,848	20,834	16,849	20,848	20,848	20,848	21,461
Sawtooth	14,971	15,000	11,682	14,971	14,971	14,971	16,682
Scatfield	626	612	585	626	626	626	684
Scotty Creek	32,027	32,026	26,511	32,027	32,027	32,027	35,482
Seneca	7,184	7,127	3,457	7,184	7,184	7,184	10,027
Silver Creek	30,038	32,026	24,084	30,038	30,038	30,038	34,727
Silvies	7,748	7,732	6,900	7,748	7,748	7,748	8,621
Slide Creek	19,249	19,463	1,226	19,249	19,249	19,249	24,595
Smoky	8,040	8,014	6,492	8,040	8,040	8,040	9,043
Snow Mountain	10,701	10,709	8,449	10,701	10,701	10,701	12,362
Snowshoe	5,385	5,334	3,891	5,385	5,385	5,385	6,383
Spring Creek*	44,890	45,157	7,065	44,890	44,890	44,890	57,748
Star Glade	1,036	1,033	0	1,036	1,036	1,036	1,117
Story-Fry	487	485	434	487	487	487	540
Summit Prairie	22,328	22,249	15,784	22,328	22,328	22,328	25,327
Upper Middle Fork	35,299	36,668	2	35,299	35,299	35,299	54,285
Van	5,168	5,533	4,450	5,168	5,168	5,168	6,669
War Canyon	509	511	344	509	509	509	534
West Malheur	17,897	18,787	15,827	17,897	17,897	17,897	22,908
West Myrtle	8,152	8,151	6,831	8,152	8,152	8,152	8,540
Williams Pasture	234	231	0	234	234	234	294
Wolf Mountain	24,225	24,637	20,559	24,225	24,225	24,225	31,607
York	503	501	0	503	503	503	519

*Spring creek allotment runs both sheep and cattle on an annual basis

Table G-3. Suitable acres for sheep grazing within active sheep allotments for each alternative on the Malheur National Forest

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Donnelly	54,716	54,490	54,490	54,490	54,490	54,490	56,054
Spring Creek*	47,080	46,856	0	46,856	46,856	46,856	57,748

*Spring creek allotment runs both sheep and cattle on an annual basis

Table G-4. Suitable acres for cattle grazing in active cattle allotments for each alternative on the Umatilla National Forest

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Asotin	6,836	10,510	3,059	6,836	6,836	6,836	39,022
Brock	130	379	25	130	130	130	964
Central Desolation	6,956	7,069	2,236	6,956	6,956	6,956	13,934
Coalmine	608	608	271	608	608	608	1,097
Collins Butte	7,356	7,875	1,650	7,356	7,356	7,356	16,916
Cooper Creek	894	894	678	894	894	894	1,284
Ditch Creek	16,467	16,559	1,258	16,467	16,467	16,467	37,150
Eden	11,130	15,807	0	11,130	11,130	11,130	34,113
F.G. Whitney	26,908	26,908	2,866	26,908	26,908	26,908	49,932
Hardman	12,211	12,462	0	12,211	12,211	12,211	20,913
Hidaway	16,543	16,566	0	16,543	16,543	16,543	37,142
Hutchison	167	167	83	167	167	167	208
Indian Creek	34,989	29,446	2,896	34,989	34,989	34,989	76,163
Jim Creek	0	17	0	0	0	0	106
Klondike	11,648	11,831	104	11,648	11,648	11,648	24,624
Little Wall	23,488	24,384	858	23,488	23,488	23,488	37,169
Lucky Strike	7,046	7,006	1,117	7,046	7,046	7,046	16,973
Matlock	5,751	5,882	288	5,751	5,751	5,751	10,697
Mcdonald Spring	48	48	24	48	48	48	48

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Monument	10,107	10,120	1,084	10,107	10,107	10,107	18,568
Peola	13,726	15,978	3,108	13,726	13,726	13,726	43,736
Pomeroy	0	3,281	0	0	0	0	20,580
Stonehill	0	0	0	228	0	0	255
Swale Creek	14,176	14,792	809	14,176	14,176	14,176	27,051
Tamarack	7,896	8,228	438	7,896	7,896	7,896	19,397
Texas Bar	28,124	28,655	2,555	28,124	28,124	28,124	41,889
Thompson Flat	4,119	4,201	21	4,119	4,119	4,119	6,535
Wenatchee	1,933	2,203	992	1,933	1,933	1,933	6,252
Western Desolation	8,591	8,591	3,077	8,591	8,591	8,591	13,459
Winlock	2,940	4,116	432	2,940	2,940	2,940	5,166
Yellowjacket	3,330	3,380	431	3,330	3,330	3,330	7,577

Table G-5. Suitable acres for sheep grazing within active sheep allotments for each alternative on the Umatilla National Forest

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Butcher Creek	2,902	2,902	2,902	2,902	2,902	2,902	10,890
Central Desolation	11,292	11,292	1,652	11,292	11,292	11,292	13,934
North End	37,535	5,455	24	19,308	19,308	19,308	126,923
Spring Mountain	8,499	8,499	8,399	8,499	8,499	8,499	35,509

Table G-6. Suitable acres for cattle grazing in active cattle allotments for each alternative on the Wallowa-Whitman National Forest

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Al-Cunningham	321	475	0	321	321	321	1,296
Alder Springs	13,446	13,446	8,167	13,446	13,446	13,446	21,712
Auburn	8,434	8,392	6,925	8,434	8,434	8,434	15,076
Balm Creek	262	259	139	262	262	262	1,643
Bear Gulch	509	2,234	0	509	509	509	8,964
Big Creek	21,738	21,239	8,915	21,738	21,738	21,738	44,744
Big Sheep	760	2,826	0	760	760	760	18,780
Black Mountain	2,894	2,894	2,261	2,894	2,894	2,894	4,694
Blue Canyon	6,379	6,379	4,127	6,379	6,379	6,379	8,463
Boulder Creek	2,240	4,399	1,069	2,240	2,240	2,240	11,532
Bourne	3,939	4,546	321	3,939	3,939	3,939	15,995
Bridgeport	3,022	3,081	2,410	3,022	3,022	3,022	4,438
Buck Creek	11,709	12,321	0	11,709	11,709	11,709	19,544
Bullrun	12,370	12,370	10,372	12,370	12,370	12,370	30,116
Camp Creek	0	0	0	10,732	0	0	23,076
Carrol Creek	55	116	0	55	55	55	1,100
Catherine Creek	5,632	5,844	1,952	5,632	5,632	5,632	20,944
Chalk Creek	43	50	0	43	43	43	276
Chesnimnus	10,848	10,909	9	10,848	10,848	10,848	30,057
China Creek	3,253	3,253	2,760	3,253	3,253	3,253	7,367
Clark Mountain	156	156	58	156	156	156	319
Cold Springs	247	247	0	247	247	247	555
Cougar Creek	8,498	8,609	0	8,498	8,498	8,498	18,331
Cree	121	121	99	121	121	121	188
Crow Creek	557	557	0	557	557	557	1,206

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Dark-Ensign	14,241		2,467	14,241	14,241	14,241	25,825
Davis Creek	3,393	3,393	0	3,393	3,393	3,393	5,640
Day Ridge	346	468	98	346	346	346	2,626
Dean-Huck	10,292	10,292	7,334	10,292	10,292	10,292	15,955
Denney Creek	295	295	172	295	295	295	760
Divide	7,939	8,602	0	7,939	7,939	7,939	14,745
Dobbins	140	140	0	140	140	140	282
Dodson-Haas	4	11	0	4	4	4	19
Doe Creek	6,036	6,162	0	6,036	6,036	6,036	14,940
Eagle Valley	15,489	15,717	10,333	15,489	15,489	15,489	32,589
East Pine Valley	15,319	15,485	3,029	15,319	15,319	15,319	33,085
Elk Mountain	206	206	0	206	206	206	207
Elmwood	121	121	90	121	121	121	162
Fine	581	581	0	581	581	581	1,513
Five Points	7,084	7,523	1	7,084	7,084	7,084	20,263
Frazier Mountain	1,629	1,629	550	1,629	1,629	1,629	2,617
Fruit Springs	190	190	106	190	190	190	253
Ghostbull	396	673	289	396	396	396	2,311
Gilkison	953	953	434	953	953	953	1,796
Goose Creek	15,262	15,274	9,854	15,262	15,262	15,262	27,323
Grouseline	217	514	0	217	217	217	2,742
Hale	249	249	197	249	249	249	458
Haney Gulch	0	0	0	207	0	0	893
Hawley Gulch	2,273	2,273	1,207	2,273	2,273	2,273	2,584
Hooker Flat	60	60	46	60	60	60	76
Hootin Rock	118	155	68	118	118	118	353

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Hunting Camp	2,816	2,960	0	2,816	2,816	2,816	10,236
Indian Creek	2,650	0	124	2,650	2,650	2,650	7,496
Ironside	9,323	9,465	8,100	9,323	9,323	9,323	16,985
Joseph Creek	55	120	0	55	55	55	1,003
Little Bald Mountain	483	483	383	483	483	483	836
Lobo	9,374	9,374	30	9,374	9,374	9,374	15,655
Lockhart	4,921	4,989	3,943	4,921	4,921	4,921	10,108
Log Creek	0	0	0	499	0	0	1,055
Marr Flat	10,571	11,426	0	10,571	10,571	10,571	42,932
Middle Point	234	240	4	234	234	234	1,396
Mill Creek	0	0	0	2,964	0	0	8,585
Mink	78	91	0	78	78	78	268
North Burnt River	9,186	9,186	6,982	9,186	9,186	9,186	18,906
North Fork Burnt River	37	37	37	37	37	37	46
North Powwatka	356	560	0	356	356	356	4,506
Pole Creek	3,669	3,790	0	3,669	3,669	3,669	11,213
Powell Gulch	246	246	189	246	246	246	365
Schleur	56	73	0	56	56	56	712
Sheep Ranch	22,600	22,600	0	22,600	22,600	22,600	32,335
Snow Creek	7,376	8,216	5,997	7,376	7,376	7,376	15,994
South Burnt River	12,818		11,249	12,818	12,818	12,818	32,566
South Powwatka	5,658	5,868	99	5,658	5,658	5,658	10,993
Special #2	42	84	0	42	42	42	108
Spring Creek	0	53	0	0	0	0	20,951
Starkey	14,338	14,361	0	14,338	14,338	14,338	30,381
Stovepipe	11,155	11,155	2,812	11,155	11,155	11,155	21,142

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
Swamp Creek	10,644	13,143	0	10,644	10,644	10,644	33,458
Table Mountain	3,621	4,448	0	3,621	3,621	3,621	14,604
Teepee Elk	1,368	1,368	0	1,368	1,368	1,368	4,385
Tie Creek	96	0	0	96	96	96	311
Tin Trough	3,180	3,299	0	3,180	3,180	3,180	4,454
Tope Creek	2,203	2,317	0	2,203	2,203	2,203	7,372
Trouble Gulch	72	136	41	72	72	72	1,139
Upper Clover Creek	16	16	0	16	16	16	16
Vigne	705	705	0	705	705	705	1,285
Warm Springs	9	9	0	9	9	9	297
West Burnt River	7,107	7,107	5,681	7,107	7,107	7,107	13,315
West Minam	6,129	4,418	0	6,129	6,129	6,129	13,682
West Pine Valley	14,432	14,742	926	14,432	14,432	14,432	34,939
Whipple Gulch	3,163	3,162	2,598	3,163	3,163	3,163	5,028
Whitehorse	6,600	6,600	0	6,600	6,600	6,600	13,798
Whitney	220	220	169	220	220	220	478

Table G-7. Suitable acres for sheep grazing within active sheep allotments for each alternative on the Wallowa-Whitman National Forest

Allotment	Alt. A	Alt. B	Alt. C	Alt D	Alt. E	Alt F	Total Acres Within the Allotment
McCarty	9,837	9,837	9,814	9,837	9,837	9,837	17,923
Mud Creek	3,710	0	0	3,437	3,437	3,437	8,090
Spring Creek	11,864	11,864	11,864	11,864	11,864	11,864	20,951

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