United States
Department of
Agriculture

Forest
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**Pacific
Northwest
Region**

Final Environmental Impact Statement
Galena Project

Blue Mountain Ranger District, Malheur National Forest

Grant County, Oregon

for the greatest good

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Final Environmental Impact Statement
Galena Project

Malheur National Forest

Blue Mountain Ranger District

Grant County, Oregon

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Abstract: This Final Environment Impact Statement (FEIS) documents the detailed analysis of four alternatives, including the "no action" alternative, that were developed for the Galena Project in the Vinegar Creek and Little Boulder Creek-Deerhorn subwatersheds that drain into the Middle Fork of the John Day River that is incorporated in the Blue Mountain Ranger District. The alternatives respond in different ways to major issues and have varying effects on the environment identified for this project. The major issues identified for this project are fuels reduction, old growth, wildlife security, and watershed/fish habitat. **Alternative 1** is the "no action" alternative. **Alternative 2**, the proposed action, includes timber harvest, natural fuels reduction treatments, pre-commercial thinning, aspen treatments, and watershed rehabilitation (road decommissioning) work. This is the alternative developed from an assessment of ecological needs across the landscape of the Galena project area and adjacent land, **Alternative 3** is a modification of the proposed action, developed to address resource damage related to new and temporary road construction. Alternative 3 completely drops new and temporary road construction from the project. **Alternative 4** is a modification of the proposed action and was developed to address a lack of treatment of fuels in unroaded areas and an increased amount of merchantable timber for commercial utilization to provide for more stability to the local economic structure by adding units to be yarded by helicopter.

Galena Project Summary

Introduction

This Final Environmental Impact Statement (FEIS) encompasses 37,200 acres in the Middle Fork of the John Day River sub-basin about 28 miles northeast of John Day, Oregon. This FEIS analyzes the effects of implementing several resource management activities known as the Galena Project, including timber harvest and pre-commercial thinning, prescribed burning, road construction, reconstruction, maintenance, road closures and decommissioning, and aspen restoration. The proposed action also includes two amendments to the Malheur National Forest Land and Resource Management Plan, 1990 (Forest Plan): one to modify designated and replacement old growth areas to meet Forest Plan standards, the second to reduce satisfactory big game cover below Forest Plan standards.

The legal description for the project area is (township, range, sections): T10S R34E S12-13, 22-28, 32-36; T11S R34E S1-5, 8-16, 17-21, 21-28, 33-36; T12S R34E S1-4; T10S R35E S 7-8, 17-21, 27-34; T11S R35E S3-9, 16-21, 29-32; and T12S R35E S5-7, Willamette Meridian.

Four alternatives were evaluated in detail and are presented in this FEIS. A general summary of the FEIS is presented here, including a brief description of the project area, purpose and need, major issues, and the alternatives. Additionally, more detailed information is presented in Chapters 1 through 3 of this FEIS and in specialists reports located in the project file located at the Blue Mountain Ranger District Office.

Purpose and Need for Action

The needs for the proposed action are derived from the difference between current conditions and desired conditions. Desired conditions are based on Forest Plan direction and management objectives. The Galena Watershed Analysis also mentions site specific goals related to increasing forest health and sustainability, habitat development, and fuels reduction in the project area. Moving forest stands toward the historic range of variability (HRV) and improving forest health is desirable because such conditions provide more sustainability over the long-term. Specifically the purposes of this project are to:

1. Promote a change in tree species composition, stand densities, and structure to develop a trend toward more resilient historic vegetative conditions in upland forested stands.
2. Reduce the fuel loading by reducing the density of standing vegetation, surface fuels, and ladder fuels. Reduce fuels along County Road 20 which is identified as an escape corridor in the Grant County Community Fire Protection Plan.
3. Provide a safe road system that meets current public and management access needs, while reducing the risk of sediment reaching streams and impacts to aquatic species and wildlife habitat.
4. Accelerate development of future late and old structural (LOS) single-stratum wildlife habitats.
5. Improve wildlife habitat for old growth dependent species by adjusting dedicated old-growth (DOGs) areas, identifying replacement old-growth (ROGs) areas, and identifying pileated woodpecker feeding areas (PWFAs) to meet Forest Plan standards.
6. Improve aspen stands and the associated wildlife habitat by creating conditions that will allow for successful regeneration and development into mature trees and stands.
7. Provide wood products to help maintain community stability and infrastructure.

The focus of the Galena project is to restore forested stands in the project area to more closely resemble historical conditions that are more sustainable than current conditions. The forested stands in the project

area are outside the HRV for the hot-dry and the warm-dry forest types. HRV is the expected range of tree species and forest structure under natural, unmanaged disturbance patterns. There is currently a lack of old forest stand structures, primarily old forest single stratum (OFSS) and old forest multi-strata (OFMS) structural stages.

To move the stands toward historical conditions with increased resiliency there is a need to reduce stand density, increase the proportion of early seral species, and modify the structure of the forest. Reducing the density of trees decreases competition and increases the health and vigor of remaining trees resulting in increased survival against insects, disease, and wildfires. Increasing the proportion of early seral tree species, would shift the stands to predominantly ponderosa pine and western larch. With these fire adapted species, stands would be in a condition where fire can be reintroduced to play a natural role. The understory of some multi-story stands would be removed to create more old forest single-story stands that are currently lacking and to increase the survival of the existing large pine and larch trees.

To reduce the large scale fire hazard there is a need to reduce surface fuel loads, ladder fuels, and the crown density. Due to the absence of low intensity frequent fire and increased mortality from insect and disease, present fuel loads have increased beyond historical levels. There is a need to reduce the chance of a surface fire becoming a crown fire and a small fire becoming an uncharacteristic severe wildfire. High-intensity wildfires present a risk to the public, firefighters, and the ecosystem. A large, high severity fire would remove entire stands and cause resource damage. Removing accumulated fuel loads, creating a single-story stand structure, and reducing the stand and crown density would decrease the risk of a large-scale fire.

The current road system in the project area was built in the past primarily to access areas of the forest for timber sales and was left open to improve access for fire suppression activities. Changes in forest management and reductions in funding available requires a need to maintain a road system that meets user needs, while reducing resource damage. Closing and decommissioning roads where resource damage occurs will help the forest improve watershed conditions and better maintain the existing open roads across the forest.

There is currently a lack of late and old structure single-stratum forest structure in the project area when compared to the historical conditions from fire suppression and past management. This has reduced the available habitat for species that use this structure type and there is a need to increase the amount. The project will increase the amount of late and old structure single-stratum forest through thinning and prescribed fire, creating open stands with large trees, similar to the historical conditions.

To improve wildlife habitat for elk there is a need to reduce disturbance caused by motorized use on roads in the project area. While past projects have closed a number of roads, additional specific road closures and decommissioning would improve elk security. To improve fish habitat there is a need to move roads out of riparian areas, reducing the amount of sediment moving into streams from native surface roads. The project area is below Forest Plan standards for the amount of dedicated old growth habitat. To increase the amount of wildlife habitat for species dependent on old growth areas, there is a need to delineate additional areas that meet Forest Plan criteria for old growth. Currently, there is a lack of large snags within much of the project area. There is a need to create open stands with large trees, which would provide future large snags benefiting bird species dependent on this type of habitat.

Aspen is a shade intolerant, early seral species occurring in small isolated stands throughout the project area and once played a larger part of the historical forest composition. To improve the wildlife habitat, there is a need to increase the size and health of the remnant aspen stands. The Galena Watershed Analysis (USDA 1999) identified the need to restore declining aspen stands within the overall watershed. Encroaching conifers, over-browsing by livestock and wildlife, and lack of low intensity wildfire have caused the decline in the quantity and quality of aspen stands.

Wood products play an important role in the local economy by providing employment and revenue. There is a need to provide wood products to help maintain the existing lumber and forest products infrastructure and support local employment, providing for community stability. The Forest Plan includes direction to provide a sustainable flow of timber and associated wood products at a level that would contribute to economic stability and provide an economic return to the public.

Public Involvement / Key Issues

A Notice of Intent (NOI) was published in the Federal Register on March 12, 2009. The NOI asked for a 30-day public comment period on the scope of the analysis. A formal scoping package was sent to around 160 individuals, groups, federal and state agencies at the same time the NOI was published. Eleven comments were received in response. A letter was mailed to local landowners and a newspaper article published in the Blue Mountain Eagle on February 18, 2009 inviting interested parties to a public meeting on April 8, 2009, where three people attended. The Forest Service response to the comment letters from the scoping period, public meeting notes, and a copy of the NOI can be found in the project record.

In November 2008 the Galena project was presented to the local Blue Mountain Forest Partners (BMFP) collaborative. They decided to not formally collaborate on this project; however, the general guidelines provided by the collaborative group on other forest projects were considered by the interdisciplinary team (IDT) during the development of the Galena project. However, a May, 2013 letter from the BMFP supported aspects of the Galena Project that were within the “zones of agreement” that had been developed on previously collaborated projects, including the creation of a sustainable and predictable supply of byproducts from forest restoration that will stabilize local communities and infrastructure, and increase restoration related employement.

The IDT used a systematic approach for analyzing the proposed action and alternatives, evaluating the environmental effects, and preparing a Draft Environmental Impact Statement for public review. In the preparation of the DEIS, public input was sought and comments received were assessed and considered both individually and collectively. Along with the individual comments, agency responses to these comments are found in Appendix D of the DEIS. Input from the public led the Forest Service to respond by modifying the proposed action and developing alternatives. A Notice of Availability was published in the Federal Register on March 25, 2011 and the DEIS was sent out for a 45 day comment period. In the development of this Final EIS comments made to the DEIS were assessed and considered in the preparation of this FEIS and the Record of Decision (ROD).

Key issues are defined as those directly or indirectly caused by implementing the proposed action; however, the effects cannot be reduced by normal Best Management Practices (BMPs) or Project Design Criteria. Usually an alternative is developed to address key issues. These issues were addressed by either modifying the proposed action, or by incorporating mitigation measures as integral components of the project design.

Key issue 1

- Construction of new and temporary roads could cause resource damage in the project area such as channelizing water, erosion, disturbance to wildlife habitat, and the spread of invasive weeds.
- **Measurement Indicator:** Presence or absence of new and temporary roads constructed by miles, road density or acres disturbed.

Key issue 2

- An increased amount of commercial thinning, providing more merchantable saw logs from the same land base, could provide more stability to the local community economic infrastructure.

- **Measurement Indicator:** Volume of merchantable timber from commercial thinning.

Key issue 3

- Lack of treatment of fuels in unroaded areas would increase fuel hazard.
- **Measurement Indicator:** Acres of units identified for commercial harvest via helicopter yarding.

Alternatives Considered In Detail

Alternative 1

The 'No Action Alternative' is required by the National Environmental Policy Act (NEPA). Under the No Action alternative, no management activities proposed in any of the other alternatives would occur. Alternative 1 is designed to represent the existing condition and is analyzed for projected future conditions if no activities proposed in any of the alternatives are authorized. It serves as the baseline to compare and describe the differences and effects between taking no action and implementing one of the other alternatives.

Alternative 2

Alternative 2 is the proposed action and preferred alternative, which responds to the need for action to improve forest health by moving stands towards historic conditions. The proposed action would authorize activities in five categories: harvest of trees and biomass, pre-commercial thinning, prescribed burning, associated road activities, and aspen stand restoration. More detailed descriptions are found in Chapter 2 and a table showing each unit and aspen stand treatment can be found in Appendix A. A list of all roads with proposed activities is in Appendix B. Maps of the thinning units, aspen stands, and roads are in Appendix C.

Alternative 3

Alternative 3 was developed in response to key issue #1 (potential resource damage caused by road construction) by not building temporary roads, only constructing a very small amount of a new system roads, and harvesting fewer units than the proposed action. Alternative 3 is a 42 percent reduction in acres proposed for commercial thinning, from Alternative 2. A table of each thinning unit and aspen stand treatment can be found in Appendix A. A list of all roads with proposed activities is in Appendix B. Maps of the thinning units, aspen stands and roads are in Appendix C.

Alternative 4

Alternative 4 was developed in response to key issues #2 and #3 (increasing amount of merchantable saw logs and accessing areas not accessible by existing roads) by increasing the number of commercial thinning units from the proposed action and adding additional units that would require helicopter yarding. Alternative 4 is a 19 percent increase in acres proposed for commercial thinning, from Alternative 2. A table of each thinning unit and aspen stand treatment can be found in Appendix A. A list of all roads with proposed activities is in Appendix B. Maps of the thinning units, aspen stands and roads are in Appendix C.

Table I. Comparison of elements between all action alternatives

Proposed Activities	Alternative 2	Alternative 3	Alternative 4
Mechanical treatment			
total number of acres harvested and/or pre-commercial thinned	8,339	6,752	9,778
Commercial harvest			
total number of acres	6,813	3,971	8,405
total volume (mmbf)	24	14	31
Pre-commercial thinning			
total number of acres	2,781	2,781	2,878
Reforestation			
total number of acres	1,217	961	1,918
Potential biomass utilization			
total number of acres	2,061	1,261	2,061
Mechanical fuel treatment			
total number of acres of slash yarded to landings	6,813	3,970	8,405
total number of acres hand piled	4,524	4,429	5,692
total number of acres grapple piled	3,070	1,188	3,262
Prescribed burning			
total number of acres underburned	19,913	19,913	19,913
total number of acres of pile burned	8,339	6,167	9,778
Roads			
miles of new road construction	12.6*	1.1*	14.7*
miles of temporary road construction	3.1	0	3.1
miles of road reconstruction	21.4	13.8	26.3
miles of road maintenance	69.7	65.4	69.7
miles of new road closures	16.7	14.9	17.3
miles of road decommissioning	21.9*	19.9*	21.2*
miles of roads relocated out of	6.2	0	6.2

Proposed Activities	Alternative 2	Alternative 3	Alternative 4
riparian areas			
number of culverts installed to replace stream fords	2 (Davis Creek & Dead Cow Gulch)	0	2 (Davis Creek & Dead Cow Gulch)
number of new stream crossings using culverts	0	0	2 (Deerhorn Creek & tributary west of Deerhorn Creek)
total open road density (mi/mi^2) after implementation, existing = 1.8	1.4	1.4	1.4
Other activities			
Forest Plan amendment changing old growth boundaries	yes	yes	yes
Forest Plan amendment changing big game cover	yes	yes	yes
aspen restoration (number of units)	28	28	28
aspen restoration (number of acres)	35	35	35
retention of snags, except danger trees	100%	100%	100%
activities planned within old growth areas (DOGs, ROGs, PWFAs)	no thinning or prescribed burning in DOGs	no thinning or prescribed burning in DOGs	no thinning or prescribed burning in DOGs
	prescribed burning in ROGs	prescribed burning in ROGs	prescribed burning in ROGs
	prescribed burning & thinning in PWFAs	prescribed burning & thinning in PWFAs	prescribed burning & thinning in PWFAs
activities planned within riparian areas (RHCAs)	aspen restoration	aspen restoration	aspen restoration
	road decommissioning	prescribed fire (underburning may back into RHCAs)	road decommissioning
	prescribed fire (underburning may back into RHCAs)		prescribed fire (underburning may back into RHCAs)
	new road construction (.15 miles)		new road construction (.81 miles)
activities planned within inventoried roadless areas (IRAs)	prescribed fire (2,590 acres)	prescribed fire (2,590 acres)	prescribed fire

Proposed Activities	Alternative 2	Alternative 3	Alternative 4
			(2,590 acres)
	aspen restoration (4 acres)	aspen restoration (4 acres)	aspen restoration (4 acres)

** Road 2010771 (.75 mi) is currently decommissioned and would be opened, used for log haul and then closed. Road 2010370 (.31 mi) is currently decommissioned and would be opened, used for log haul and left open. Forest Service practice is that when a road is decommissioned and then re-opened they are classified as new construction. These two road segments are still within the existing road prism and will be reopened on the existing road bed and would not disturb any new ground. Post implementation decommissioned road totals include this. Road mileages may exhibit additional slight variations due to GIS errors and rounding.*

Proposed Forest Plan Amendments

All three action alternatives require the following Forest Plan amendments:

Adjust and Expand Dedicated Old Growth Habitats (DOG's) and Create New Replacement Old Growth Habitats (ROG's)

Within the project area, the number of acres set aside for dedicated old growth habitats (DOGs), replacement old growth habitats (ROGs) and pileated woodpecker feeding areas (PWFAs are currently below thresholds in the Forest Plan). The proposed Forest Plan amendment would redraw Management Area 13 boundaries for existing areas and delineate boundaries for new areas within the project area to bring total acres up to Forest Plan standards. This amendment would be applied under any action alternative. DOGs would increase by 134 acres, ROGs would increase by 1,046 acres, and PWFAs would increase 470 acres.

Reduce Satisfactory Cover below Forest Plan Standards

The Proposed Action would reduce satisfactory cover within big game summer range below Forest Plan standards on 128 acres comprising a 0.3% reduction of the satisfactory cover in the Vinegar Creek Subwatershed and by 3 acres comprising a 0.1% reduction of the satisfactory cover within big game winter range in the Little Boulder Creek/Deerhorn Subwatershed. Total cover in both subwatersheds would still exceed standards.

Summary of Effects by Alternative

This section provides a summary of effects of implementing each alternative. Information in Table II is focused where effects can be distinguished quantitatively or qualitatively between alternatives. Further discussion of effects on resources by alternative can be found in Chapter 3 of the FEIS.

Table II. Comparison of environmental effects by alternative

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Vegetation				
HRV	Without thinning, forest stands would not shift toward HRV, and trees would become increasingly susceptible to large-scale disturbance.	Harvest and thin approximately 8,300 acres of forest stands. The effect would be beneficial by moving these stands toward HRV and reducing the susceptibility to large scale disturbance from fire, insect and disease.	Harvest and thin approximately 6,100 acres of forest stands. The effect would be beneficial by moving these stands toward HRV and reducing the susceptibility to large scale disturbance from fire, insect and disease.	Harvest and thin approximately 9,700 acres of forest stands. The effect would be beneficial by moving these stands toward HRV and reducing the susceptibility to large scale disturbance from fire, insect and disease.
Composition and Density	Without thinning species composition would not shift toward HRV and continue to be overstocked and susceptible to insect, disease and large scale disturbance.	Thinning would reduce stand density and retain early seral species enabling the remaining trees to respond by increasing their crowns and roots, and increasing the height to the bottom of the live crown. The overall resiliency to natural disturbances would be increased.	Thinning would reduce stand density and retain early seral species on approximately 20% less acres than Alternative 2 enabling the remaining trees to respond by increasing their crowns and roots, and increasing the height to the bottom of the live crown. The overall resiliency to natural disturbances would be increased, but approximately 20% less than Alternative 2.	Thinning would reduce stand density and retain early seral species on approximately 20% more acres than Alternative 2 enabling the remaining trees to respond by increasing their crowns and roots, and increasing the height to the bottom of the live crown. The overall resiliency to natural disturbances would be approximately 20% increased compared to Alternative 2.
Structural Stages	The hot-dry OFSS are projected to increase from 0% to 26% and OFMS from 7% to 72%. In	The hot-dry OFSS are projected to increase from 0% to 40% and OFMS from 7% to 58%. In the warm-dry OFSS is projected to increase from 1%	The hot-dry OFSS are projected to increase from 0% to 35% and OFMS from 7% to 62%. In the warm-dry OFSS is projected to increase from 1%	The hot-dry OFSS are projected to increase from 0% to 41% and OFMS from 7% to 57%. In the warm-dry OFSS is projected to increase from 1% to 17% and

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	the warm-dry OFSS are projected to increase from 1% to 5% and OFMS from 10% to 69%. In the cool-moist OFSS are expected to not change, but OFMS are expected to increase from 30% to 76%	to 15% and OFMS from 10% to 58%. In the cool-moist OFSS are projected to increase from 0% to 3%, and OFMS are expected to increase from 30% to 73% This alternative would convert 556 acres of old forest multi strata for conversion to old forest single strata by removing the understory. The increased tree growth from thinning would accelerate the development of old forest structural stages, allowing the thinned stands to grow into the large size classes sooner.	to 11% and OFMS from 10% to 61%. In the cool-moist OFSS are projected to increase from 0% to 2%, and OFMS are expected to increase from 30% to 75% This alternative would convert 350 acres of old forest multi strata for conversion to old forest single strata by removing the understory. The increased tree growth from thinning would accelerate the development of old forest structural stages, allowing the thinned stands to grow into the large size classes sooner.	OFMS from 10% to 55%. In the cool-moist OFSS are projected to increase from 0% to 6%, and OFMS are expected to increase from 30% to 70% This alternative would convert 798 acres of old forest multi strata for conversion to old forest single strata by removing the understory. The increased tree growth from thinning would accelerate the development of old forest structural stages, allowing the thinned stands to grow into the large size classes sooner.
Resiliency and Sustainability	Without treatment the resiliency and sustainability of the project area is at an increased risk from large scale disturbances.	Approximately 42% of the area diagnosed in the silvicultural specialist report in need for mechanical treatment is proposed for tree thinning and slash treatment. Thinned ponderosa pine stands would increase in growth and vigor as stand density is reduced. Conversion to early seral species in mixed conifer stands would shift the species composition towards early-	Approximately 31% of the area diagnosed as being in need of mechanical treatment is proposed for tree thinning and slash treatment. About 20% fewer acres would be treated than proposed under Alternative 2 resulting in less areas with increased growth and vigor	Approximately 49% of the area diagnosed in need of mechanical treatment is proposed for tree thinning and slash treatment. About 20% more acres would be treated than proposed under Alternative 2 resulting in more areas with increased growth and vigor

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires		
Insect Risk & Disease Risk	By not treating any acres in the project area the risk for insect and disease will continue to follow the severe outbreaks experienced in the last several decades.	The additional light and warmth in thinned stands is inhospitable for bark beetles, providing an immediate degree of protection to the trees. As the trees respond with increased growth over the next several decades after the thinning, their increased vigor would allow them to withstand attempted beetle attacks by successfully pitching out the invading insects. The removal of late seral species during the thinning operations would reduce the amount of trees susceptible to root diseases, eventually allowing the disease to fade to a minor role in the forest. The risk would remain at high levels for both insects and diseases in the leave patches (5-15% of the treated areas).	Similar effects to Alternative 2, however the decreased thinning across the landscape would increase insect risk and stem and root diseases compared to Alternative 2	This alternative has similar effects to those described under alternative 2, but the increased thinning across the landscape would reduce insect risk and stem and root diseases since both the thinning and the conversion to early seral species prescriptions would reduce the primary host, late seral species

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Aspen stands	By not restoring aspen stands the effect would be a continued decline in the extent of aspen stands.	There would be a beneficial impact to aspen stands by thinning conifers resulting in the expansion of aspen stands.	There would be a beneficial impact to aspen stands by thinning conifers resulting in the expansion of aspen stands.	There would be a beneficial impact to aspen stands by thinning conifers resulting in the expansion of aspen stands.
Fuels				
Fire Hazard	Perpetuation of high fuel loads with an increase in fuel loads and fire risk.	Reduction in surface and ladder fuel loads resulting in a decreased risk of large-scale wildfires.	Reduction in surface and ladder fuel loads resulting in a decreased risk of large-scale wildfires.	Reduction in surface and ladder fuel loads resulting in a decreased risk of large-scale wildfires.
Fire Regime Condition Class	Within fire regime 1, in dry forests, condition classes would continue to depart further from natural fire regimes.	Within fire regime 1, in the dry forests, condition classes 2 and 3 would begin moving towards condition class 1.	Within fire regime 1, in the dry forests, condition classes 2 and 3 would begin moving towards condition class 1 but at a smaller scale than alternative 2	Within fire regime 1, in the dry forests, condition classes 2 and 3 would begin moving towards condition class 1 more rapidly than alternative2.
Fuel Loadings and Crown Fire Potential	There would be an increase in high to extreme crown fire potential due to the levels of fuel loads at the surface and in ladder fuels to the tree crowns.	Crown fire potential would be reduced overall by about 12%, due to reduction in fuel load at the surface and in tree crowns.	Crown fire potential would be reduced by about 7%, due to reduction in fuel load at the surface and in tree crowns.	Crown fire potential would be reduced overall by about 13%, due to reduction in fuel load at the surface and in tree crowns.
Soils				

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Commercial harvest: soil productivity, soil nutrients and organic matter	No impacts to soil productivity and no organic matter or nutrients would be removed.	*Skid trails*: effects would last for 20-50 years with soil productivity recovering over time. *Landing zones:* would displace topsoil and erosion could move soil several feet, having a minimal effect.	*Skid trails*: effects would last for 20-50 years on fewer acres than Alternative 2 with soil productivity increasing over time. *Landing zones:* would displace topsoil and erosion could move soil several feet, having a minimal effect.	*Skid trails*: effects would last for 20-50 years on more acres than Alternative 2 with soil productivity increasing over time. *Landing zones:* would displace topsoil and expose soil to erosion for a short time due to removal of vegetation. Helicopter lands would expose soil on 2 acres for a short term.
Road activities: soil productivity, soil nutrients and organic matter	No impacts to soil productivity and no organic matter or nutrients would be removed.	*New Roads*: remove soil productivity within the road prism for the long term. *Temporary Roads*: displacement and compaction would recover over several decades *Road Decommissioning*: short term increase in erosion (2 years), and a beneficial long-term effect on soil productivity.	*Road Decommissioning*: short term increase in erosion (2 years), and a beneficial long-term effect on soil productivity.	*New Roads*: remove soil productivity within the road prism for the long term. *Temporary Roads*: displacement and compaction would recover over several decades *Road Decommissioning*: short term increase in erosion (2 years), and a beneficial long-term effect on soil productivity.
Prescribed burning: soil productivity, soil nutrients and organic matter	No impacts to soil productivity and no organic matter or nutrients would be removed.	Possible positive effect on soil productivity in the short term due to low fire intensity and recycling of nutrients. Possible slight decrease of soil productivity over the long	Possible positive effect on soil productivity in the short term due to low fire intensity and recycling of nutrients. Possible slight decrease of soil productivity over the long	Possible positive effect on soil productivity in the short term due to low fire intensity and recycling of nutrients. Possible slight decrease of soil

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		term.	term.	productivity over the long term.
Watershed				
Commercial Harvest and Pre-Commercial Thinning	No direct or indirect effects to snowpack, annual water yield, peak flows, minimum flows, or water quality are anticipated and are expected to remain within their current range of variability.	Erosion and increased overland flow may occur, but would remain within unit boundaries. Erosion and overland flow from activities on hillslopes would not deliver increased sediment to streams. Peak flow would not be measurably altered since proposed activities would not remove more than 60% of trees.	Erosion and increased overland flow would occur, but would remain within unit boundaries, but on 2,800 less acres than Alternative 2. Erosion from activities on hillslopes would not deliver increased sediment to streams. Peak flow would not be measurably altered since proposed activities would not remove more than 60% of trees.	Effects would be similar to those described under Alternative 2, however, ground disturbing activities would occur on more acres, increasing overall disturbance proportionately.
Prescribed Burning	No direct or indirect effects to snowpack, annual water yield, peak flows, minimum flows, or water quality are anticipated and are expected to remain within their current range of variability.	There will be no effects to stream channels and water quality as well as water quantity or timing because of the Best Management Practices	There will be no effects to stream channels and water quality as well as water quantity or timing because of the Best Management Practices	There will be no effects to stream channels and water quality as well as water quantity or timing because of the Best Management Practices
Road Activities	No change to snowpack, annual water yield, peak	Removing roads from RHCAs would reduce direct sedimentation and overland	Since there would be no temporary roads constructed, an additional 10 acres would	Removing roads from RHCAs would reduce direct sedimentation and overland

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	flows, minimum flows, or water quality are expected. Roads in RHCAs will continue to intercept and concentrate peak flows and decrease minimum flows.	flow reaching streams. New roads may affect watershed function by intercepting subsurface flow and, potentially, channeling and re-directing overland flow. Road decommissioning will have beneficial effects by reducing overland flow and sediment delivered to streams, increasing local floodplain storage, increasing shade, and improving stream channel function.	be undisturbed reducing opportunities for impacts. Road decommissioning will have beneficial effects by reducing overland flow and sediment delivered to streams, increasing local floodplain storage, increasing shade, and improving stream channel function. Six miles of road would not be relocated out of the RHCA, allowing existing impacts to continue into the future.	flow reaching streams. Construction of two additional crossings would introduce up to 0.5 ft^2 of sediment, but would not change stream flow because culverts will allow passage of 100 year events. New roads may affect watershed function by intercepting subsurface flow and, potentially, channeling and re-directing overland flow. Shade may be reduced locally; however exposed to solar radiation would not to be measurable. Road decommissioning will have beneficial effects by reducing overland flow and sediment delivered to streams, increasing local floodplain storage, increasing shade, and improving stream channel function.
Aspen	Aspen will continue to decline throughout the project area and reduce stream shading and alter	Added material to RHCAs will increase filtering and infiltration capacity. Activities will provide for future downed woody recruitment improving filtering and infiltration	Added material to RHCAs will increase filtering and infiltration capacity. Activities will provide for future downed woody recruitment improving filtering and infiltration	Added material to RHCAs will increase filtering and infiltration capacity. Activities will provide for future downed woody recruitment improving filtering and infiltration

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	they hydrology of the area.	capacity and allow for sediment to be deposited and stabilized, reducing future erosion and improving stream shading.	capacity and allow for sediment to be deposited and stabilized, reducing future erosion and improving stream shading.	capacity and allow for sediment to be deposited and stabilized, reducing future erosion and improving stream shading.
Watershed hazard	Existing moderate watershed hazard would continue due to the impacts from past activities still persisting in the project area.	Increased watershed hazard in the short-term. Despite the increase, the watershed hazard would remain moderate and decrease as harvest units and decommissioned roads recovered.	Increased watershed hazard in the short-term compared to Alternative 1. Despite the increase, the watershed hazard would remain moderate proportional to the amount of harvest occurring under Alternative 2. Hazard would decrease except in the vicinity of the Category 4 tributaries where hazard would remain.	Watershed hazard would increase slightly compared to alternative 2, however it would remain moderate in the short term and would decrease as harvest units and decommissioned roads recover.
Aquatics				
Pool Frequency	Pool levels would remain below standard with no action instigating change.	During harvest activities, felling danger trees into streams may create pools. Aspen treatments may improve stream channels and pool habitat during conifer felling and provide for future LWD.	Effects to pool frequency are expected to remain the same as under Alternative 2.	Effects to pool frequency are expected to remain the same as under Alternative 2.
Water Temperatures and Stream Shading	Stream shading would remain at the current rate.	Aspen treatments may not measurably reduce stream shading within small portions	Effects to water temperature and stream shading are expected to remain the same as	Effects to water temperature and stream shading are expected to remain the same as

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		of treatment areas in the short term; however conifer felling is expected to improve aspen stands increasing shade within 10-15 years.	under Alternative 2.	under Alternative 2.
Large Woody Debris (LWD)	LWD is likely to increase over the next 25 years as overstocked conifers die and fall into streams or due to large scale events that destroy stand health.	Felling danger trees may reduce supply of LWD if they cannot be felled into streams, however efforts will be made to use trees to increase stream LWD. Over the long term, road decommissioning within RHCAs is expected to improve LWD recruitment near streams. Aspen treatments may accelerate the recruitment of LWD in the short term and long term.	Effects to large woody debris are expected to remain the same as under Alternative 2.	Effects to large woody debris are expected to remain the same as under Alternative 2.
Embeddedness and Fine Sediments	Current levels would remain, having an adverse effect on aquatic habitat	Road maintenance may decrease chronic sedimentation in some locations, improving drainage and reducing erosive surface materials. Proposed road activities will be implemented with project design criteria, limiting impacts to streams from activities. Decommissioning roads may generate sediment in the short	Effects to embeddedness and fine sediments are expected to remain similar as alternative 2, however 6 miles of roads will not be relocated out of the RHCA, maintaining currently levels having an adverse effect on aquatic habitat.	Effects to embeddedness and fine sediments are expected to remain the same alternative 2.

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		term, but would provide for beneficial effects to aquatic habitat in the long term.		
Width to Depth Ratio	Ratios would remain at below standard levels for approximately half of the streams in the project area	Project design criteria are expected to minimize impacts to stream bank stability from harvest, prescribed fire, road activities or aspen treatments.	Effects to width to depth ratio are expected to remain the same as Alternative 2.	Effects to width to depth ratio are expected to remain the same as Alternative 2.
Bank Stability	Bank stability would remain at current levels	Prescribed burning has the potential to decrease bank stability in the short term where vegetation is removed; however it is unlikely that this would be of sufficient size to result in an overall decrease in bank stability.	Effects to bank stability are expected to remain the same as Alternative 2.	Effects to bank stability are expected to remain the same as Alternative 2.
Aquatic Species				
Steelhead	Mid-Columbia Summer Steelhead ESA: No Effect Mid-Columbia Summer Steelhead Sensitive Species: No Impact Steelhead Management	Mid-Columbia Summer Steelhead ESA: May Affect, Likely to Adversely Affect in the short term. Beneficial Effect in the long-term. Mid-Columbia Summer Steelhead Sensitive Species: May Impact Individuals or Habitat, but will not likely contribute to a trend towards	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	Indicator Species: No Impact to Viability Steelhead Designated Critical Habitat ESA: No Effect	federal listing or cause a loss of viability to the population or species in the short term. Beneficial Impact in the long-term. Steelhead Management Indicator Species: Continued Viability at the Forest Scale Steelhead Designated Critical Habitat ESA: May Affect, Likely to Adversely Affect in the short term. Beneficial Effect in the long-term.		
Redband Trout	Interior Redband Trout Sensitive Species: No Impact. Redband Trout Management Indicator Species: No Impact to Viability	Interior Redband Trout Sensitive Species: 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 in the short term. Beneficial Impact in the long term Redband Trout Management Indicator Species: Continued Viability at the Forest Scale	Same as Alternative 2	Same as Alternative 2
Bull Trout	Columbia River Basin Bull Trout ESA Determination:	Columbia River Basin Bull Trout ESA: May Affect, Likely to Adversely Affect in the short term. Beneficial	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	No Effect Columbia River Basin Bull Trout Sensitive Species: No Impact Bull Trout Management Indicator Species Determination: No Impact to Viability Bull Trout Designated Critical Habitat ESA: No Effect	Effect in the long-term Columbia River Basin Bull Trout Sensitive Species: 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 in the short term. Beneficial Impact in the long-term. Bull Trout Management Indicator Species: Continued Viability at the Forest Scale. Bull Trout Designated Critical Habitat: May Affect, Likely to Adversely Affect in the short term. Beneficial Effect in the long-term.		
MCR Spring-Run Chinook Salmon	Chinook Salmon Essential Fish Habitat: No Adverse Effect	Chinook Salmon Essential Fish Habitat: May Adversely Affect	Same as Alternative 2	Same as Alternative 2
Columbia Spotted Frog	Columbia Spotted Frog Sensitive Species: No Impact	Columbia Spotted Frog Sensitive Species: May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		or species in the short term. Beneficial Impact in the long-term		
Western Ridged Mussel	Western Ridged Mussel Sensitive Species: No Impact	Western Ridged Mussel Sensitive Species: May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species in the short term. Beneficial Impact in the long-term.	Same as Alternative 2	Same as Alternative 2
Shortface Lanx	Shortface Lanx Sensitive Species Determination: No Impact	Shortface Lanx Sensitive Species: May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species in the short term. Beneficial Impact in the long-term	Same as Alternative 2	Same as Alternative 2
Botany				
Open Uplands and Vernal Meadows	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of disappearing	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of Henderson ricegrass, Wallowa ricegrass, Bolander's spikerush, disappearing monkeyflower, annual	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	monkeyflower, annual dropseed and least phacelia.	dropseed, least phacelia and arrow-leaf thelypody.		
Forest and Woodland Areas	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of clustered lady's slipper	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of cordilleran sedge, clustered lady's slipper and schistidium moss, with a beneficial indirect effect to clustered lady's slipper	Same as Alternative 2	Same as Alternative 2
Wetland, Moist Forest and Riparian Areas	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of upward-lobed moonwart, crenulate grape-fern, common moonwart, Mingan moonwort, mountain moonwort, peculiar moonwort, stalked moonwort and Idaho sedge. There would be beneficial effects to northern twayblade	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of upward-lobed moonwart, crenulate grape-fern, common moonwart, Mingan moonwort, mountain moonwort, peculiar moonwort, stalked moonwort, northern twayblade and Idaho sedge. There would be beneficial indirect effects to upward-lobed moonwart, crenulate grape-fern, common moonwart, Mingan moonwort, mountain moonwort, peculiar moonwort, and stalked moonwort.	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Wildlife				
Federally listed threatened and endangered species	None present	None present	None present	None present
Forest Service sensitive species (9 with habitat)	Habitat would remain in its current condition since no action is being proposed and there will be no impacts to species.	No impact to 7 species California wolverine: may impact (MIIH) white-headed woodpecker: may impact (MIIH) in the short term and beneficial impact (BI) in the long term	No impact to 7 species California wolverine: may impact (MIIH) white-headed woodpecker: may impact (MIIH) in the short term and beneficial impact (BI) in the long term	No impact to 7 species California wolverine: may impact (MIIH) white-headed woodpecker: may impact (MIIH) in the short term and beneficial impact (BI) in the long term
MNF management indicator species (MIS): Elk	Cover percentages, quantity and quality of forage and open road densities would remain in their current condition. In the mid to long-term, development of multi-strata stands would create additional satisfactory and marginal cover stands.	Reduction in satisfactory and marginal cover, change in the cover to forage distribution, and increase in overall habitat effectiveness resulting in beneficial impact (BI) to forest-wide population and habitat trends. Satisfactory summer range will decline from 8% to 7 % in Vinegar Creek SWS, marginal summer range from 21% to 20% in Little Boulder/Deerhorn SWS, and satisfactory winter range will stay at 5%. Marginal summer range will change	Reduction in satisfactory and marginal cover, change in the cover to forage distribution, and increase in overall habitat effectiveness resulting in beneficial impact (BI) to forest-wide population and habitat trends. Satisfactory summer range will stay the same in Vinegar Creek SWS, marginal summer range from 21% to 20% in Little Boulder/Deerhorn SWS, and satisfactory winter range will stay at 5%. Marginal summer range will change from 38% to	Reduction in satisfactory and marginal cover, change in the cover to forage distribution, and increase in overall habitat effectiveness resulting in beneficial impact (BI) to forest-wide population and habitat trends. Satisfactory summer range will decline from 8% to 7 % in Vinegar Creek SWS, marginal summer range from 21% to 19% in Little Boulder/Deerhorn SWS, and satisfactory winter range will stay at 5%. Marginal summer range will change from 38% to

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		from 38% to 27% in Vinegar Creek SWS, from 48% to 40% in Little Boulder/Deerhorn SWS, and marginal winter range will decrease from 30% to 25%.	29% in Vinegar Creek SWS, from 48% to 44% in Little Boulder/Deerhorn SWS, and marginal winter range will decrease from 30% to 25%.	25% in Vinegar Creek SWS, from 48% to 36% in Little Boulder/Deerhorn SWS, and marginal winter range will decrease from 30% to 25%.
MIS: Old growth dependent species (4 species)	While old growth would not expand under this alternative continuing to be below Forest Plan standards. Habitat would remain in its current condition and may not be self-sustaining over time. Old growth habitat would remain the same and there would be no impact to forest wide habitat or population trends.	Changes and additions to MA-13 would expand old growth by 1,941 acres across the project area, providing additional habitat. Also, 6,751 acres of created connectivity corridors will provide free movements between LOS habitats. Thinning will make treatment areas less suitable for nesting, but still suitable for foraging. Thinning will occur in approximately 1,148 acres of three-toed woodpecker habitat, which will benefit the species. New roads will open approximately 472 acres of potential habitat for firewood cutting and hazard tree removal, but an additional 1,673 acres will be removed from these risks. Additionally no new road construction will	Changes and additions to MA-13 would expand old growth by 1,941 acres across the project area, providing additional habitat. Approximately 6,751 acres of created connectivity corridors will provide free movements between LOS habitats. Additionally, 1,202 acres will be set aside as pileated woodpecker feeding areas. An inconsequential amount of new roads will open up areas to firewood cutting and approximately 1,309 acres will be removed from these risks. Conversion of stands to OFSS will benefit the white-headed woodpeckers. In the short to mid-term thinning and prescribed fire will have negative effects to pileated	Changes and additions to MA-13 would expand old growth by 1,941 acres across the project area, providing additional habitat. Also, 6,751 acres of created connectivity corridors will provide free movements between LOS habitats. Thinning will make treatment areas less suitable for nesting, but still suitable for foraging. Thinning will occur in approximately 1,504 acres of three-toed woodpecker habitat, which will benefit the species. New roads will open approximately 509 acres of potential habitat for firewood cutting and hazard tree removal, but an additional 1,673 acres will be removed from these risks. Approximately 1/5 mile of new road construction would fragment old growth habitat

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		dissect any existing old growth. Conversion of stands to OFSS will benefit the white-headed woodpeckers. In the short to mid-term thinning and prescribed fire will have negative effects to pileated woodpecker and pine marten by reducing stand density and cover; however in the long term stand structure will better mimic historical sustainable conditions which are beneficial to old growth dependent species. There would be no change to forest-wide habitat or population trends for the species.	woodpecker and pine marten by reducing stand density and cover; however in the long term stand structure will better mimic historical sustainable conditions which are beneficial to old growth dependent species. There would be no change to forest-wide habitat or population trends for the species.	under Alternative 4. Conversion of stands to OFSS will benefit the white-headed woodpeckers. In the short to mid-term thinning and prescribed fire will have negative effects to pileated woodpecker and pine marten by reducing stand density and cover; however in the long term stand structure will better mimic historical sustainable conditions which are beneficial to old growth dependent species. There would be no change to forest-wide habitat or population trends for the species.
MIS: Primary cavity nesters (7 species)	Hairy woodpecker, Lewis' woodpecker and northern flicker habitat would continue to be reduced as a result of stand structure and high stand densities. At risk stands may benefit black-backed woodpecker and	Thinning would convert OFMS stands to OFSS benefitting habitat for hairy woodpecker, Lewis' woodpecker, northern flicker. Thinning would benefit Williamson's sapsucker by retaining old forest structure. Thinning and burning would reduce stand density and cover, thus reducing nesting	Thinning would convert OFMS stands to OFSS benefitting habitat for hairy woodpecker, Lewis' woodpecker, northern flicker. Thinning would benefit Williamson's sapsucker by retaining old forest structure. Thinning and burning would reduce stand density and cover, thus reducing nesting	Thinning would convert OFMS stands to OFSS benefitting habitat for hairy woodpecker, Lewis' woodpecker, northern flicker. Thinning would benefit Williamson's sapsucker by retaining old forest structure. Thinning and burning would reduce stand density and cover, thus reducing nesting and foraging habitat for black-

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	high stand densities would benefit downy woodpecker, red-naped sapsucker and Williamson's sapsucker. Continuing declines in aspen stands may impact down woodpeckers, red-naped sapsuckers and Williamson's sapsucker. There will be no change expected to forest-wide populations or habitats.	and foraging habitat for black-backed woodpecker. Road closures will secure an additional 1,673 acres of habitat from risks of firewood and hazard tree removal, but road construction will open 472 acres to these risks. Aspen restoration would benefit downy woodpecker, red-naped sapsucker. No change expected to forest-wide population and habitat trends.	and foraging habitat for black-backed woodpecker. Road closures will secure an additional 1,309 acres of habitat from risks of firewood and hazard tree removal. Aspen restoration would benefit downy woodpecker, red-naped sapsucker. No change expected to forest-wide population and habitat trends.	backed woodpecker. Road closures will secure an additional 1,673 acres of habitat from risks of firewood and hazard tree removal, but road construction will open 509 acres to these risks. Aspen restoration would benefit downy woodpecker, red-naped sapsucker. No change expected to forest-wide population and habitat trends.
Migratory birds (5 habitat types)	Habitat would remain in its current condition and habitat would not change from the way it is currently being utilized, therefore there would be no effects to habitat, individuals or populations.	No impact to populations, in dry forests possible increase in individuals from converting OFMS stands to OFSS, in mixed-conifer habitats possible decrease to individuals from reducing tree species composition, positive and negative impacts to species from increasing edge habitat, positive impacts from increasing shrubs by opening forest canopy, in riparian and	No impact to populations, in dry forests possible increase in individuals from converting OFMS stands to OFSS, in mixed-conifer habitats possible decrease to individuals from reducing tree species composition, positive and negative impacts to species from increasing edge habitat, positive impacts from increasing shrubs by opening forest canopy, in riparian and	No impact to populations, in dry forests possible increase in individuals from converting OFMS stands to OFSS, in mixed-conifer habitats possible decrease to individuals from reducing tree species composition, positive and negative impacts to species from increasing edge habitat, positive impacts from increasing shrubs by opening forest canopy, in riparian and

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		aspen habitats bird species benefit from aspen treatments, no impacts to sub-alpine forests or montane meadows.	aspen habitats bird species benefit from aspen treatments, no impacts to sub-alpine forests or montane meadows.	aspen habitats bird species benefit from aspen treatments, no impacts to sub-alpine forests or montane meadows.
MNF featured species (3 species)	Habitats would remain in their current condition and continue to be utilized, which may not be self-sustaining over time. No impact to northern goshawk and osprey, suitable nesting and foraging habitat for blue grouse would remain the same.	Reductions in down wood, snags, future snags, dwarf mistletoe brooms, dense forests and closed canopy-forests are likely to reduce habitat preferred by featured species. However, no activities would occur within nest stands, and activities occurring in PFAs would enhance goshawk prey conditions. Blue grouse habitat would be reduced by the removal of roost trees and approximately 27 acres of subalpine habitat could be altered. Approximately 3,236 acres of thinning and 6.8 miles of road construction will occur within 2 km of the MFJDR potentially impacting osprey nesting sites. However, no impacts to featured species are expected in the long term.	Reductions in down wood, snags, future snags, dwarf mistletoe brooms, dense forests and closed canopy-forests are likely to reduce habitat preferred by featured species. However, no activities would occur within nest stands, and activities occurring in PFAs would enhance goshawk prey conditions. Blue grouse habitat would be reduced by the removal of roost trees. Approximately 2,028 acres of thinning will occur within 2 km of the MFJDR potentially impacting osprey nesting sites. However, no impacts to featured species are expected in the long term.	Reductions in down wood, snags, future snags, dwarf mistletoe brooms, dense forests and closed canopy-forests are likely to reduce habitat preferred by featured species. However, no activities would occur within nest stands, and activities occurring in PFAs would enhance goshawk prey conditions. Blue grouse habitat would be reduced by the removal of roost trees and approximately 89 acres of subalpine habitat could be altered. Approximately 3,816 acres of thinning and 7.8 miles of road construction will occur within 2 km of the MFJDR potentially impacting osprey nesting sites. However, no impacts to featured species are expected in the long term.
Heritage Resources				

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Cultural properties	No effects on cultural resources	No effects, sites would be flagged during layout and avoided from harvesting or be protected by logging over snow.	Same as Alternative 2	Same as Alternative 2
Visual Resources				
Visual quality objectives (VQO)	VQOs would be maintained, with scenic stability continuing to decline and scenic integrity continuing to shift from reduced visual sight distances from overstocked stands.	Scenic stability would increase in the mid-to long term from the reduction in stand densities, and scenic integrity would be positively affected by increasing the resiliency of forested stands. Visual quality objectives would be maintained for all foreground and middleground in visual corridors	Same as Alternative 2	Same as Alternative 2
Roads				
Road density standards	Existing open road density = 1.8 mi/mi^2	Open road density would decrease to 1.4 mi/mi^2	Open road density would decrease to 1.4 mi/mi^2	Open road density would decrease to 1.4 mi/mi^2
Miles of open road	98	75.2	76.22	75.2
Miles of closed road	90	103.2	92.7	105.9
Miles of roads to be	0	20.9	18	20.2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
decommissioned				
Recreation				
Recreation opportunity spectrum (ROS)	No change to existing condition	No effects, ROS classes would not change	No effects, ROS classes would not change	No effects, ROS classes would not change
Developed and Dispersed Campsites	There will be no changes to developed campsites or access to dispersed campsites.	Developed campsites will not be directly impacted by the project, although the sights and sounds of harvest activities and burning may be present during implementation. Two dispersed campsites with current access will become inaccessible from road closure, and one dispersed campsite on a closed road will be decommissioned.	Same as Alternative 2	Same as Alternative 2
Hunting and other Recreation	Hunting and other recreational activities will continue to occur at their current rate. Access will slowly diminish due to road conditions declining.	The short-term effect of harvest and burning activities or increases in the sights and sounds from project activities may displace recreationists and hunters in the short term. Road closures may redirect recreationists over the long-term; improved road system could provide similar opportunities as the present	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		time.		
Developed Trails and Trailheads	There will be no effect to developed trails or trailheads in the project area	Temporary impacts to snowmobile activities and roaded recreation along the 2010 road may occur as a result of haul and logging operations. Trail users will experience a variety of short term visual impacts along trails in the project area; however this will end after activity is completed. The 0.25 mile long road to the Blackeye Trailhead will be closed, however access will be available along the closed road to the trailhead.	Same as Alternative 2	Same as Alternative 2
Air Quality				
Air quality standards	No effect	Air quality standards would be met. Short-term impacts to communities down-wind and adjacent to prescribed fire units.	Air quality standards would be met. Short-term impacts to communities down-wind and adjacent to prescribed fire units. The same number of acres would be burned as Alternative 2, however 2,172 less acres of pile-burning would occur compared to Alternative 2, producing less	Air quality standards would be met. Short-term impacts to communities down-wind and adjacent to prescribed fire units. The same number of acres would be burned as Alternative 2, however 1,439 more acres of pile-burning would occur compared to Alternative 2, producing more smoke.

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
			smoke.	
Rangeland				
Forage production	Decrease in forage production and quality from increased canopy closure.	In the long-term there would be an increase in forage production on 7,642 acres over the existing condition.	In the long-term there would be an increase in forage production on 7,324 acres over the existing condition.	In the long-term there would be an increase in forage production on 7,930 acres over the existing condition.
Aspen treatment	No aspen treatment will continue	Aspen enhancement will take approximately 35 acres out of livestock grazing by fencing out the stands.	Same as Alternative 2	Same as Alternative 2
Road treatments	No Effect	Approximately 12.6 miles of new road construction will offer travel ways to livestock, increasing distribution through the allotment. Approximately 16.6 miles of closing and 21.9 miles of decommission roads can slow herding and pasture moves resulting in trailing and increase the time spent in grazing units.	Approximately 1.1 miles of new road construction will offer travel ways to livestock, increasing distribution through the allotment. Approximately 14.9 miles of closing and 19.9 miles of decommission roads can slow herding and pasture moves resulting in trailing and increase the time spent in grazing units.	Approximately 14.7 miles of new road construction will offer travel ways to livestock, increasing distribution through the allotment. Approximately 16.59 miles of closing and 21.2 miles of decommission roads can slow herding and pasture moves resulting in trailing and increase the time spent in grazing units.
Invasive Weeds				
Rate of spread	No effects	Spread would occur related to road use, construction of new roads (12.6 miles), tractor yarding, mobilization of equipment, and prescribed	Spread would occur related to road use, construction of new roads (1.1 miles), tractor yarding, mobilization of equipment, and prescribed	Spread would occur related to road use, construction of new roads (14.7 mi), tractor yarding, mobilization of equipment, and

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		burning.	burning.	prescribed burning.
Economics				
Viability of Harvest	N/A	Commercial harvest shows positive bid rates producing a viable harvest, $971,186 is the estimated revenue from the sale.	Commercial harvest shows positive bid rates producing a viable harvest, $511,367 is the estimated revenue from the sale.	Commercial harvest shows positive bid rates producing a viable harvest, $81,207 is the estimated revenue from the sale.
Employment and Income	Declining trends in timber harvesting from National Forest lands would continue in the future and contribute to declines in wood products employment	Short term economic relief by providing commercial saw logs and biomass. Harvest related employment (211 jobs) would occur for 2 years.	Short term economic relief by providing commercial saw logs and biomass. Harvest related employment (125 jobs) would occur for 2 years.	Short term economic relief by providing commercial saw logs and biomass. Harvest related employment (272 jobs) would occur for 2 years.
Economic Efficiency	The public would incur no costs, nor realize any benefits.	A present net value of $-220,343 would be experienced under Alternative 2. This would produce 211 jobs, and $6,180,194 in local income.	A present net value of $-182,373 would be experienced under Alternative 2. This would produce 123 jobs, and $3,598,273 in local income.	A present net value of $-1,459,346 would be experienced under Alternative 2. This would produce 272 jobs, and $7,990,505 in local income.
Inventoried Roadless Areas				
Roadless characteristic	An increased risk of loss from large scale wildfire or insect/disease	No harvest or road building. Approximately 1,945 acres of prescribed fire and 6 acres of aspen restoration would help	No harvest or road building. Approximately 1,945 acres of prescribed fire and 6 acres of aspen restoration would help	No harvest or road building. Approximately 1,945 acres of prescribed fire and 6 acres of aspen restoration would help to

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		to maintain and restore the characteristics of ecosystem composition and function, and the activities would not impact roadless character or the area's eligibility for potential wilderness.	to maintain and restore the characteristics of ecosystem composition and function, and the activities would not impact roadless character or the area's eligibility for potential wilderness.	maintain and restore the characteristics of ecosystem composition and function, and the activities would not impact roadless character or the area's eligibility for potential wilderness.
Potential Wilderness Areas				
Dixie Butte Potential Wilderness Areas	No effects to existing 5,514 acre PWA within the project area	Timber harvest and 0.2 miles of road construction would reduce the PWA by approximately 60 acres. Prescribed fire would occur on 2,039 acres of the PWA, but would not remove the area from inclusion in a PWA inventory.	There would be no changes in acreages to the PWA. Prescribed fire would occur on 2,039 acres of the PWA, but would not remove the area from inclusion in a PWA inventory.	Approximately 2 miles of road would be constructed in the PWA outside of the IRA, thinning would occur within the PWA, outside of the IRA. These activities would reduce the PWA by 719 acres. The Dixie Butte PWA would still be over 5,000 acres including areas outside of the project boundary. Prescribed fire would occur on 2,039 acres of the PWA, but would not remove the area from inclusion in a PWA inventory.
Greenhorn Potential Wilderness Area	No effects to existing 3,183 PWA within the project area	Activities would not occur within the PWA within the project area, maintaining the 3,183 acres of PWA. Prescribed fire would occur on 663 acres of the PWA, but would not remove area from	There would be no changes in the acreages to the PWA. Prescribed fire would occur on 663 acres of the PWA, but would not remove area from inclusion of a PWA inventory.	No road construction or harvest activities would occur in the PWA, maintaining the 3,183 acres of PWA. Prescribed fire would occur on 663 acres of the PWA, but would not remove area from inclusion of a PWA

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		inclusion of a PWA inventory.		inventory.
Other Undeveloped Lands				
Acres of Other Undeveloped Lands	No effects to OULs within the project area. 9,965 acres would still remain undeveloped, but not IRAs or PWAs. The project area will remain 50% undeveloped or within PWAs	Activities occurring as part of the project will reduce the OULs by 3,223 acres. The project area will be approximately 41% undeveloped or within PWAs after implementation.	Activities occurring as part of the project will reduce the OULs by 1,855 acres. The project area will be approximately 45% undeveloped or within PWAs after implementation.	Activities occurring as part of the project will reduce the OULs by 3,675 acres. The project area will be approximately 38% undeveloped or within PWAs after implementation.
Climate Change				
Greenhouse gas emissions and carbon sequestration	No immediate effect, potential wildfires could release 3-5 times the quantities of CO_2 into the atmosphere as prescribed fire.	Prescribed burning will release reduced amounts of CO_2 into the atmosphere when compared to wildfire. Harvest and thinning is not expected to have a measurable change in the ability of the forest to sequester carbon.	Prescribed burning will release reduced amounts of CO_2 into the atmosphere when compared to wildfire. Harvest and thinning is not expected to have a measurable change in the ability of the forest to sequester carbon.	Prescribed burning will release reduced amounts of CO_2 into the atmosphere when compared to wildfire. Harvest and thinning is not expected to have a measurable change in the ability of the forest to sequester carbon.
Effects of climate change on project area	Species composition and stand density will remain the same or trend toward late	Activities will increase the ability of the forest to withstand increased levels of wildfire and other disturbances	Activities will increase the ability of the forest to withstand increased levels of wildfire and other disturbances	Activities will increase the ability of the forest to withstand increased levels of wildfire and other disturbances and provide

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	seral species and increased density, which can lead to larger fuel loadings and higher potential for wildfire with increasing temperatures and shifting precipitation patterns.	and provide for a more resilient forest in the face of potential climate change.	and provide for a more resilient forest in the face of potential climate change.	for a more resilient forest in the face of potential climate change.
Environmental Justice				
Minority and low income communities	Nearby low income communities would not see an increase in jobs related to treatment activities.	There would be no disproportionately high human health or environmental effects on minority or low income communities. Nearby communities would be positively affected by economic impacts connected with treatment activities	Similar effects to Alternative 2, however since less treatment is occurring compared to Alternative 2, less employment opportunities will exist.	Similar effects to Alternative 2, however since more treatment is occurring compared to Alternative 2, more employment opportunities will exist.

Some effects are the same for each action alternative due to the mitigation through the design criteria. Therefore, the table does not display difference in effects between alternatives.

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Chapter 1 Purpose and Need

Introduction

The United States Department of Agriculture (USDA), Forest Service has prepared this final Environmental Impact Statement (FEIS) in compliance with the National Environmental Policy Act (NEPA 40 CFR 1500-1508) and other relevant Federal and State laws and regulations. This FEIS is prepared according to the format established by the Council on Environmental Quality (CEQ) regulations implementing NEPA. The interdisciplinary team (IDT) used a systematic approach for analyzing the proposed action and alternatives, evaluating the environmental effects, and preparing a Draft Environmental Impact Statement for public review. During scoping in the preparation of the DEIS, public input was sought and comments received were assessed and considered both individually and collectively. Along with the individual comments, agency responses to these comments are found in the project record. Input from the public led the Forest Service to respond by modifying the proposed action and developing alternatives. A Notice of Availability was published in the Federal Register on March 25, 2011 and the DEIS was sent out for a 45 day comment period. In the development of this Final EIS (FEIS) comments made to the DEIS were assessed and considered in the preparation of this FEIS and the Record of Decision (ROD).

This FEIS tiers to and incorporates by reference the Malheur National Forest Land and Resource Management Plan as amended (Forest Plan), FEIS, and ROD (1990).

Project Area Description

The Galena project is located on the Blue Mountain Ranger District (BMRD) within the Malheur National Forest. The project area is located in Grant County approximately 28 miles northeast of the town of John Day, Oregon (Figure 1). The Galena project area encompasses approximately 37,200 acres in the Vinegar Creek and Little Boulder Creek-Deerhorn subwatersheds that drain into the Middle Fork of the John Day River. The main road access to the project area is via County Road 20 off State Highway 7.

The climate in northeastern Oregon is a combination of the maritime climate that extends through the Columbia Gorge and the drier continental climate of the Great Basin with an average precipitation of 20-40 inches per year. The forest is characterized by ponderosa pine stands at lower elevations transitioning to mixed conifer stands consisting of ponderosa pine, western larch, grand fir, Douglas-fir, western white pine, and lodgepole pine at higher elevations.

The project area has been altered by past management activities including mining, cattle and sheep grazing, timber harvest, and fire suppression. Many of the timber stands in the area are dominated by young ponderosa pine trees resulting from natural regeneration after intensive railroad logging of the large ponderosa pine in the early to mid-1900s. Later timber harvest in the higher elevations again focused on the larger ponderosa pine trees and these areas have experienced ingrowth of late seral species like grand fir. Past timber harvest and the absence of fire have left many of the forested stands stocked with a composition and density of tree species that cannot be sustained in the long term. Insect and disease mortality and damage have increased with the change in tree species composition and overcrowding. These dense stands have heavy fuel loads on the ground, multi-layer canopies, and crowns that are close together increasing the fire hazard and severity.

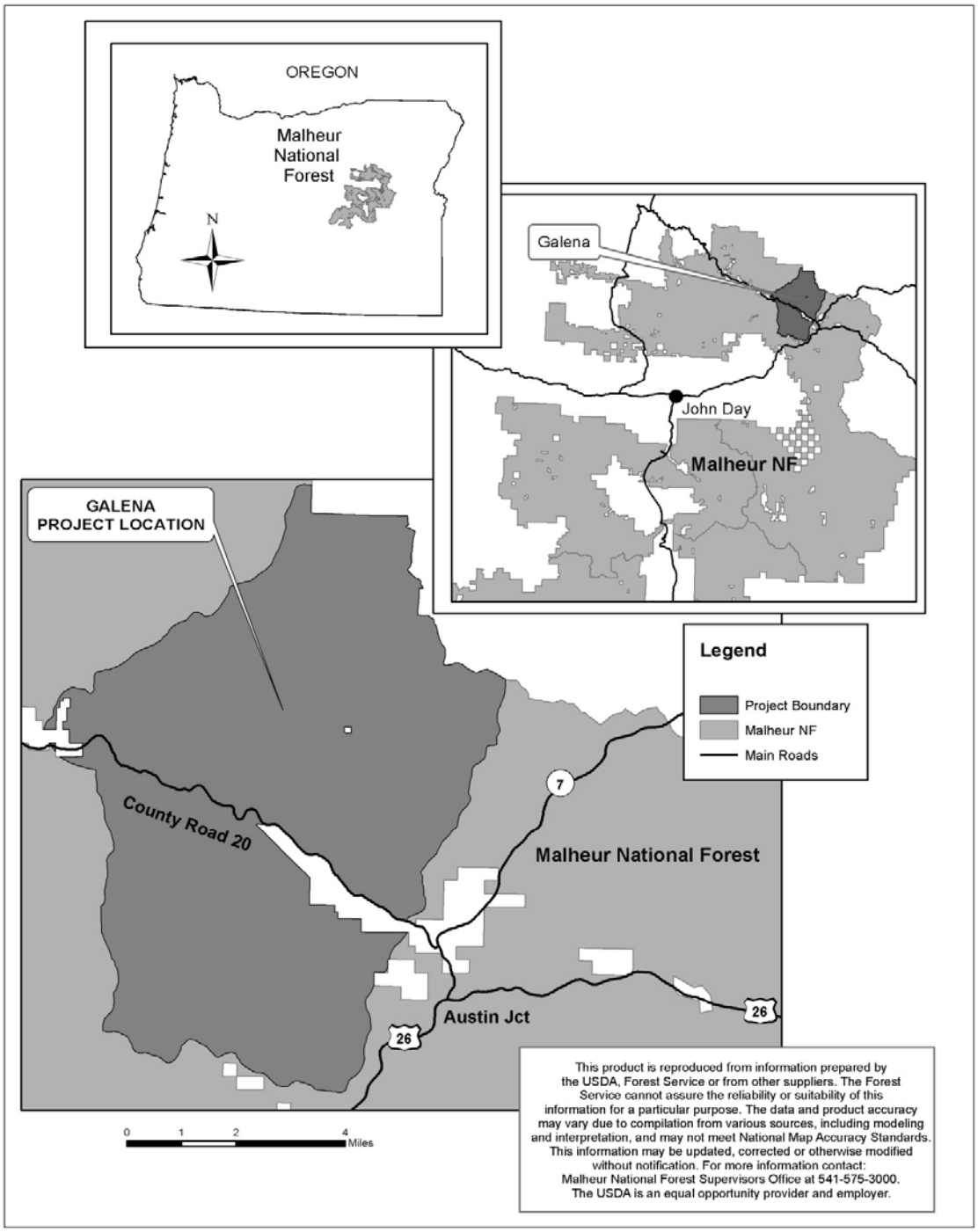

Figure 1. Location of the Galena project area on the Malheur National Forest

The legal description for the project area is (township, range, sections): T10S R34E S12-13, 22-28, 32-36; T11S R34E S1-5, 8-16, 17-21, 21-28, 33-36; T12S R34E S1-4; T10S R35E S 7-8, 17-21, 27-34; T11S R35E S3-9, 16-21, 29-32; and T12S R35E S5-7, Willamette Meridian.

Purpose and Need

The needs for the proposed action are derived from the difference between current conditions and desired conditions. Desired conditions are based on Forest Plan direction and management objectives. Moving forest stands toward historic range of variability (HRV) and improving forest health is desirable because such conditions provide more sustainability over the long-term. The historic range of variability is a reference point utilized to base the need for an increase in the resiliency of the forest to natural disturbance regimes for the long term. Specifically the purposes of this project are to:

1. Promote a change in tree species composition, stand densities, and structure to develop a trend toward more resilient historic vegetative conditions in upland forested stands.
2. Reduce the fuel loading by reducing the density of standing vegetation, surface fuels, and ladder fuels. Reduce fuels along County Road 20 which is identified as an escape corridor in the Grant County Community Fire Protection Plan.
3. Provide a safe road system that meets current public and management access needs, while reducing the risk of sediment reaching streams and impacts to aquatic species and wildlife habitat.
4. Accelerate development of future late and old structural (LOS) single-stratum wildlife habitats.
5. Improve wildlife habitat for old growth dependent species by adjusting dedicated old-growth (DOGs) areas, identifying replacement old-growth (ROGs) areas, and identifying pileated woodpecker feeding areas (PWFAs) to meet Forest Plan standards.
6. Improve aspen stands and the associated wildlife habitat by creating conditions that will allow for successful regeneration and development into mature trees and stands.
7. Provide wood products to help maintain community stability and infrastructure.

The focus of the Galena project is to restore forested stands in the project area to more closely resemble historical conditions that are more sustainable than current conditions. The forested stands in the project area are outside the historic range of variability (HRV) for the hot-dry and the warm-dry forest types. HRV is the expected range of tree species and forest structure under natural, unmanaged disturbance patterns. There is currently a lack of old forest stand structures, primarily old forest single stratum (OFSS) and old forest multi-strata (OFMS) structural stages.

To move the stands toward historical conditions with increased resiliency there is a need to reduce stand density, increase the proportion of early seral species, and modify the structure of the forest. Reducing the density of trees decreases competition and increases the health and vigor of trees resulting in increased survival against insects, disease, and wildfires. Increasing the proportion of early seral tree species, would shift the stands to predominantly ponderosa pine and western larch. With these fire adapted species, stands would be in a condition where fire can be reintroduced to play a natural role. The understory of some multi-story stands would be removed to create more old forest single-story stands that are currently lacking and to increase the survival of the existing large pine and larch trees.

To reduce the large scale fire hazard there is a need to reduce surface fuel loads, ladder fuels, and the crown density. Due to the absence of low intensity frequent fire and increased mortality from insect and disease, present fuel loads have increased beyond historical levels. There is a need to reduce the chance of a surface fire becoming a crown fire and a small fire becoming an uncharacteristic severe wildfire. High-intensity wildfires present a risk to the public, firefighters, and the ecosystem. A large, high severity fire would remove entire stands and cause resource damage. Removing accumulated fuel loads, creating a single-story stand structure, and reducing the stand and crown density would decrease the risk of a large-scale fire.

There is a need to provide an adequate transportation management system that meets public and management access needs while reducing impacts to streams and aquatic and wildlife habitats. To improve stream condition and aquatic species fish habitat there is a need to construct new roads in the upland forest to allow for moving roads out of riparian areas while still providing for public and management access. Constructing new roads in the uplands and decommissioning roads in riparian areas will reducing the amount of sediment moving into streams from native surface roads and allow for riparian vegetation to become established, improving the overall function of the stream and associated riparian area as well as fish and wildlife habitat. To improve wildlife habitat for elk big game there is a need to reduce disturbance caused by motorized use on roads in the project area. The Forest Plan future desired condition for road densities are 1.0 mi/mi^2 in big game winter range and 1.5 mi/mi^2 in big game summer range. The current open and closed road density in winter range is 3.0 mi/mi^2 and 1.8 mi/mi^2 in summer range within the project area. While past projects have closed a number of roads, more road closures and decommissioning would improve elk big game security.

There is a need to improve habitat for old growth dependent species and to provide conditions that would accelerate the growth of large trees for future old forest structure. The project area is below Forest Plan standards for the amount of Dedicated Old Growth (DOG) and the associated Replacement Old Growth (ROG). There is a need to designate additional acres to bring DOG and ROG up to Forest Plan standards. To increase the amount of wildlife habitat for species dependent on old growth areas, there is a need to delineate additional areas that meet Forest Plan criteria for old growth. Currently, there is also a lack of large snags within much of the project area. There is a need to create open stands with large trees, which would provide future large snags benefiting bird species dependent on this type of habitat.

Aspen is a shade intolerant, early seral species occurring in small isolated stands throughout the project area and once played a larger part of the historical forest composition. To improve the wildlife habitat, there is a need to increase the size and health of the remnant aspen stands. The Galena Watershed Analysis (USDA 1999) identified the need to restore declining aspen stands within the overall watershed. Encroaching conifers, over-browsing by livestock and wildlife, and lack of low intensity wildfire have caused the decline in the quantity and quality of aspen stands.

Wood products play an important role in the local economy by providing employment and revenue. There is a need to provide wood products to help maintain the existing lumber and forest products infrastructure and support local employment, providing for community stability. The Forest Plan includes direction to provide a sustainable flow of timber and associated wood products at a level that would contribute to economic stability and provide an economic return to the public.

Forest Plan Standards, Goals and Desired Conditions

The purpose and need of this project is aimed at achieving desired conditions stated in the Forest Plan. The Forest Plan lists standards and goals related to desired conditions for the project area.

- Manage forest for species composition, stand density and structure to move toward HRV in upland forests (The Regional Forester's Forest Plan Amendment No.2, USDA 1995a)
- Reduce risks of fire severity and insect damage by maintaining stand vigor through the use of activities such as stocking level control (Forest Plan standard 98, p. IV-37).
- Minimize density of open roads in riparian areas by decommissioning unnecessary roads in riparian areas (Forest Plan standard 41, p. IV-67).
- Develop historical levels of OFSS forest habitat for species dependent on large, open grown ponderosa pine stands (The Regional Forester's Forest Plan Amendment No.2 USDA 1995a).

- Manage for old growth habitat through a system of Dedicated Old Growth (DOG) and Replacement Old Growth (ROG) units to provide for pileated woodpecker and pine marten viability (Forest Plan standards for MA-13, pp. IV-105 & 106).
- Provide conditions that would allow aspen to improve vigor and regenerate (Forest Plan standards 8, 9, & 14 for MA-3b, pp. IV-63, IV-64).
- Provide wood products to local community on a sustained yield basis while providing for other resources (Forest Plan goals for MA-1, p. IV-50).

The Galena Watershed Analysis also mentions site specific goals related to increasing forest health and sustainability, habitat development, and fuels reductions for the project area. Desired conditions specific to this project area (Galena Watershed Analysis 2002 Supplement) would be consistent with the Forest Plan and meet the purpose and need. The desired condition for vegetation is to move forest structure and composition towards HRV. This includes increasing the number of large trees across the landscape, increasing the proportion of fire tolerant early seral species, and creating open and park-like stands that are maintained by low intensity, frequent fire. The desired condition of the transportation system is to provide forest users safe and adequate road access while protecting aquatic resources. The desired condition for wildlife habitat is to provide sustainable habitat at historical levels for those wildlife species that prefer OFSS forest structures.

Forest Plan Direction and Guidelines

The Forest Plan (chapter IV) provides overall direction to meet desired conditions by identifying management goals and objectives to reflect conditions on the ground. The Forest Plan management areas are used to guide the type and intensity of management activities that may occur on the forest. The Galena project falls within 10 management areas (MA) as described in Table 1. A map showing these areas can be found in Appendix C. There are some management areas that overlap, so the total acreage is more than the size of the project area.

Table 1. Summary of management areas within the project area boundary

Management Area	Acres	Forest Plan Goals
MA1: general forest	18,683	Manage for timber production and other multiple uses on a sustained yield basis.
MA2: rangeland	Included in MA1	Manage for livestock forage production and other multiple uses on a sustained yield basis.
MA3b: anadromous riparian areas RHCAs	6,204	Manage to protect or enhance riparian-dependent resources in watersheds supporting anadromous fish. Acres for this MA are measured using RHCA buffers.
MA4a: big game winter range	3,218	Manage to maintain useable forage for elk and deer on potential winter range.
MA7: scenic area	1,287	Manage to preserve and protect the outstanding natural aesthetics of the Vinegar Hill-Indian Rock scenic area.
MA9: research natural area	45	Manage areas for non-manipulative research, observation, and study of undisturbed ecosystems.
MA12: developed recreation sites	12	Manage for developed recreation opportunities, providing interpretation and enhancement of cultural and natural resources.

Management Area	Acres	Forest Plan Goals
MA13: old growth habitat	1,966	Manage old growth for wildlife and plant habitat, ecosystem diversity, and aesthetic quality. Dedicated old growth areas are managed to provide old growth characteristics for dependent wildlife species. Replacement old growth areas are managed to provide future old growth habitat.
MA14: visual corridors	7,015	Manage viewshed corridors with primary consideration given to scenic quality and growth of large diameter trees. Visual quality objectives such as retention, partial retention, and modification will be applied while providing for other uses and resources.
MA21: wildlife emphasis area with non-scheduled timber harvest	1,069	Manage to provide high quality fish and wildlife habitat and water quality. Manage elk habitat to provide at least 70% elk habitat effectiveness. Timber harvest will be on a non-scheduled basis and used only to meet fish or wildlife habitat objectives. Provide opportunities for high quality semi-primitive dispersed recreation.
Other ownership	1,143	Non-national forest system land. No activities would be authorized on these lands.

There are a number of forest-wide goals identified in the Forest Plan, related to various resources for which this project is consistent (Forest Plan IV-1-4):

Goal 17 (wildlife): Provide for the maintenance and enhancement of big-game habitat so as to sustain elk and deer populations at the state management objective level.

Goal 18 (fish): Provide for improved fish habitat conditions to support increased populations of anadromous and resident fish.

Goal 25 (timber): Provide and utilize wood fiber in the form of saw timber, fiber, and associated wood products in a manner which will minimize losses and maximize outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards.

Goal 27 (water): Provide a favorable flow of water (quantity, quality, and timing) for off-forest users by improving or maintaining all watersheds in a stable condition.

Goal 30 (soils): Manage the soil resource of the forest by using management practices that will maintain or enhance its productive properties.

Goal 49 (fire): Identify, develop and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction

Need for Amending the Forest Plan

Dedicated Old Growth

There are three areas related to old growth forest habitat for which Forest Plan standards were set. These are dedicated old growth habitats (DOGs), replacement old growth habitats (ROGs) and pileated woodpecker feeding areas (PWFAs). Within the project area, the number of acres set aside for each of these habitats is below thresholds set in the Forest Plan. The Forest Plan states that DOGs will be 300 acres, PWFAs will be 300 acres, and ROGs will be 150 acres for every 12,000 acres. The Forest Plan

standards for old growth habitats are identified for Management Area 13 (Forest Plan, IV-105, 106 & Appendix G, LRMP FEIS), directing that old growth areas be distributed across the forest to provide for wildlife species dependent on this forest type. The Forest Plan requires an assessment of old growth areas utilizing an interdisciplinary process to recommend boundary changes to better meet objectives. The proposed non-significant Forest Plan amendment would redraw boundaries for existing areas and delineate boundaries for new areas within the project area to bring total acres up to Forest Plan standards within the project area. The proposed Forest Plan amendment would redraw Management Area 13 boundaries for existing areas and delineate boundaries for new areas within the project area to bring total acres up to Forest Plan standards. This amendment would be applied under any action alternative. DOGs would increase by 134 acres, ROGs would increase by 1,046 acres, and PWFAs would increase by 470 acres.

Reduction of Satisfactory Big Game Cover

The Forest Plan selected Rocky Mountain Elk as a Management Indicator Species (MIS) for estimating elk habitat effectiveness on the landscape. Overall habitat effectiveness (HEcsrf) incorporates four variables or indices including cover. The forest plan establishes minimum standards for cover for both summer range (LRMP, pp. IV-27 to IV-29) and winter range (LRMP, pp. IV-69 to IV-73). In addition, the forest plan identifies minimum standards for retention of satisfactory cover, marginal cover, and total cover. Each action alternative would reduce satisfactory cover within big game summer range below Forest Plan standards. Within the Vinegar Creek Subwatershed satisfactory cover will be reduced by approximately 1%. Within Little Boulder/Deerhorn Subwatershed satisfactory cover will be reduced by 0.3% for alternatives 2 and 3, and 1.3% for alternative 4. Satisfactory big game winter range in the Little Boulder Creek-/Deerhorn Subwatershed would be reduced by 0.1% for each action alternative. Total cover in both subwatersheds would still exceed standards. All treatments would occur in dry forest types.

Summer Range

Existing Satisfactory cover for summer range in the project area is 8% which is below the Forest Plan standard of 12%. The proposed action would reduce the satisfactory cover to 7%. The other two action alternatives would also reduce satisfactory cover to approximately 7% in summer range and require an amendment (p. 194).

Winter Range

Satisfactory cover within winter range is currently 5% which is below the Forest Plan standard of 10%. The proposed action would reduce satisfactory cover in winter range by 0.1%. The other two action alternatives would also reduce satisfactory cover in winter range by 0.1% and would require an amendment.

In spite of the reduction in satisfactory cover within the project area the overall habitat effectiveness would remain above forest plan standards after implementation of all action alternatives. All action alternatives would require a non-significant Forest Plan amendment. This amendment would apply only for the duration of and to those actions proposed for the site-specific project called Galena.

Proposed Action

In response to the need to improve forest health by moving forest stands toward historical conditions, restore fire adapted ecosystems, reduce ladder and surface fuels, reduce the impacts of roads to riparian areas, improve wildlife habitat, and improve aspen stands while providing wood products on a sustained yield basis, the Forest Service proposes ground disturbing activities in five categories:

- Harvest of trees for products
- Pre-commercial thinning
- Prescribed burning
- Associated road activities
- Aspen stand restoration

These activities would reduce stand density, alter species composition, and encourage growth of large trees. These activities would occur over approximately the next 10 years. A brief description of these activities follows, and a more detailed description is in Chapter 2.

Harvesting Trees for Products

Commercial Thinning: Commercial thinning consists of removing a portion of merchantable trees from 7 to 20.9 inches diameter at breast height (dbh), to reduce stand density and canopy fuels and enhance individual tree growth.

Understory Removal: Understory removal of commercial and pre-commercial sized trees (1.0 to 20.9 inches dbh) would thin multi-storied stands from below.

Return to Early Seral: Douglas-fir and grand fir trees from 7 to 20.9 inches diameter that have grown into early seral ponderosa pine and western larch stands will be removed to facilitate a return to HRV in these stands.

- Commercial thinning – 5,040 acres
- Understory removal – 556 acres
- Return to early seral species – 1,217 acres

A number of units proposed for pre-commercial thinning and pre-commercial thinning within commercial units have enough small diameter material to be considered for biomass utilization (Map 3, Appendix C). Material not utilized for traditional timber products may be removed from commercial harvest and pre-commercial thinning units that can be accessed by ground based equipment (current economics are not conducive to skyline or helicopter removal of biomass material). This material may be used for pulp chips, co-generation of electricity, commercial fuel pellets, post and poles, or other non-traditional uses.

- Biomass from pre-commercial thinning – 1,370 acres
- Biomass from harvest units – 693 acres

Pre-commercial Thinning

The objectives of pre-commercial thinning are to reduce ladder fuels and to increase growth and vigor of remaining trees. The prescriptions for pre-commercial thinning would favor early seral trees to promote the desired future species composition of the stands. Pre-commercial thinning consists of removing non-merchantable sized trees (1 foot tall to 9 inches dbh) that don’t meet commercial tree standards, but could potentially be used for consumer products such as posts and poles, firewood, wood pellets, and biomass fueled co-generation of electricity. In addition, tops, branches, and other woody biomass from harvest of trees could be made available for utilization. The material not utilized for products would be hand piled and burned. Pre-commercial thinning may occur in areas that are also commercially harvested. Pre-commercial thinning would occur as follows:

- Pre-commercial thinning up to 9 inches dbh – 1,526 acres
- Pre-commercial thinning in commercial thinning units – 1,255 acres

Prescribed Burning

The objectives of prescribed burning are to reduce surface fuels, reduce litter depth, and increase canopy base height. Prescribed burning would occur in commercial and pre-commercial thinning units as well as units that are not going to have any mechanical treatments to bring area into compliance with Forest Plan Standards. The units would be treated by underburning, and pile burning by hand piling or mechanical piling. The decision to incorporate pile burning or underburn in commercial, pre-commercial, or areas not treated mechanically are based upon fuel loading, stand characteristics, and other resource concerns (i.e. wildlife, soils, botany, etc.).

Prescribed burning would occur as follows:

- Underburning on up to 19,913 acres
- Pile burning on localized piles covering 8,339 acres

Portions of the Inventoried Roadless Areas (IRA) would be underburned with no mechanical treatments proposed. Proposed activities within the IRA would include fireline construction and the use of aerial and hand ignition. All constructed hand line would utilize natural barriers and be rehabilitated after the burn is complete. There would be no prescribed burning in dedicated old-growth areas (DOGs) and no ignition within 100’ of riparian zones.

Road Activities

Roads would be utilized in the project area to access harvest, pre-commercial thinning, and prescribed burning units. General road maintenance, reconstruction, and new system road construction to relocate roads out of riparian areas would take place prior to use. New road construction is generally proposed

- Allow the relocation of roads out of riparian areas (allowing decommissioning of riparian roads).
- Provide access where the present road system is inadequate, generally on former railroad grades which are either unsafe or poorly distributed (existing roads on railroad grades that would be no longer needed are included in the proposed decommissioning).
- In some cases, to provide access to areas last treated decades ago.

Short temporary roads would be constructed and rehabilitated to a natural state after implementation. A number of roads have been identified that are not needed for future access and are planned for closure and decommissioning. The resulting reduction in road density per square mile will move the project area toward meeting the Forest Plan desired condition of road densities of 1.5 mi/mi^2 for elk summer range and 1.0 mi/mi^2 for elk winter range. Proposed road activities are as follows;

- Culvert Installation – 2 (replacing fords at Davis Creek. & Dead Cow Gulch)
- New road construction – 12.6 miles
    - Includes roads relocated from riparian areas – 6.2 miles
- Temporary road construction – 3.1 miles
- Closed roads to be opened for log haul and reclosed after completion – 37.0 miles
- Road maintenance – 69.7 miles
- Road reconstruction – 21.4 miles

- Additional road closures – 16.6 miles
- Road decommissioning – 21.9 miles
    - Includes roads decommissioned within riparian areas – 6.2 miles

Aspen Restoration

Twenty-eight aspen stands, totaling approximately 35 acres, have been identified for restoration. There are three actions proposed to protect aspen stands and improve aspen regeneration and vigor. Thinning conifer trees that have grown into aspen stands will reduce competition and increase production of aspen suckers. Some aspen stands may be included in prescribed burning units, where underburning is expected to improve aspen regeneration. Constructing fences around aspen stands will reduce browsing grazing pressure from livestock and wildlife and allow the aspen suckers to grow. Fencing will include room for the aspen stands to expand.

Decision Framework

The Forest Supervisor of the Malheur National Forest is the responsible official who will review the proposed action, alternatives to the proposed action, and the environmental consequences to make a decision. The analysis is both a programmatic-level Forest Plan analysis (36 CFR 219) and a project-level analysis (36 CFR 228.102). The decision should contain activities that best meet the purpose and need and provide consistency with Forest Plan standards and guidelines for all related resource areas. Under any action alternative, the decision would include design criteria necessary for the activities to take place and provide resource protection.

The Forest Supervisor will decide whether to:

- Implement the proposed action as described,
- Implement an alternative to the proposed action as described,
- Implement a combination of activities from either the proposed action or an alternative, or
- Choose not to take any action at this time.

If an action alternative or combination of alternatives is selected, then the Forest Supervisor will decide whether to amend the Forest Plan to adjust old-growth boundaries and big game cover standards.

Public Involvement

In November 2008 the Galena project was presented to the local Blue Mountain Forest Partners (BMFP) collaborative. The BMFP group seeks to improve the resilience and well-being of forests and communities in the Blue Mountains. BMFP has collaborated with the Forest Service on three previous forest health projects on the Malheur National Forest. They decided to not formally collaborate on this project; however, individuals were invited to participate in the project design. General guidelines provided by the collaborative group on other forest projects were considered by the IDT during the development of the Galena project.

A Notice of Intent (NOI) was published in the Federal Register on March 12, 2009. The NOI asked for a 30-day public comment period on the scope of the analysis. A formal scoping package was sent to approximately 160 individuals, groups, federal and state agencies at the same time the NOI was published. Eleven comments were received in response. A letter was mailed and a newspaper article published in the Blue Mountain Eagle on February 18, 2009 inviting interested parties to a public meeting

on April 8, 2009, where three people attended. The Forest Service response to the comment letters from the scoping period, public meeting notes, and a copy of the NOI can be found in the project record.

The Forest Service prepared a draft environmental impact statement for the Galena Project and a Notice of Availability was published in the Federal Register on March 25, 2011. The DEIS was sent out for a 45-day comment period to agencies, groups and individuals. Comments made to the DEIS were assessed and considered in the preparation of this FEIS and the Record of Decision (ROD). A list of comments received and the agencies response to the comments can be found in Appendix D of this document.

Schedule of Proposed Actions

The Galena project has been listed in the Malheur National Forest Schedule of Proposed Actions (SOPA) beginning in the summer of 2008 and in subsequent quarterly SOPAs. This document is mailed to individuals and is available on the internet (http://www.fs.fed.us/sopa/forest-level.php?110604) for those who are interested in activities proposed on the Malheur National Forest.

Tribal Consultation

This project is compliant with Executive Order 13175, Consultation and Coordination with Indian Tribal Governments. Tribal consultation is ongoing with three American Indian tribes with ceded or traditional use areas within the project area. The government-to-government consultation is being conducted under the terms of specific agreements with the individual tribes. A tribal consultation letter was mailed to the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation, and the Burns Paiute Tribe on March 12, 2009. This letter included a detailed description of the proposed action. No comments were received during the scoping process of this project. The DEIS for this project was mailed to all three tribes on March 25, 2011 and comments were received from the Confederated Tribes of the Warm Springs Reservation and can be found with the USFS response in Appendix D of this document.

Consultation with NMFS and FWS

Preparation of a Biological Assessment (BA) for Endangered Species Act consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) has been completed for this project. Federally listed fish species and their proposed or designated critical habitat in the project area subject to consultation include bull trout and their designated critical habitat, and Mid-Columbia River steelhead and their designated critical habitat. The Malheur National Forest received a Biological Opinion (BO) from NMFS was received April 23, 2013 regarding effects to steelhead and their designated critical habitat, and a letter of concurrence from the FWS regarding effects to bull trout and designated critical habitat. Essential Fish Habitat (EFH) consultation with NMFS pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) regarding effects of the proposed project on EFH for Chinook salmon is occurred concurrently with ESA section 7 consultation.

Laws and Regulations

The management of timber resources on National Forest System (NFS) lands is based on several federal laws and regulations. The following information has been included in this chapter to help the reader better understand the basis for the purpose and need and the proposed action. A description of additional laws and regulations applicable to each resource area can be found in chapter 3 and in specialist reports located in the project record.

Multiple Use Sustained-Yield Act, 1960

The Forest Service shall manage NFS lands for multiple uses. 'Multiple uses' are defined as, "the management of all the various surface renewable resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people without impairment of the land."

Endangered Species Act, 1973, as amended

The purposes of the Endangered Species Act (ESA) are to "provide 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 steps as may be appropriate to achieve the purposes 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."

Magnuson-Stevens Fishery Conservation and Management Act, 1976, as amended

This Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of Chinook salmon Essential Fish Habitat (EFH) descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH.

Clean Water Act, as amended, 1977, 1982

The primary objective of this Act is to restore and maintain the integrity of the nation's waters. This objective translates into two fundamental national goals: 1) Eliminate the discharge of pollutants into the nation's waters and 2) Achieve water quality levels that are fishable and swimmable. This Act establishes a non-degradation policy for all federally proposed projects.

Clean Air Act, as amended, 1990

The purposes of this Act are "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to state and local governments in connection with the development and execution of their air pollution prevention and control programs; and to encourage and assist the development and operation of regional air pollution prevention and control programs."

National Forest Management Act, 1976

This Act guides development and revision of the national forest land management plans (16 USC 1604) and includes annual reporting requirements on timber sale contracts, the Secretary of Agriculture must submit to Congress.

National Historic Preservation Act, 1966 as amended, 1976, 1980, 1992

Section 106 of this Act is the foremost legislation governing the treatment of cultural resources during project level planning and implementation. This section requires federal agencies to review the potential effects of project proposals on cultural resources.

Migratory Bird Treaty Act, 1918 and Executive Order 13186

The purposes of this Act are to establish an international framework for the protection and conservation of migratory birds. The Act makes it illegal, unless permitted by regulations, to "pursue, hunt, take, capture,

purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or any manner, any migratory bird, included in this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird" (16 USC 703).

On January 10, 2001, President Clinton signed an Executive Order titled Responsibilities of Federal Agencies to Protect Migratory Birds. This Executive Order requires that "environmental analysis of Federal actions, required by NEPA or other established environmental review processes, evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern."

Chapter 2 Alternatives

Introduction

This chapter describes the issues related to the proposed action identified through the public involvement process and describes in detail, a range of alternatives designed to address these issues. Maps of each alternative can be found in Appendix C. This section also presents the alternatives, including the proposed action, in comparative form by defining the differences between each alternative, providing options for the responsible official to make a decision. The information used to compare the alternatives is based upon the design of the alternative and the environmental, social, and economic effects of implementing each alternative.

Issues

Using the comments provided from the public, tribes, other agencies, and industry representatives during collaboration and scoping, the interdisciplinary team developed a list of issues related to the proposed activities. The issues were separated into three groups: key issues, analysis issues and issues eliminated from detailed study. Key issues were defined as those within the scope of the project, were directly or indirectly caused by implementing the proposed action and were used to develop the range of action alternatives. Analysis issues were those issues addressed in the effects analysis and used to compare the alternatives. Issues eliminated from detailed study were: (a) outside the scope of the proposed action (b) already decided by law, regulation, Forest Plan, or other higher level decisions (c) irrelevant to the stated decision to be made or (d) conjectural and not supported by scientific or factual evidence.

The Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of issues eliminated from detailed study and reasons regarding their categorization are in the project record. Three key issues were identified and alternatives 3 and 4 were developed to respond to these issues while meeting the purpose and need of the project.

Key Issue 1

Construction of new and temporary roads could cause resource damage in the project area such as channelizing water, erosion, disturbance to wildlife habitat, and the spread of invasive weeds.

Measurement Indicator: Presence or absence of new and temporary roads constructed by miles, road density or acres disturbed.

Key Issue 2

An increased amount of commercial thinning, providing more merchantable saw logs from the same land base, could provide more stability to the local community economic infrastructure.

Measurement Indicator: Volume of merchantable timber from commercial thinning.

Key Issue 3

Lack of aerial treatment of fuels in unroaded areas would increase fuel hazard.

Measurement Indicator: Acres of units identified for commercial harvest via helicopter yarding

Analysis Issues

The following statements were developed from issues or concerns received during internal scoping or from the public or other agencies that reflect potential effect the proposed action or action alternatives would have on resources or the environment. These issues are analyzed in detail in Chapter 3 by resource and were used to compare effects of the alternatives.

- Hazardous fuels: Whether proposed fuel treatment levels would be adequate enough to affect fire behavior and reduce fire danger. Measure: Percent change in crown fire potential after completion of each alternative 40 years in the future
- Water quality: Proposed harvest, road construction, and prescribed burning could reduce water quality. Measure: Changes in water quality and water quantity leading to a change in watershed hazard after implementation and over the next 20-50 years.
- Hydrology: Existing road beds and proposed road construction may impact hydrologic function. Measure: Miles of road located in RHCA after implementation
- Road Access: Road decommissioning may limit access for future needs. Measure: Miles of open roads and miles of closed roads after project completion.
- Wildlife connectivity corridors: the proposed activities may reduce the extent or functionality of critical connectivity corridors. Measure: Number of acres identified for connectivity and miles of road potentially fragmenting corridors
- Big game security: Increased road density contributes to a loss of big game security. Measure: Open road density in mi/mi^2
- Inventoried roadless areas, potential wilderness areas, and undeveloped areas: Commercial timber harvest, road construction, and mechanical fuel treatment may impact the roadless or undeveloped character of these areas. Measure: Acres of Potential Wilderness Area and Other Undeveloped Lands that meet the identification criteria after completion of each alternative
- Sensitive soils: Soil disturbance would occur with proposed activities that require ground-based equipment. Disturbance could include compaction, displacement, and exposure of the mineral surface to erosion due to the removal of ground cover. Measure: Percent of detrimental impacts to soils after thinning activities.
- Spread of invasive weeds: Soil exposure from project activities may provide habitat for noxious and invasive plants. There is the potential for the spread of existing noxious and invasive plant populations by harvest equipment. Measure: Acres of soil disturbance and prescribed fire.
- Forage for livestock: There is an issue that the grazing operations could be adversely impacted by the rest needed after prescribed burning. Measure: Acres potentially unavailable for permitted grazing after prescribed fire.
- Economic viability of the timber sale: A number of factors including the number of acres treated by commercial harvest, harvest volume per acre, and amount of road construction may affect the economic viability of the timber sale. Measure: Present net value for commercial units.

Findings

- 303(d) listed streams: Proposed activities may retard improvement in degraded stream conditions. Finding: Whether the project meets the requirements of the Clean Water Act.
- Species impacts: The proposed activities may impact threatened and endangered species, management indicator species, and species of concern and their habitat. Finding: Whether the

project meet the Endangered Species Act and/or whether it will lead to a trend toward federal listing of any species.

- Air quality: smoke from prescribed burning would contribute to short term decreased air quality and visibility. Finding: Whether the project meets the Clean Air Act and State and Federal air quality standards.
- Cultural resources: The proposed project may affect tribal natural and/or cultural resources. Finding: Whether the project meets the National Historic Preservation Act.

Issues Eliminated From Detailed Study

There were a number of other issues brought up in the scoping response letters that were already addressed through the design of the alternatives or mitigation, beyond the scope of the project, or would result in an alternative that would not meet the purpose and need of the project.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of consideration for timber harvest, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, some alternatives were considered but eliminated from detailed consideration for reasons summarized below.

Retain all cover for big game

An alternative was considered that would avoid thinning in stands containing hiding cover for big game. The interdisciplinary team recognized that cover is limited in winter range across the forest. Stands in the project area with big game hiding cover have high amounts of fuels and are overstocked to the point of being vulnerable to large-scale disturbance. It was therefore determined that thinning in a portion of the big game cover in hot-dry and warm-dry forest types is necessary to meet the purpose and need for the project. While reductions in stand density contribute to reduced hiding cover, there would be increased forage. In commercial thinning units, variable tree spacing and retention of unthinned areas would provide continued hiding cover for wildlife. For these reasons, the alternative was not analyzed in detail.

Remove large diameter trees

During public scoping, it was requested that an alternative be considered that would commercially thin trees over 21 inches diameter at breast height (dbh). The primary purpose for this alternative would be to provide a greater economic benefit from the sale of large diameter trees. There is a deficit of trees over 21” in the project area. Removal of live trees greater than 21 inches dbh would require an amendment to Regional Forester’s Eastside Forest Plan Amendment #2 - Existing Standard: 6d (2) (a): “Maintain all remnant late and old seral and/or structural live trees greater than 21 inches dbh that currently exist within stands proposed for harvest activities.”

The intent of this amendment was to maintain and enhance late and old structure (LOS) forest stands for wildlife species dependent on these habitats. The interdisciplinary team acknowledged a need to maintain LOS stands, including trees greater than 21 inches dbh, within the project area. After giving this alternative careful consideration, the responsible official decided not to consider an alternative of removing trees greater than 21 inches dbh.

No commercial timber harvest

Based on feedback from public comments, an alternative was considered that would consist of only pre-commercial thinning and prescribed burning without commercial harvest. This alternative would not include commercial thinning or new road construction. Pre-commercial thinning alone would reduce stocking levels in just the smaller tree diameter classes and would only partially meet the "purpose and need". The addition of prescribed fire may be successful in reducing surface fuels and increasing canopy base heights however, is generally less effective at reducing canopy bulk density. Prescribed fire that kills the larger diameter trees would exceed the acceptable threshold for severity and can be unpredictable to manage. Other constraints including meeting air quality standards would be difficult to achieve due to prolonged smoke emissions. One of the purposes for the project, to reduce the crown fire potential, would not be achieved. For these reasons, this alternative was not analyzed in detail.

No activities within Inventoried Roadless areas or Potential Wilderness

The biophysical environments that are encompassed by the Inventoried Roadless Areas (IRAs) and Potential Wilderness Areas (PWAs) include hot-dry, warm-dry and cool moist forests. Natural fire behavior within these boundaries is consistent with the rest of the dry forest types within the project area. Historically, high frequency fire at a low intensity would most likely burn at an interval of 1-35 years.

There are no thinning treatments proposed for IRAs with the exception of aspen restoration. Aspen stands are a critical part of the habitat for a broad range of wildlife and can provide a benefit during a wildfire by moderating fire behavior in some situations. Not treating these stands would eventually result in losing the stands to the encroaching conifers and the result would be the loss of the critical habitat that aspen stands provide.

There are thinning treatments planned for PWAs within the project area to begin to move the biophysical environments in the stands to a historic range of variability. Not treating these areas would leave them with high amounts of fuels and are overstocked to the point of being vulnerable to large-scale disturbance. Additionally, incorporating burning activities would improve forest restoration and resiliency, while mitigating fuel loads. No thinning treatments or prescribed burning within the IRAs and PWAs would leave stands more vulnerable to a large scale, high severity wildfire, especially on the north slopes of Dixie Butte and in the Indian Rock/Vinegar Hill scenic area. Additionally, not treating areas within PWAs that are within the vicinity of the County Road 20 escape corridor identified in the Grant County Community Fire Protection Plan would leave the corridor without a defensible space between the Dixie Butte IRA and the escape corridor. For these reasons this alternative was not analyzed in detail.

Alternatives Considered in Detail

The Forest Service developed two additional alternatives to the proposed action in response to key issues raised by the public for a total of four alternatives considered in detail, including the no action alternative.

Proposed Forest Plan Amendments

All three action alternatives require the following Forest Plan amendments:

Adjust and Expand Dedicated Old Growth Habitats (DOG's) and Create New Replacement Old Growth Habitats (ROG's)

There are three areas related to old growth forest habitat for which Forest Plan standards were set. These are dedicated old growth habitats (DOGs), replacement old growth habitats (ROGs) and pileated woodpecker feeding areas (PWFAs). Within the project area, the number of acres set aside for each of these habitats is currently below thresholds in the Forest Plan. The proposed Forest Plan amendment would redraw Management Area 13 boundaries for existing areas and delineate boundaries for new areas

within the project area to bring total acres up to Forest Plan standards. This amendment would be applied under any action alternative. There would be a net gain of designated and replacement old growth acreages.

The Forest Plan standards for old growth habitats are identified for Management Area 13 (Forest Plan, IV-105, 106 and Appendix G, Forest Plan FEIS), directing that old growth areas be distributed across the forest to provide for wildlife species dependent on this forest type including pileated woodpecker, pine marten, three-toed woodpecker, and white-headed woodpecker (management indicator species). The Forest Plan requires an assessment of old growth areas utilizing an interdisciplinary process to recommend boundary changes to better meet objectives.

DOGs, ROGs and PWFAs are identified based on a set of criteria. The DOG is the system of dedicated old growth units set aside by the Forest Plan. Individual DOG units are classified by the management indicator species dependent on the habitat's unique characteristics. For DOGs associated with pileated woodpeckers, a PWFA is required. ROGs are established by the Forest Plan to counter possible large scale damage or deterioration of dedicated old growth areas. Replacement areas may not currently have all characteristics of old growth, but are managed to achieve those characteristics in the future so that when a DOG no longer meets the needed habitat requirements, the ROG can take its place. Table 2 compares the existing old growth habitats set aside within the project area with the proposed changes in relation to Forest Plan standards.

Table 2. Summary of existing old growth habitat and proposed changes within the project area for pileated woodpecker and pine marten

	DOGs		ROGs		PWFAs	
	Areas	**Acres**	**Areas**	**Acres**	**Areas**	**Acres**
Existing habitat	10	2,433	2*	181	1*	134
Proposed new areas	0	0	8	1,046	3	470
Proposed changes to existing areas	10	134	2	154	1*	3*
Total Increase	10	134	10	1,200	4	473
Habitat after proposed changes	10	2,567	10	1,381	4	607

**The 134 acre PWFA completely overlaps with a ROG. The proposed changes are to add three acres to the PWFA, which would still overlap the ROG.*

Reduce Satisfactory Cover below Forest Plan Standards

Satisfactory cover for winter range in the Little Boulder Creek/Deerhorn subwatershed is currently 5%, which is below the Forest Plan standard of 10%, and would be further reduced to 4.9%, a total of one tenth of one percent. Satisfactory cover for summer range in the Vinegar Creek Subwatershed is currently 8.2%, which is below the Forest Plan Standard of 12%, and would be further reduced to 7.3%, a total of nine tenths of one percent (158 acres). The Proposed Action would reduce satisfactory cover within big game summer range by 0.3% (37 acres) in the Little Boulder/Deerhorn Subwatershed and by 0.1% (3 acres) within big game winter range. Total cover in both subwatersheds would still exceed standards. All treatments would occur in the warm-dry and hot-dry forest types.

Cover requirements may not always be compatible with the historical range of variation (HRV). This conflict is readily apparent in hot-dry and warm-dry biophysical environments dominated by ponderosa pine. Historical conditions and fire return intervals favored large blocks of single story, mature stands

with canopy closure too low to support large blocks of satisfactory or marginal cover. Under historical conditions, cover percentages would be inherently low, probably below Forest Plan standards. Today, cover requirements are being met on many ponderosa pine sites; however, stands are overstocked and at high risk to bark beetle attack and uncharacteristically severe wildfires. Unfortunately, tree thinning, the treatment that most effectively reduces beetle and fire risk, also reduces the effectiveness of a stand as cover. Most of these stands would likely fall out of cover within the next 25 years if not treated. In a 2003 letter to the Eastside Forests, the Regional Office provided direction encouraging Forests to use site specific Forest Plan amendments to move the landscape towards HRV (USDA FS June 11, 2003).

Alternative 1 – No Action Alternative

This alternative is the "no action" alternative, required by the National Environmental Policy Act NEPA. Under the no action alternative, no change in existing forest management would occur. Alternative 1 is designed to represent the existing condition and projected future conditions if current forest management continues. The no action alternative is based on the assumption that ecosystems undergo change, even in the absence of active management. It serves as a baseline to compare and describe the differences and effects between taking no action and implementing action alternatives. There would be no Forest Plan amendment or treatment of aspen stands under Alternative 1. The existing open road density of 1.8 mi/mi^2 would not change. The no action alternative would not move the project area towards desired conditions and does not meet the purpose and need.

Alternative 2 - (Proposed Action)

Alternative 2 is the proposed action, which responds to the need : improve forest health by moving forest stands toward historical conditions, restore fire adapted ecosystems, reduce ladder and surface fuels, reduce the impacts of roads to riparian areas, improve wildlife habitat, and improve aspen stands while providing wood products on a sustained yield basis. The proposed action would authorize activities in five categories: harvest of trees for products, pre-commercial thinning, prescribed burning, associated road activities, and aspen restoration. The order in which these activities would be implemented is variable. A list of all units with proposed activities is in Appendix A. Maps of the thinning units, aspen stands, and roads are in Appendix C.

Commercial Harvest

This project incorporates three different commercial harvest treatments. A combination of commercial thinning, understory removal, and return to early seral species would best meet the objectives of the project as described in the purpose and need section in Chapter 1. There would be no commercial harvest within Riparian Habitat Conservation Areas (RHCAs). Activities would occur on 189 units covering 6,813 acres, producing 24 million board feet in volume as follows:

- Commercial thinning – 129 units, 5,040 acres
- Understory removal – 25 units, 556 acres
- Return to early seral species – 35 units, 1,217 acres

Commercial Thinning: The objectives of commercial thinning are to reduce total fuel loads, promote ecologically appropriate species composition, restore historic structural conditions, increase resiliency to insects and disease, and allow the reintroduction of fire. Commercial thinning would reduce competition among trees for sunlight, water and nutrients resulting in more vigorous forest stands. This prescription would thin small and medium size trees in immature forest stands. Commercial thinning would consist of removing a portion of merchantable trees from 7 up to 20.9 inches dbh. There would be an average of 50 to 60 square feet per acre of basal area retained in commercial thinning units. Commercial thinning would leave trees at a varied spacing with densities varying by 50% across the stand to provide structural

diversity and forage for wildlife. Un-thinned areas that are 3-5 acres in size and cover 5-15% of the stand would be left for wildlife habitat in stands that exceed 20 acres in size. Stands that are less than 20 acres in size will not have unthinned patches, but will still have varied spacing as described above. All snags would be retained for wildlife unless identified as a danger tree. There would be no commercial harvest within RHCAs. In units immediately adjacent to public or private land, thinning would be at a lighter density and un-thinned patches would be left at the 5% level.

To comply with regional direction (Regional Foresters' Forest Plan amendment #2), trees 21 inches dbh and larger would be retained to keep the old forest component. The only exceptions would be for road construction, landings and to fell danger trees greater than 21 inches dbh. Felled trees outside of RHCAs may be removed for utilization; those within the RHCAs are to be felled into streams where feasible, left within the RHCA, or transported off-site for watershed restoration projects. Medium-sized older trees less than 21 inches dbh with old growth characteristics indicating they are older than 150 years would be retained. Cull trees less than 12 inches dbh would be cut, but larger "wolfy" cull trees would be left for wildlife habitat not to exceed one per acre, where available. After commercial thinning, remaining tree tops and limbs would be utilized for biomass, or piled and burned.

Understory Removal: Understory removal would thin from below by removing commercial and pre-commercial sized trees (1-20.9 inches dbh) from old forest multi-storied stands. Thinning from below would remove the majority of smaller trees and would remove some medium diameter trees. Old forest stands would be converted from multi-story to single-story and young stands would be thinned from closed canopy to open canopy. The result would be minimized ladder and mid-canopy fuels, and improved survivability of larger trees.

Return to Early Seral Species: Return to early seral species would remove young, mostly late seral trees (1-20.9 inches dbh) that have grown into early seral ponderosa pine and western larch stands. Any resulting under-stocked stands would be reforested by planting with early seral species to historic stocking levels. The objective of removing the fir trees is to return stands to a condition where fire can eventually be reintroduced to play a natural role. Where early seral species are above historic stocking levels, the trees under 21 inches in diameter would be thinned. Where larger early seral species are not available a minimum of 20 trees per acre would be left to provide structural variety and future large snags.

Harvest Systems

Cut trees would be yarded to landing zones via tractor or skyline depending on topography. Skid trails, skyline corridors, and landing locations up to 1-2 acres in size would be determined before logging and are subject to approval by the sale administrator. In landing zones the vegetation would be cleared for equipment to prepare, deck, and load trees for hauling. No landing zones would be located within RHCAs. The areas proposed for commercial harvest (6,813 acres) would be yarded via tractor or skyline as follows:

- Tractor – 5,108 acres
- Skyline – 1,705 acres

Pre-commercial Thinning

The objective of pre-commercial thinning is to reduce ladder fuels and increase the growth and vigor of remaining trees. Pre-commercial thinning would remove trees up to 9 inches dbh that are not economically merchantable in size. Cull trees would be removed up to 12 inches dbh, leaving on average one per acre for wildlife. Varying the spacing by as much as 50% and leaving patches covering 10% of the units unthinned would provide a variety of wildlife habitats and visual diversity. Pre-commercial

thinning (including pile burning) would not occur within RHCAs. Pre-commercial thinning would occur on 84 units covering 2,781 acres as follows:

- Pre-commercial thinning – 50 units, 1,526 acres
- Pre-commercial thinning in commercial thinning units – returning to 34 units covering approximately 1,255 acres

Pre-commercial thinning material may be utilized for biomass. Most material not used for consumer products would be hand piled leaving a fuel profile of no more than 7-10 tons per acre to provide for nutrient recycling. The material placed in piles would be burned.

Biomass Utilization

A number of units proposed for commercial thinning and pre-commercial thinning within commercial units have enough small diameter material to be considered for biomass utilization (Map 3, Appendix C). Material not removed from commercial harvest units such as tops, branches, and other woody material and pre-commercial thinning material may be utilized for consumer products such as posts and poles, firewood, fuel pellets, and for fueling co-generation of electricity. For the most part, existing woody material on the ground is not suitable for biomass utilization and would be left on site for nutrient input to the soil or would be piled and burned if in excessive amounts. Efforts would be made to stimulate local markets by utilizing woody biomass generated by this project rather than dispose of it by burning. Utilization is limited by the marginal economics of the products to areas accessible by ground based skidding.

- Biomass from pre-commercial thinning units – 26 units, 1,370 acres
- Biomass from commercial thinning units – returning to 17 units, 693 acres

Prescribed Burning

The objective of prescribed burning is to reduce surface fuels, increase canopy base height, and reduce fir understory establishment primarily in the hot-dry and warm-dry forest types within the project area. This alternative includes prescribed fire, specifically underburning and pile burning, as follows:

- Underburning (ignition) – 19,913 acres
- Riparian Areas with potential to underburn – 3,562 acres
- Hand & Grapple Pile burning – localized piles on 8,339 acres
- Landing Pile Burning – approximately 830 piles

Underburning would occur in 5 large blocks (refer to Map 6 in Appendix C) that are primarily located in the warm-dry and hot-dry forest types. The lower elevations in Blocks 1, 2, and 3 were underburned once or twice in the 1990s, the rest of the blocks have not been burned since fire suppression became effective. Each year, a portion of each block could be burned, limited to approximately 1,000 acres unless approved by the District Ranger upon advice from the wildlife biologist. No dedicated old growth areas are to be burned and within RHCAs no ignition is to occur within 100 feet of the stream channel. Fire would be allowed to back into riparian areas, burning at low intensities in a mosaic pattern in the moister riparian environment.

Underburning is more effective with less adverse effects when done after mechanical treatments (such as thinning and pile burning) and most of the underburning will be scheduled to occur after the planned mechanical treatments are accomplished. In Block 2 the previous Moe timber sale was logged about 10 years ago and that area is currently ready for underburning. In Blocks 1, 3, and 4 underburning will

mostly occur after the mechanical treatment is completed. In Block 5 little mechanical treatment is planned, so underburning could be done at any time.

The Design Criteria at the end of this chapter list a number of parameters for the burning, including mortality limits for trees, amount of duff reduction, and snag and large log retention. To meet these, considering the long time since the last fire, the initial underburn will need to be done carefully under more restrictive conditions than following underburns. Often this means the initial underburn is done in the spring when the duff and large logs are still moist, so that only a portion of the buildup of ground fuels is consumed by the first burn. Subsequent underburns can be done under drier, fall-like conditions within a larger window of fuel moisture and weather conditions as there is less fuel on the ground. Once desired fuel conditions are met, maintenance underburning would be done every 10 -15 years with the objective to keep the fuels within the desired levels and to reduce the amount of new understory establishment.

Ignition for the initial underburning would be by hand or from ATVs stopping 100 feet from the stream channels. Ignition for following underburns could include aerial ignition, as well as hand and ATV lighting. Fire is expected to back across only a portion of the riparian areas, generally leaving half or more of the duff layer where it does burn and less than ¼ of the riparian vegetation affected.

Underburning would result in mosaic burning patterns across the landscape with the objective to burn less than 90% at any one time. Prescribed fire would not be utilized to substantially change the structure of any stand. Acceptable tree mortality percentages can be found under the Silviculture section in Table 3. Tree mortality would provide future snag replacements for wildlife.

Underburning is proposed in inventoried roadless areas (IRAs), there would be no cutting of any trees within these areas, with the exception of danger trees. MIST tactics (Minimum impact suppression tactics) would be utilized when there is a need to construct fireline. This would follow the recommendations of the: NWCG Guidance on Minimum Impact Suppression Tactics in Response To the 10-Year Implementation Plan for Reducing Wildland Fire Risks to Communities and the Environment.

Underburning is not proposed in any dedicated old growth areas (DOGs), but is proposed in replacement old growth areas (ROGs) and pileated woodpecker feeding areas (PWFAs) that fall within burning units.

Burning hand and grapple piles would occur within units after commercial and pre-commercial thinning and biomass removal. Up to 10% of the piles may be left unburned, to provide for additional wildlife habitat. Piles would be limited to less than 3% of the total surface area of a thinning unit and would be located to minimize damage to live trees and snags. Pile burning is done under moist conditions that limit the spread of the fires away from the piles. No pile burning would occur within RHCAs.

An estimated 830 landing piles would need burning. The material in these landing piles is available for utilization and this may reduce the overall amount of landing pile burning. These piles would be burned under moist conditions when fire is limited to the pile location. Piles would be located so that damage to any residual trees would be minimal during burning.

Road Activities

Roads would be utilized in the project area to provide access for treatment activities. General road maintenance, reconstruction, and some new construction would be necessary prior to use. Temporary roads would be constructed and rehabilitated after implementation. Haul routes have been identified to transport commercially harvested timber out of the project area. Some new system road construction is planned to relocate existing roads out of riparian areas and to access areas previously logged by railroad grades or with horses. Two culverts designed for fish passage would replace the ford across Davis Creek and Dead Cow Gulch. A number of roads have been identified as not needed for future access and are

planned for decommissioning. Individual roads are listed in Appendix B, and proposed road activities for Alternative 2 are as follows:

- 12.6 miles of new road construction
    - Includes 6.2 miles of road relocation out of riparian areas
- 21.4 miles of road reconstruction
- 1.2 miles of road reconstruction on haul routes outside the project area
- 69.7 miles of road maintenance
- 15.2 miles of road maintenance on haul routes outside the project area
- 44.9 miles of closed roads to be opened for log haul
    - 37.0 miles to be re-closed at completion of project
- 16.6 miles of currently open roads to be closed at completion of project
- 103.18 total miles of closed roads at completion of project
    - Net increase of 12.9 miles of closed roads from existing condition
- 21.9 miles of road decommissioning
    - Includes 6.2 miles of road relocation out of riparian areas

New system road construction, temporary road construction, and reopening closed roads temporarily would occur to provide adequate access for harvest and fuel reduction treatments. Reconstruction and road maintenance would occur on open or temporarily closed roads to provide safe access and adequate drainage.

New system road construction is planned to relocate access routes out of riparian areas, allowing unneeded road segments to be decommissioned, and to provide access to areas previously railroad and horse logged. Some new construction would provide alternative access in areas where road blockage associated with previous decommissioning has been ineffective and decommissioning treatments would be reinforced.

Temporary road construction would be necessary to access several timber harvest units. All temporary roads would be rehabilitated after use. Rehabilitation would eliminate future use of the road with the objective of restoring hydrological function. Rehabilitation could include re-contouring, subsoiling, and seeding as necessary and discouraging continued use by constructing an earth berm or placing large rocks and slash at the road entrance.

Roads that are currently closed but needed for proposed activities would be opened. The majority of the closed roads that are opened will be reclosed after project activities are concluded. Those that are determined to be necessary for the road system after the project's completion will remain open. The closures would remain consistent with the intent of the original closure. Basic custodial maintenance would be performed to allow for future access and to prevent damage by maintaining adequate drainage.

The following work is classified as maintenance: blading and shaping the roadbed, reshaping drain dips or grade sags, reshaping waterbars/cross ditches, spot rocking in the roadbed, brushing and removing danger trees, removing snow minor realigning of road junctions, cleaning culverts, seeding, removing excess material from the roadbed, and placing fill material in ruts in the road. Application of chip seals or chemical dust abatement products is not proposed.

Reconstruction includes major improvements and road realignment and may include: removing small trees and stumps, constructing new drainage dips, constructing new waterbars, constructing new outlet ditches, placing geotextile on the existing road surface replacing existing cattle guards, or any actions that may result in a new location of an existing road.

Additional closures are proposed on currently open or newly constructed roads. The proposed closures are primarily in big game summer or winter range where the existing road density is above Forest Plan standards. Road closures would be on roads desired to be kept on the system, but use will be limited to infrequent management and other permitted activities. Closure may be by a physical barrier or gate, or by regulation. Basic custodial maintenance will be performed for future resource access and to prevent damage. Closed roads are to be left in a stable hydrologic state and are to be periodically maintained.

Roads, including some located on railroad grades, that would not be needed for future access and roads in riparian areas that are replaced by new roads are planned for decommissioning. Decommissioning includes blocking access, restoring hydrologic function, and re-establishing vegetation. Re-contouring, subsoiling, and scarification of the surface may be done on some roads, depending on site specific conditions and potential for short term versus long term sedimentation into streams. The first segment of the roadbed and decommissioned roads within RHCAs would be obstructed with natural materials such as logs, rocks, slash, and brush or otherwise obscured or made impassable to prohibit motor vehicle use and may be seeded with native vegetation and planted with conifers.

Aspen Restoration

Twenty-eight aspen stands of various sizes have been identified comprising approximately 35 acres. Individual units are listed in Appendix A. There are three actions proposed to protect aspen stands and improve aspen regeneration and vigor. The first is to thin conifer trees that have grown into aspen stands to reduce competition for light and water. The second action is to construct fences around aspen stands to reduce grazing pressures from livestock and wildlife. The third is to underburn in the aspen stands that are in or next to a prescribed burning unit.

Conifers less than 21 inches dbh would be felled within 100 feet of aspen stands to encourage expansion of the stands. Conifers felled within RHCAs would be felled into streams where feasible, left within the RHCA, or transported off-site for watershed restoration projects. Some trees cut from aspen stands that are outside of RHCAs and within commercial thinning units could be harvested as merchantable logs. Some conifers would be girdled and left as snags, including trees larger than 21 inches dbh and any conifers within 25 feet of stream channels, springs or wetlands. Smaller diameter trees and slash would be hand piled and burned or left to provide a protective barrier from livestock and wildlife grazing. Encroaching lodgepole pine would be felled and may be used to construct buck and pole fences around aspen stands. The thinning and fencing would be done on a larger area than the existing stands with the objective to expand the current stands and would cover approximately 35 acres.

When prescribed burning is implemented in the project area, the underburning would be allowed to back into some aspen stands. The underburning of an aspen stand would only occur if that stand is associated with a proposed prescribed burning unit and after it has been fenced to exclude browsing of the new suckers. Aspen stands would be enhanced by prescribed burning, which would stimulate new growth of aspen trees.

Alternative 3

Alternative 3 was developed in response to key issue #1 (potential resource damage caused by road construction) by not building temporary roads, only constructing a very small amount of a new system roads, and harvesting fewer units than the proposed action. Alternative 3 is a 42 percent reduction in acres

proposed for commercial thinning, from Alternative 2. This alternative would authorize ground disturbing activities in five categories: commercial thinning and harvest of trees, pre-commercial thinning, prescribed burning, associated road activities, and aspen stand restoration. The order in which these activities could occur is variable. A list of each thinning unit and aspen stand can be found in Appendix A and maps of the thinning units, aspen stands and roads in Appendix C. A list of all roads with proposed activities is in Appendix B.

Commercial Harvest

The description of commercial harvest and objectives under Alternative 2 are the same for Alternative 3, however, the number of units and acres are different. Activities would occur on 111 units covering 3,971 acres, producing 14 mmbf in volume as follows:

- Commercial thinning – 85 units, 2,660 acres
- Understory removal – 17 units, 350 acres
- Conversion to early seral species – 29 units, 961 acres

Tractor and skyline logging systems would be utilized as follows:

- Tractor – 2,838 acres
- Skyline – 1,133 acres

Pre-commercial Thinning

The description of pre-commercial thinning and objectives under Alternative 2 is the same for Alternative 3; however, some units that were to be both commercial and pre-commercial thinned are now only pre-commercial thinning so the total acres thinned remain the same. Pre-commercial thinning would occur on 84 units covering 2,781 acres as follows:

- Pre-commercial thinning – 64 units, 2,196 acres
- Pre-commercial thinning in commercial thinning units – returning to 20 units covering approximately 585 acres

Prescribed Burning

The description of prescribed burning and objectives under Alternative 2 are the same for Alternative 3; however, there are less acres of pile burning.

- Underburning – 19,913 acres
- Riparian Areas with potential to underburn – 3,562 acres
- Hand & Grapple Pile burning – localized piles on 6,167 acres
- Landing Pile Burning – approximately 350 piles

Road activities

The description of road activities for new road construction, road maintenance, reconstruction and decommissioning under Alternative 2 are the same for Alternative 3. There is no proposed temporary road construction planned under Alternative 3. There is no proposal under Alternative 3 to remove the roads from riparian areas and relocate them as described in Alternative 2. The Davis Creek culvert would not be installed and use of the present ford would continue. The road system proposed under this alternative is as follows:

- 1.06 miles of new road construction
- 13.8 miles of road reconstruction
- .04 miles of road reconstruction on haul routes outside the project area
- 65.4 miles of road maintenance
- 14.8 miles of road maintenance on haul routes outside the project area
- 33.9 miles of closed roads to be opened for log haul
    - 29 miles to be re-closed at completion of project
- 14.89 miles of currently open roads to be closed at completion of project
- 92.7 total miles of closed roads at completion of project
    - Net increase of 2.5 miles of closed roads from existing condition
- 19.9 miles of road decommissioning

Aspen Restoration

The description of aspen restoration including the number of stands and acres under alternative 2 is the same for Alternative 3.

Alternative 4

Alternative 4 was developed in response to key issues #2 and #3 (increasing amount of merchantable saw logs and accessing areas not accessible by existing roads) by increasing the number of commercial thinning units from the proposed action and adding additional units that would require helicopter yarding. Alternative 4 is a 19 percent increase in acres proposed for commercial thinning, from Alternative 2. This alternative would authorize ground disturbing activities in five categories: commercial thinning and harvest of trees, pre-commercial thinning, prescribed burning, associated road activities, and aspen stand restoration. The order in which these activities could occur is variable. A list of each thinning unit and aspen stand can be found in Appendix A and maps of the thinning units, aspen stands and roads in Appendix C. A list of all roads with proposed activities is in Appendix B.

Commercial Harvest

The description of commercial harvest and objectives under Alternative 2 are the same for Alternative 4. The addition of 27 helicopter yarded commercial thinning units and some additional road construction that were not included in any other alternative, would allow more acres to be thinned under Alternative 4. There would be helicopter landing zones, up to 2 acres in size where vegetation would be cleared. There are no proposed helicopter landing zones within RHCAs. Activities would occur on 234 units covering 8,405 acres, producing 31 mmbf in volume as follows:

- Commercial thinning – 146 units, 5,689 acres
- Understory removal – 34 units, 798 acres
- Conversion to early seral species – 54 units, 1,918 acres
- Tractor, skyline, and helicopter logging systems would be utilized as follows:
    - Tractor – 5,764 acres

- Skyline – 1,863 acres
- Helicopter – 778 acres

Pre-commercial thinning

The description of pre-commercial thinning and objectives under Alternative 2 are the same for Alternative 4; however, there are several additional units with pre-commercial thinning in this alternative. Pre-commercial thinning would occur on 88 units covering 2,878 acres as follows:

- Pre-commercial thinning – 45 units, 1,373 acres
- Pre-commercial thinning in commercial thinning units – returning to 43 units covering approximately 1,505 acres

Prescribed burning

The description of prescribed burning and objectives under Alternative 2 is the same for Alternative 4; however, there are more acres of pile burning.

Underburning – 19,913 acres

- Riparian Areas with potential to underburn - 3,562 acres
- Hand & Grapple Pile burning – localized piles on 9,778 acres
- Landing Pile Burning – approximately 1,070 piles

Road activities

The description of road activities for new road construction, road maintenance, reconstruction and decommissioning under Alternative 2 are the same for Alternative 4. Alternative 4 includes additional new road construction not included in Alternative 2 to tie into existing roads and to provide access. New roads would be built from the end of the 2614-452 Road across Deerhorn Creek connecting to the road system to the west that was isolated when the ford across the Middle Fork was closed and into an area north of this new road where railroad grades re located in riparian areas. Two additional culverts will be installed at stream crossings at Deerhorn Creek and a tributary west of Deerhorn Creek. The road system work proposed under this alternative is as follows:

- 14.7 miles of new road construction
    - Includes 6.2 miles of road relocation out of riparian areas
- 26.3 miles of road reconstruction
- 1.2 miles of road reconstruction on haul routes outside the project area
- 69.7 miles of road maintenance
- 15.2 miles of road maintenance on haul routes outside the project area
- 46 miles of closed roads to be opened for log haul
    - 41.1 miles to be re-closed at completion of project
- 27 miles of currently open roads to be closed at completion of project
- 105.93 total miles of closed roads at completion of project
    - Net increase of 15.68 miles of closed roads from existing condition

- 21.2 miles of road decommissioning
    - Includes 6.2 miles of road relocation out of riparian areas

Aspen restoration

The description of aspen restoration including the number of stands and acres found under Alternative 2 is the same for Alternative 4.

Design Criteria

Design criteria are an integral part of each action alternative and serve to mitigate impacts of activities on resource areas. In addition to best management practices (BMPs) and legal requirements, these measures would be applied under any action alternative during implementation (Table 3).

Table 3. Project design criteria to be applied during implementation

Design Criteria	
Wildlife	
	Restrictions for all Activities
1	If an occupied bald eagle nest is found within the project area, management activities within ½ mile of the nest would be prohibited from February 1st – July 31st.
2	If a bald eagle winter roost is found within the project area, management activities within ½ mile of the roost for the following period, November 1st – April 30th, will only be allowed from 1 half hour after daylight to one half hour before dusk.
3	If an occupied Peregrine Falcon nest is found within the project area, management activities within ¼ mile of the nest would be prohibited from April 1st – August 31st.
4	No activities are allowed within goshawk PFAs or within ½ mile of an occupied goshawk nest site from April 1-Sept 30. No timing restrictions apply to unoccupied nest sites.
5	No thinning or burning treatments in at least 30 acres of the most suitable nesting habitat surrounding active and historical goshawk nest trees.
6	No activities allowed within big game winter range (MA-4a) from December 1-April 1.
7	The district wildlife biologist will be consulted if any raptor nest is discovered during layout/marking so a buffer can be created and any other requirements of the species can be met before implementation of management activities.
8	Retain woody debris during underburning, hand piling, and grapple piling with these parameters: 1) ponderosa pine, 3-6 pieces/acre, 12 inch minimum diameter at small end, greater than 6 feet in length, for a total of 20-40 feet/acre. 2) Mixed conifer, 15-20 pieces/acre, 12 inch minimum diameter at small end, greater than 6 feet in length, for a total of 100-140 feet/acre. 3) Lodgepole pine, 15-20 pieces/acre, 8 inch minimum diameter at small end, greater than 8 feet in length, for a total of 120-160 feet/acre.
9	Reduce diameter of large down logs during underburning by no more than 3 inches for 8” lodgepole and 12” ponderosa pine, and mixed conifer as per the criteria in East Side Screens; Appendix B, pg. 12.

Design Criteria	
10	If a waiver is requested to operate within the timelines set aside in the above measures, the District Ranger will consult with the Wildlife Biologist prior to approval.
	Mechanical Treatments (Harvesting and Pre-commercial Thinning):
11	Horizontal hiding cover will be provided by retaining non-thinned patches of forest trees as necessary throughout the project area. Leave 5-15% of the area untreated in patches of 3-5 acres, unless the thinning is within plantations in which case non-thinned patches will be ½ -2 acres. These patches should not be near the boundary of private land. Where possible, leave these clumps around existing snags for further protection.
12	To provide blue grouse winter roosts, retain the larger (>16 inch dbh) mistletoe infected or large limbed Douglas-fir trees along ridge tops and upper slopes at 5 to 8 trees per acre, where available.
13	Retain all snags not considered a danger to logging operations, Forest Plan standard is 2.39 snags/acre, 21 inch dbh or greater. If 21 inch dbh snags are not available, retain snags of the largest representative diameter. Snags considered a danger to logging operations can be felled, but are to be left on site to meet wildlife habitat needs. Snags felled within 150 feet of an open road may be removed.
14	Within “return to early seral species” units retain a minimum of 15 to 20 trees per acre >12 inches dbh for green tree replacements. More than a sufficient number of green tree replacements will be retained in all other harvest, pre-commercial thinning, and prescribed burn units. Leave green tree replacements in groups where possible.
	Prescribed Burning (Underburning and Pile Burning)
15	Burn no more than 5,000 acres using prescribed fire in the Galena project area in any one year. Individual burn blocks larger than 1,000 contiguous acres will require a wildlife biologists input to ensure that big game forage and neo-tropical migratory bird objectives are being met.
16	Avoid ignition within 100 feet of perennial and intermittent streams. Fire may be allowed to back into riparian areas with the objective to maintain a minimum of 40-50% of the shrub layer to meet migratory bird objectives.
17	Avoid hand or ATV ignition within 100 feet of standing dead trees 12 inch dbh and larger.
18	Units within big game winter range (MA-4a) will maintain a minimum of 40-50% of shrubs in a mosaic of untreated patches by not igniting within 10 feet of shrubs to meet big game forage and migratory bird objectives.
19	Units outside of big game winter range (MA-4a) will maintain a minimum of 20-30% of shrubs in a mosaic of untreated patches by not igniting within 10 feet of shrubs to meet big game forage and migratory bird objectives.
20	Minimize mountain mahogany mortality by not igniting in or near stands of mountain mahogany.
21	Conifers competing with aspen will be felled or girdled before burning takes place.
22	Fencing will be in place before burning aspen stands to protect new suckers from browsing the next year.
23	Burning within aspen stands will be avoided if aspen suckering is already occurring.

Design Criteria	
24	Burning will not occur in those aspen stands consisting of less than 5 weakened individuals. Instead, competing conifers will be removed and the stand will be fenced or caged.
Soils	
1	In units where biomass is removed by low ground pressure harvesters and forwarders the following applies: 1) Operate all forwarders with a maximum 12 pounds/square inch pressure, 2) Space equipment trails a minimum of 50 feet apart center to center, 3) Only operate when ruts would be 4 inches or less deep on a continuous 50 feet or more of forwarder trails, 4) Only operate on 35% slopes or less except for short distances.
2	Only remove biomass from units 256, 456 and 458 at the time of logging with the same equipment.
3	No skidding off skid trails unless soil is frozen, or unless approved by a soils specialist. Use directional felling or winching to avoid leaving designated skid trails. Low ground pressure equipment (less than 8.5 psi) can leave the skid trails if ground is dry (July through September, or obviously dry in the top 4 inches), snow covered (sufficient snow strength and depth to prevent soil disturbance and compaction), or frozen (top 4 inches).
4	On slopes greater than 30% and with less than 75% ground cover (soils at higher risk for erosion) restrict heavy equipment from operating on areas larger than 50 feet diameter. Exceptions (either stricter or less strict) can be approved by a soils specialist. Parts of thinning units 332 and 432 meet these criteria.
5	Use grapple piling equipment with low ground pressure (less than 8.5 psi) on dry, frozen, or snow covered soil and stay on existing skid trails where possible.
6	Thinning units 11, 122, 290, 310, 438, 456 and 458 are to be logged only on dry, frozen, or snow covered soil so that Forest Plan Standards are met.
7	All skid trail locations will be approved by the Forest Service prior to logging. Use existing skid trails if spaced 100 feet – 140 feet apart and appropriately located. Otherwise, space new skid trails 120 feet apart where practical, using existing skid trails where appropriate. Skid trails should average less than 14 feet wide.
8	No skidding in draw bottoms. Exclude parts of units from thinning if skidding in a draw bottom is necessary.
9	Avoid downhill skidding on greater than a 35% slope where feasible. On slopes greater than 45%, do not skid downhill for more than 40 feet. No uphill skidding on slopes greater than 35% for more than 40 feet.
10	No skidding on serpentine or coarse textured soils downhill on slope over 35% or uphill on slopes over 25%. Thinning units 3, 21(SE part), 31, 39, 40, 296, 310 (SW part), 332(East part), 482, 496, 502 (South part) meet this condition.
11	No skidding on wet soil (ruts 6 inches or deeper, 50 feet or longer).
12	Install cross drains or comparable measures to control runoff and erosion from skid trails, skyline corridors, and tractor winch furrows. Cross drains must have clear outfalls, be appropriately spaced, and located where water will infiltrate (not shallow or impermeable soil).

Design Criteria	
13	On specified units: 46, 238, 296, 322 (not in Alternative 3), 324, 326, 618 (not in Alternative 3) either (1) log on dry soil and subsoil skid trails, or (2) log on frozen/snow covered soil. In addition, harvest biomass at the same time as logging, using the same equipment.
14	Control erosion from subsoiled skidder or forwarder trails by subsoiling using a "J" pattern, waterbars, or comparable measures. Do not subsoil if runoff cannot be diverted out of furrows (such as in draw bottoms), slopes are over 28%, or sections of trails where excessive rock would be pulled to the surface.
15	Re-use existing landings where feasible. Do not use existing landings within shallow soil or ephemeral draws without prior approval by a soil specialist, hydrologist, or fisheries biologist.
Watershed	
1	Utilize erosion control measures (sediment filters or straw bales) and operate machinery only on road prism during road construction, reconstruction, and decommissioning.
2	In RHCAs or ephemeral draws, conduct culvert installation, replacement or removal during dry conditions or with approval from the district hydrologist and fish biologist. Prevent erosion of soil into streams during installation. Cease work if a storm event increases stream flows.
3	No timber harvest within ephemeral draw buffer (10-50 feet on each side). Equipment is permitted only at designated crossings within the ephemeral draw buffer. Skyline corridors shall be oriented perpendicular across ephemeral draws, not running lengthways along them.
4	Locate temporary roads outside sediment delivery zones (determined by soil type, ground vegetation, and slope), meet best management practices for controlling surface runoff and erosion, and keep machinery on approved roadway.
5	Decommission roads and obliterate temporary roads by some combination of the following: recontouring slopes (removing cut and fill slopes); subsoiling (loosening) compacted soils in a “J” pattern to a depth of 16 inches (unless prevented by bedrock or rock content of soils); pulling berm; pulling slash (where available); planting or seeding disturbed areas with native species that naturally occur in the project area to achieve a minimum of 35% ground cover; restoring natural drainage patterns and waterbarring as needed; and/or disguising the first 300 feet of travel way with large pieces of organic material such as cull logs and tops of trees. Methods will be determined in consultation with a hydrologist, fisheries biologist, or soil scientist.
6	Do not use heavy equipment in RHCAs and do not use off road vehicles within 100 feet of streams, springs, or wetlands. Exceptions include activities associated with road construction, reconstruction, decommissioning, culvert installation, and removal of trees for watershed restoration projects.
7	Apply all applicable BMPs listed in General Water Quality Best Management Practices (USFS Pacific NW Region, 1988) and the 2012 National BMPs for Water Quality Management. Full descriptions of each BMP are found in Appendix G. Specific BMPs for watershed and fisheries applicable to this project are: T1-T22, R1-R15, R17-R23, F2-F3, VM1-VM4, RM1, W5.
8	Require one end suspension on >90% of skyline logging corridors. Logs would be fully suspended over streams. Do not locate skyline corridors down ephemeral draws; skyline corridors may cross ephemeral draws.
Aquatics	

Design Criteria	
	RHCAs
1	Riparian Habitat Conservation Areas (RHCAs) for Category 1, 2, and 4 streams and for Category 3 and 4 wetlands shall be consistent with PACFISH (100-300 foot standard buffer widths).
2	Timber harvest units, landings/staging areas, grapple/hand piling areas, and temporary roads will not be located within RHCAs.
3	In order to reduce or eliminate effects to water quality during project activities near RHCAs, no contractor/purchaser road use will be authorized on any decommissioned road within an RHCA.
4	Because streams in the aquatics analysis area are deficient in LWD in accordance with PACFISH Standard RA-2, all trees felled within or into RHCAs (including danger trees, those felled for road construction/reconstruction and landings, and aspen restoration) will either be felled into fish bearing streams where feasible to provide LWD, or left within the RHCA. Felled trees may be transported off-site for use in watershed restoration projects. Trees felled for road construction shall be pushed over with root wad intact where feasible.
5	Ignition of underburning will occur in some RHCAs, stopping –100 feet from stream channels, fire will be allowed to back into the riparian areas. At least 95% of the shrub and tree shade, which directly shades permanently flowing stream channels, will be retained.
6	Industrial camping permits will be required. Locations within RHCAs will be coordinated with a biologist before permits are issued.
	Product Haul
7	For native-surfaced system roads, all stream crossings shall be rocked to maintain as close to an 8-inch lift as the travelway width allows, for a distance of 100 feet on either side of the stream. The Davis Creek and Deerhorn crossings should be rocked the length of the downgrades leading to the streams to reduce sediment transport.
8	Product haul will occur during the Commercial Use Period (June 1 – January 15), unless otherwise authorized by the Forest Engineer. The Commercial Use Period is intended to prevent weather-related road damage, but actual field conditions may necessitate suspending haul to prevent road damage at any time. Product haul is also limited to conditions that will not result in Resource Damage, as described in the June 2009 Malheur National Forest Commercial Road Use Rules (CRUR).
9	During product haul, weather conditions are monitored daily for the chance of precipitation by the Timber Sale Administrator, Hydrologist or Fish Biologist.
10	During product haul, road conditions shall be monitored by the Timber Sale Administrator daily for indications of Road Distress, defined in the CRUR as visible road conditions that occur as a result of road use, or a combination of road use and weather, which indicate that damage to a road or the adjacent resources may occur under existing conditions. Examples of indicators include, but are not limited to, excessive dust, compromised or improper functioning road drainage, muddy ditch water, mud tracked onto asphalt or aggregate surfaced roads, and significant distortions of the road surface such as tracks, ruts, potholes, wash boarding, asphalt cracking or settling.

Design Criteria	
11	When the Timber Sale Administrator observes indications of Road Distress, one or more of the following actions would be taken: 1) perform maintenance work (including installation of additional erosion control materials); 2) change method of operations; 3) strengthen road surface to avoid damage; or 4) suspend operations until conditions change.
12	Haul will cease at any time when the travelway of the road is wet and turbid water or fines are observed moving off the road surface to ditchlines that deliver to stream channels regardless of time of year.
13	Timber haul on gravel and native-surface roads will be limited to dry and/or frozen conditions.
14	During product haul on native-surface roads, the road surface at all approaches to stream crossings will be rocked to maintain as close to an 8-inch lift as the travelway width allows, for a distance of 100 feet on either side of the stream. The Davis Creek and Deerhorn Creek crossings will be rocked the length of the road downgrades leading to the streams to reduce sediment delivery.
15	Prior to annual haul, mitigations will be implemented to minimize sediment delivery to Critical Habitat for MCR Steelhead and Columbia River Bull Trout. Examples of mitigation measures will include but are not limited to; Sediment fences or straw bales in ditch lines and mulching.
16	Apply mitigation and BMP's for dust abatement (water) during dry conditions, as directed by physical scientist or road engineer.
17	Roads exempt from haul restrictions (due to no mechanism for sediment delivery) include paved roads, surfaced ridge top roads, surfaced outsloped roads with no ditch or stream crossings, and any roads while hauling over snow or frozen conditions.
	Water Drafting
18	Follow measures outlined for water drafting activities to protect Anadromous fish habitat and populations. Eleven criteria are found in Appendix A to the Aquatics Specialist Report (project record). Criteria related to pump intake screens for water drafting are found in Appendix B to the Aquatics Specialist Report (project record). The above referenced criteria are also included in Appendix F of this EIS. Designated water drafting sites are identified in the Aquatics Specialist Report (project record).
	RHCAs – Hazardous Substances
19	The Forest Service will require a Hazardous Substances Plan and Prevention of oil spill Plan from contractor which will be reviewed and approved prior to implementation activities. Fuels and other toxicants shall not be stored within RHCAs, and other provisions of PACFISH Standard RA-4 shall be observed.
20	Inspect all heavy equipment and machinery for hydraulic or other leaks before working near RHCAs. Leaking or faulty equipment will not be used. Equipment with accumulations of oil, grease, or other toxic materials will be cleaned in pre-approved sites outside RHCAs.
	Road Decommissioning
21	The work period for instream work, including road decommissioning within or immediately adjacent to the active channel will be July 15 through August 15, as specified in the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources, June 2008. Conduct activities during dry-field conditions – low to moderate soil moisture levels.

Design Criteria	
22	For those road segments immediately adjacent to the stream or where the road fill is near the wetted stream, use sediment control barriers between the project and the stream where needed.
23	Minimize disturbance or existing vegetation in ditches and at stream crossings to the greatest extent possible.
24	For road decommissioning within riparian areas, re-contour the affected area to mimic natural floodplain contours and gradient to the greatest degree possible.
25	Drainage features should be spaced to hydrologically disconnect road surface runoff from stream channels.
26	Dispose of slide and waste material in stable sites out of the flood prone area. Waste material other than hardened surface material (asphalt, concrete, etc.) may be used to restore natural or near-natural contours.
27	Obtain approval from district fisheries biologist and hydrologist on specific methods for removing culverts from first or second order streams.
28	Road decommissioning would be completed in accordance with the Regional General Permit issued by the U.S. Army Corps of Engineers. Minimization measures for fisheries, watershed function, water quality, and soil conditions include those identified in the NMFS 2008 and FWS 2007 ARBO as well as PDCs developed by the Blue Mountain Ranger District interdisciplinary team. A complete listing of ARBO PDCs specific to this project element is included in Appendix B. The ARBO PDCs specific to this project will be implemented as described in the NMFS 2008 and FWS 2007 ARBOs regardless of any changes that may occur through subsequent revisions
	Yarding
29	Cable yarding corridors (sky roads) and tailholds are permitted across perennial, intermittent, and ephemeral streams. Corridors must be less than 12 feet wide, spaced greater than 100 feet apart when transecting the primary shade zone, as close to perpendicular to the channel as possible.
	Road Reshaping and Blading
30	Side casting of materials will not occur where materials could be introduced into a stream, or where placement of materials will contribute to slope destabilization.
31	Avoid undercutting cut slopes during ditch maintenance.
32	No fuel storage or equipment fueling within RHCAs
33	Deposit disposal materials in approved areas.
34	Grader operators will backslope away from areas adjacent to streams where there is a potential for sediment delivery. Maintain grassy areas around culverts to minimize potential sediment delivery to streams. Place sediment control devices in spots where sediment could reach a stream.
35	Deposit sloughing material in a disposal site away from any stream and leave to vegetate naturally. If the annual amount of slough is substantial and the road has become narrowed by loss of material from cut banks or by machine removal of the slough, haul material to an approved site.

Design Criteria	
	Drainage Structure Maintenance
36	Deposit waste materials removed during maintenance and cleaning culverts in approved disposal areas outside floodplains.
37	Construct berms, sediment basins, or sediment traps where required to contain sediment from the site.
	Ditch Relief Culvert Replacement, Installation, or Removal
38	Install only during dry conditions.
39	Take efforts to prevent the escapement of soil into streams. Install sediment filters, hay bales, or other devices at the culvert outlet if natural filters are not present.
40	Review culvert work inside RHCAs with engineering, hydrology, fisheries staff and design in conformance with project design criteria, standards, guides, and BMPs. These activities are subject to review and approval of Level 1 for fisheries.
41	All quality pools (pools greater than 2 feet in depth or pools greater than 1.5 feet in depth with cover) will be noted and designed for retention within the project area.
42	There should be no measureable loss in stream side shade within the project area. If a measurable reduction in shade cannot be avoided, the project will be designed to obtain recovery of stream side shade within an approximate five year period, including the use of riparian plantings.
43	Where slopes adjacent to the stream are greater than six percent, temporary erosion matting such as jute, straw, hydromulch, etc. will be placed to provide a minimum buffer distance of 10 feet from the stream upon completion of mechanical construction. The matting should complement fall seeding.
	Roadside Brushing
44	Maintain stream shade in road segments that parallel streams along with safety considerations. May necessitate hand brushing, partial brushing, or limbing with consideration for growth for future shade.
45	Remove brush in RHCAs where safety is an issue. Consider options other than complete "removal" in order to leave ground cover to help control water and sediment flow into the RHCA and stream channels.
46	Cut to a minimum height of 6 inches above the ground when brush cutting is necessary at stream crossings, to prevent sediment delivery to a live stream. Leave brush in ditches at stream crossing and maintain brush and other standing vegetation to provide shade and dust filtering to streams except where public safety is an issue.
47	Roadside brushing that involves more than minimal removal of vegetation (i.e., limbing of trees or removal of brush) in RHCAs will be reviewed by a District fish biologist or hydrologist and will require approval of the Level 1 fisheries team.
	Snow Removal
48	The use of dozers to remove snow requires written Forest Service approval. All blades or plows on graders shall be equipped with shoes or runners to keep the blade a minimum of 2 inches above the road surface unless otherwise agreed in writing.

Design Criteria	
49	Open berms (surface trenches or drainage holes) to prevent accumulation of runoff. Space drainage holes as required to obtain satisfactory surface drainage without discharge on erodible fills and place above vegetation filters.
50	Avoid side casting of snow adjacent to streams where there is potential to cause snow or ice damming.
51	Do not include dirt and gravel in side cast material.
52	Damage from, or as a result of snow removal, will be restored in a timely manner.
	Road Closures
53	Road closures would be done on roads desired to be kept on the system, but use will be limited to infrequent management and other permitted activities. Closure may be by a physical barrier or gate, or by regulation. Closed roads are to be left in a stable hydrologic state and are to be periodically maintained.
54	Roads to be closed will be treated to provide self-maintenance prior to closure. Self-maintenance includes a variety of actions. Ditch relief culverts will be removed behind roads closed using earth-berms. Earth berms will not be used on roads with culverts at channel crossings still installed. Water bars will be installed with appropriate skew, outlet, and spacing. Sediment barriers of available woody material such as slash, brush, etc., will be placed at water bar outlets. Side ditches will be bladed where needed; culverts will be cleaned to drain; catch basins will be functional and free of debris. Drain dips, grade sags, and cross ditches will be reconstructed/rocked as necessary to assure proper functioning. All actions will be considered on a site-specific basis with each road or road segment actions suited to the needs and condition of the road and related resources.
55	Road closure actions, whether the initial closure or re-closing a breached road will occur only during sufficiently dry conditions to prevent damage and runoff. Road closure activities within or immediately adjacent to active stream channels are also confined to July 15 through August 15 so that key fish or spawning areas are not impacted and soil movement is not likely to occur.
	Fish Passage Culverts
56	Placement of the new culverts would be consistent with Region 6 fish passage guidance and in accordance with the Regional General Permit issued by the U.S. Army Corps of Engineers. Minimization measures for fisheries, watershed function, water quality, and soil conditions include those identified in the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) Aquatic Restoration Programmatic Biological Opinion (ARBO) as well as design criteria developed by the Blue Mountain Ranger District interdisciplinary team. Design criteria and specific to this proposed project are in Appendix F.
57	The work period for instream work, including road decommissioning within or immediately adjacent to the active channel will be July 15 through August 15, as specified in the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources, June 2008. Conduct activities during dry-field conditions – low to moderate soil moisture levels.
Heritage	

Design Criteria	
1	All NRHP eligible and potentially (unevaluated) eligible sites would be avoided/protected from any ground disturbing impacts during all timber harvest activities. This includes full log suspension over sites when skyline and helicopter yarding. Heritage sites within a ground skidding unit would be flagged and no activity would occur.
2	There would be no piling, either by hand or with ground-based machines, within any boundaries of a site; all hand piling and burning of slash or fuel concentrations would take place outside of the site boundaries.
3	All eligible and potentially eligible (unevaluated) historic properties with structural remains or other wooden feature types would be avoided or protected during all burning activities. Eligible historic remains would be identified on the ground and proper protection measures would be conducted during the burning activities and mechanical fire lines would only be constructed outside the boundaries of this site type.
4	Under the terms of the Management Strategy for the Treatment of Lithic Scatter Sites (Keyser et al., 1988), low intensity burning would have no effect on the prehistoric lithic assemblages, but mechanical fire lines would not be constructed within the boundaries of this site type.
5	There are areas where cultural sites and commercial logging activities coincide and the cultural sites cannot be avoided. To achieve a “No Adverse Effect” determination for those identified cultural sites (7), all of which are eligible or potentially eligible historic properties, over-the-snow logging will be required in selected cutting units. See “Over-Snow Logging Treatment Plan To Avoid Adverse Effects To Lithic Dominant Archaeological Sites” attached to the Heritage Specialist report for required direction. The remaining eight eligible or potentially eligible heritage sites situated within commercial cutting units will not be subject to requiring over-the-snow logging but will be flagged for avoidance.
6	If cultural resources are located during implementation of the alternatives, work would be halted and the Zone Archaeologist would be notified. The cultural resource would be evaluated and a mitigation plan developed in consultation with SHPO and Tribes.
Visuals	
1	Within 200 feet of County Road 20: Utilize existing landings wherever possible, keep construction of new landings to as few as possible and the size to ¼ acre or less. Dispose of slash on landings within 1 year of piling, leaving less than 10 tons per acre, using the Photo Series for Quantifying Natural Forest Residues, description guide 3-PP-3. Return landings and skid trails to their natural profile, with no continuous berms or soil piles. This does not preclude the use of cross bars to reduce erosion on skid trails.
2	Cut stumps as low as possible within 200 feet of County Road 20. Tree marking paint should not be visible from County Road 20, except for stump marks.
Rangeland	
1	Protect all existing structural range improvements (fences, gates, spring developments) and permanent ecological plots from harvest and burning activities. Any damage would be repaired to Forest Service standards by the responsible party prior to livestock turnout.
2	Fence right of ways (6 feet either side of fence), trails, other developments and access to them would be cleared of slash produced by logging or post-sale activities.
3	Coordinate timing and locations of prescribed burning with district range specialist.

Design Criteria	
4	Identify available alternate water sources to any existing ones in aspen stands and develop before fencing aspen.
5	New aspen exclosure fences should have gates installed in proper locations to allow for removal of stray livestock. Aspen fences should be maintained prior to the start of the grazing season each year and repaired whenever necessary. Plans for aspen exclosures should define when restoration of the protected stand has been achieved. When no longer needed, aspen fences should be removed.
6	In order to maintain proper grazing practices, fences need to remain intact from May 1 through November 15, or when livestock are on either side of the fence.
Botany	
1	No timber harvest, thinning activities, prescribed fire ignitions, or off road vehicles and equipment in scablands, rock outcrops and non-forested openings in order to protect sensitive plant and lichen populations and habitat.
2	ATV use for prescribed fire ignition is permitted in dry conditions.
3	Prescribed fire Ignition is allowed in meadows.
4	No timber harvest, thinning activities (with the exception of aspen treatments), prescribed fire ignition, or off road vehicles and equipment in riparian areas, wetlands, wet meadows, seeps and springs in order to protect sensitive plant and lichen populations and habitat. Prescribed fire should only produce low to moderate fire severity within these areas.
5	Use local native seed mixes, non-persistent weed-free certified seed, and mulch consisting of either, native plant bales or chipped slash, for erosion control or rehabilitation measures to avoid additional introduction of non-native species. Seeding and mulching should be done after ground disturbing activities, including staging areas, helicopter landing zones, skid trails and other disturbed sites to prevent new weed infestations. Consult forest botanist for appropriate selection of seed mixes, sowing density, and application of seed. Allow native plants to fully establish before commencing livestock grazing.
Invasive Plants	
1	District weeds specialist will inspect active gravel pits, quarry sites, and borrow areas for invasive plants before use and transport. Treatment is required of infested sources before use of pit material.
2	Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with district weeds specialist and incorporate appropriate invasive plant prevention practices.
3	Insure all equipment and vehicles used on National Forest lands are cleaned and free of noxious weed seeds. Notify the Forest Service prior to moving each piece of equipment onto National Forest lands by identifying the location of the most recent operations. Upon request of the Forest Service, arrangements would be made for inspection of each piece of equipment.
4	Contractors and Forest Service shall agree on locations of cleaning equipment on National Forest lands, such as at the end of a project or prior to moving to a new unit.

Design Criteria	
5	If a noxious weed is known to spread due to burning, they would be appropriately treated prior to prescribed burning.
Fire and Fuels	
1	Maintain a low intensity ground fire with average flame lengths less than 4 feet.
2	Use fire to reduce surface fuel loads in leave patches but not to reduce stocking levels within leave patches. Minimize tree mortality in leave patches within thinning units.
3	Reduce leave-tree mortality from prescribed fire with methods that could include raking litter and bark accumulations away from large trees (>21”), not burning areas where concentrations of large trees exist, and burning when duff moisture is sufficient to reduce damage to the base of large trees or fine roots close to the surface.
4	Firelines will not be constructed within RHCAs and will be waterbarred on slopes greater than 35%. Firelines will utilize natural barriers such as existing roads and streams and will be rehabilitated to a natural state after use. Fireline construction will not occur down draw bottoms. Hand lines may be used to keep fire out of sensitive areas and private property.
5	Protect private property from prescribed fire by separating it from areas to be treated by constructing firelines, planning ignitions to stop at effective control points such as roads or natural barriers, staging firefighters or firefighting equipment at strategic points, or other means. Prescribed fire could enter private property if an agreement with land owners is put into place. Notify adjacent land owners in advance of planned prescribed burn operations.
6	Underburn units will be designed to include areas of similar fuels conditions using trails and roads as boundaries, wherever possible, to reduce resource damage from fireline construction.
7	Notify the Oregon Department of Transportation and place hazard signs along the highway during prescribed burning operations.
8	Grapple/hand piling areas will not be located within RHCAs.
Silviculture	
1	To enhance structural diversity for wildlife and visuals while reducing fuel loadings, trees would be left at a varied spacing, as opposed to even spacing, with the density varying as much as 50% across the stands. Thin to lighter densities near the private lands and in the drier biophysical environments and at higher densities farther from the boundary and in the cooler and moister environments. Use the following range of densities for each of the prescribed average densities:

Percentage of Stand	40 ft2/acre Average	50 ft2/acre Average	60 ft2/acre Average	80 ft2/acre Average
10%	20 ft2/acre	25 ft2/acre	30 ft2/acre	40 ft2/acre
15%	30 ft2/acre	40 ft2/acre	45 ft2/acre	60 ft2/acre
50%	40 ft2/acre	50 ft2/acre	60 ft2/acre	80 ft2/acre
15%	50 ft2/acre	60 ft2/acre	75 ft2/acre	90 ft2/acre
10%	60 ft2/acre	80–100 ft2/acre	90–110 ft2/acre	100–120 ft2/acre

	Design Criteria
2	Retain “wolfy” cull trees with stem damage, poor form, broken tops, numerous large branches, or other characteristics that make them unsuitable for commercial products are to be left for wildlife habitat, at an average of approximately one tree per acre, when available.
3	Unthinned areas are to be left for wildlife habitat that are 3 to 5 acres in size in commercial thinning units and ½ -2 acres in pre-commercial thinning units and cover 5 to 15% of the area to be treated. In units immediately adjacent to the public/private boundary, retain unthinned patches at the 5% level.
4	Openings up to ¼ acre in size are permissible in locations when suitable trees are scarce.
5	Acceptable mortality ranges for prescribed burning in Blocks 1 – 4 are as follows: • Trees 0-1” dbh tree mortality from 30 to 70%. • Trees 1-5” dbh tree mortality from 5 to 15%. • Trees 5-10” dbh tree mortality from 5 to 10%. • Trees 10-20” dbh, tree mortality from 1 to 5%. • Over 20” dbh tree mortality is not exceed 1 tree per acre. Acceptable mortality ranges for prescribed burning in Block 5 are as follows: • Trees 0-1” dbh tree mortality from 30 to 70%. • Trees 1-5” dbh tree mortality from 20 to 40%. • Trees 5-10” dbh tree mortality from 10 to 30%. • Trees 10-20” dbh tree mortality from 5 to 10%. • Over 20” dbh tree mortality is not exceed 1 tree per acre. These mortality levels are based on averages over the whole burning areas and recognize the fact that fire is a relatively inexact tool and that there may be some areas where mortality reaches 100%. In Blocks 1–4 these patches should be kept to less than 2 acres and preferably no larger than the ¼ to ½ acre that was thought to exist under historic conditions (Agee, 1993). In Block 5 these patches should be kept to less than 5 acres.

Monitoring

Forest Service specialists would perform monitoring throughout the implementation of this project to ensure BMPs and design criteria are adhered to. The sale administrator would be expected to continually monitor the implementation of the commercial harvest portion of the project. Since it is not feasible to have all Forest Service resource specialists monitoring, the responsibility is placed on the sale administrator, who would communicate with the resource specialists if any concerns arise during project implementation. This person would be checking that the BMPs and design measures as described in this document are adhered to. The monitoring would occur as follows:

Silviculture prescriptions

This monitoring would be conducted by the district silviculturist. Tree marking would be monitored to ensure compliance with the silvicultural prescription and marking guide. Selection and designation of trees to be left as snag retention for wildlife habitat and resource protection would be reviewed.

After commercial harvest, a post-sale examination would determine the exact areas for pre-commercial thinning, fuel treatment, and reforestation. Plans would be adjusted to the actual post-harvest conditions and need for further treatment. Unit boundaries and prescriptions would not change from what has been proposed in the alternatives.

Areas planned for reforestation would be examined prior to planting. Exams would assess levels of competing vegetation, pocket gopher and other animal activity, and other environmental conditions. Seedling species and stock type would be prescribed as well as site preparation, planting, and protection methods. Areas reforested and natural regeneration areas would be monitored over time after the project is completed, checking for seedling survival, growth, and damaging agents.

Fire and fuels

This monitoring would be completed by district fire personnel. Monitoring of work conducted under thinning, grapple and hand piling contracts would consist of periodic inspections while work is in progress and after completion to determine compliance with contract standards. Monitoring of prescribed burning includes weather, flame length and smoke dispersal to ensure burning is conducted within the parameters stated in the burn plan. Fuel reduction results would be monitored through fuels plots.

Areas to be burned would be monitored before and after burning to compare the amount of effective ground cover remaining, the amount of fuel reduction, post burn mortality, and crown scorch. Burning in riparian areas will be monitored for the amount of ground cover that is exposed and the mortality levels of riparian shrubs and trees.

Fisheries/Hydrology

The district fisheries biologist or hydrologist will monitor the decommissioning and closure of temporary and system roads and fish passage culvert installations in relation to design criteria.

Throughout operations monitoring will ensure that the rock ford on road 2010-630 across Vincent Ck. is adequate to allow fish passage.

During product haul, road conditions shall be monitored by the Timber Sale Administrator. When turbid water or fines are observed moving off the road surface to ditchlines that deliver to stream channels, one or more of the following actions would be taken to control sediment delivery: 1) perform maintenance work (including installation of erosion control materials); 2) change method of operations; 3) strengthen road surface to avoid damage; or 4) suspend operations until conditions change. See June 2009 Malheur National Forest Commercial Road Use Rules for additional information.

Wildlife

All road closure activities will be reviewed by a wildlife biologist to determine effectiveness.

Noxious and invasive weeds

The sale administrator will monitor weed infestations before and during project implementation.

Range

The district range specialist will monitor forage production during and after project implementation.

Visuals

The sale administrator will monitor the visuals design criteria to determine if a scenery restoration action plan is needed.

Summary Comparison of Alternatives

Table 4 displays the action alternatives so that a comparison can be made between all alternatives. The activities proposed by alternative are provided.

Table 4. Comparison of elements between all action alternatives, Alternative 1 has values of "none" for all activities

Proposed Activities	Alternative 2	Alternative 3	Alternative 4
Mechanical treatment			
total number of acres harvested and/or pre-commercial thinned	8,339	6,752	9,778
Commercial harvest			
total number of acres	6,813	3,971	8,405
total volume (mmbf)	24	14	31
Pre-commercial thinning			
total number of acres	2,781	2,781	2,878
Reforestation			
total number of acres	1,217	961	1,918
Potential biomass utilization			
total number of acres	2,061	1,261	2,061
Mechanical fuel treatment			
total number of acres of slash yarded to landings	6,813	3,970	8,405
total number of acres hand piled	4,524	4,429	5,692
total number of acres grapple piled	3,070	1,188	3,262
Prescribed burning			
total number of acres underburned	19,913	19,913	19,913
total number of acres of pile burned	8,339	6,167	9,778
Roads			

Proposed Activities	Alternative 2	Alternative 3	Alternative 4
miles of new road construction	12.6*	1.1*	14.7*
miles of temporary road construction	3.1	0	3.1
miles of road reconstruction	21.4	13.8	26.3
miles of road maintenance	69.7	65.4	69.7
miles of new road closures	16.7	14.9	17.3
miles of road decommissioning	21.9*	19.9*	21.2*
miles of roads relocated out of riparian areas	6.2	0	6.2
number of culverts installed to replace stream fords	2 (Davis Creek & Dead Cow Gulch)	0	2 (Davis Creek & Dead Cow Gulch)
number of new stream crossings using culverts	0	0	2 (Deerhorn Creek & tributary west of Deerhorn Creek)
total open road density (mi/mi^2) after implementation, existing = 1.8	1.4	1.4	1.4
Other activities			
Forest Plan amendment changing old growth boundaries	yes	yes	yes
Forest Plan amendment changing big game cover	yes	yes	yes
aspen restoration (number of units)	28	28	28
aspen restoration (number of acres)	35	35	35
retention of snags, except danger trees	100%	100%	100%
activities planned within old growth areas (DOGs, ROGs, PWFAs)	no thinning or prescribed burning in DOGs	no thinning or prescribed burning in DOGs	no thinning or prescribed burning in DOGs
	prescribed burning in ROGs	prescribed burning in ROGs	prescribed burning in ROGs
	prescribed burning & thinning in PWFAs	prescribed burning & thinning in PWFAs	prescribed burning & thinning in PWFAs
activities planned within riparian	aspen restoration	aspen restoration	aspen restoration

Proposed Activities	Alternative 2	Alternative 3	Alternative 4
areas (RHCAs)	road decommissioning	prescribed fire (underburning may back into RHCAs)	road decommissioning
	prescribed fire (underburning may back into RHCAs)		prescribed fire (underburning may back into RHCAs)
	new road construction (.15 miles)		new road construction (.81 miles)
activities planned within inventoried roadless areas (IRAs)	prescribed fire (2,590 acres)	prescribed fire (2,590 acres)	prescribed fire (2,590 acres)
	aspen restoration (4 acres)	aspen restoration (4 acres)	aspen restoration (4 acres)

** Road 2010771 (.75 mi) is currently decommissioned and would be opened, used for log haul and then closed. Road 2010370 (.31 mi) is currently decommissioned and would be opened, used for log haul and left open. Forest Service practice is that when a road is decommissioned and then re-opened they are classified as new construction. These two road segments are still within the existing road prism and will be reopened on the existing road bed and would not disturb any new ground. Post implementation decommissioned road totals include this. Road mileages may exhibit additional slight variations due to GIS errors and rounding.*

Summary of Effects by Alternative

This section provides a summary of effects of implementing each alternative. Information in Table 5 is focused where effects can be distinguished quantitatively or qualitatively between alternatives. Further discussion of effects on resources by alternative can be found in Chapter 3.

Table 5. Comparison of environmental effects by alternative

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Vegetation				
HRV	Without thinning, forest stands would not shift toward HRV, and trees would become increasingly susceptible to large-scale disturbance.	Harvest and thin approximately 8,300 acres of forest stands. The effect would be beneficial by moving these stands toward HRV and reducing the susceptibility to large scale disturbance from fire, insect and disease.	Harvest and thin approximately 6,100 acres of forest stands. The effect would be beneficial by moving these stands toward HRV and reducing the susceptibility to large scale disturbance from fire, insect and disease.	Harvest and thin approximately 9,700 acres of forest stands. The effect would be beneficial by moving these stands toward HRV and reducing the susceptibility to large scale disturbance from fire, insect and disease.
Composition and Density	Without thinning species composition would not shift toward HRV and continue to be overstocked and susceptible to insect, disease and large scale disturbance.	Thinning would reduce stand density and retain early seral species enabling the remaining trees to respond by increasing their crowns and roots, and increasing the height to the bottom of the live crown. The overall resiliency to natural disturbances would be increased.	Thinning would reduce stand density and retain early seral species on approximately 20% less acres than Alternative 2 enabling the remaining trees to respond by increasing their crowns and roots, and increasing the height to the bottom of the live crown. The overall resiliency to natural disturbances would be increased, but approximately 20% less than Alternative 2.	Thinning would reduce stand density and retain early seral species on approximately 20% more acres than Alternative 2 enabling the remaining trees to respond by increasing their crowns and roots, and increasing the height to the bottom of the live crown. The overall resiliency to natural disturbances would be approximately 20% increased compared to Alternative 2.
Structural Stages	The hot-dry OFSS are projected to	The hot-dry OFSS are projected to increase from 0%	The hot-dry OFSS are projected to increase from 0%	The hot-dry OFSS are projected to increase from 0% to 41% and

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	increase from 0% to 26% and OFMS from 7% to 72%. In the warm-dry OFSS are projected to increase from 1% to 5% and OFMS from 10% to 69%. In the cool-moist OFSS are expected to not change, but OFMS are expected to increase from 30% to 76%	to 40% and OFMS from 7% to 58%. In the warm-dry OFSS is projected to increase from 1% to 15% and OFMS from 10% to 58%. In the cool-moist OFSS are projected to increase from 0% to 3%, and OFMS are expected to increase from 30% to 73% This alternative would convert 556 acres of old forest multi strata for conversion to old forest single strata by removing the understory. The increased tree growth from thinning would accelerate the development of old forest structural stages, allowing the thinned stands to grow into the large size classes sooner.	to 35% and OFMS from 7% to 62%. In the warm-dry OFSS is projected to increase from 1% to 11% and OFMS from 10% to 61%. In the cool-moist OFSS are projected to increase from 0% to 2%, and OFMS are expected to increase from 30% to 75% This alternative would convert 350 acres of old forest multi strata for conversion to old forest single strata by removing the understory. The increased tree growth from thinning would accelerate the development of old forest structural stages, allowing the thinned stands to grow into the large size classes sooner.	OFMS from 7% to 57%. In the warm-dry OFSS is projected to increase from 1% to 17% and OFMS from 10% to 55%. In the cool-moist OFSS are projected to increase from 0% to 6%, and OFMS are expected to increase from 30% to 70% This alternative would convert 798 acres of old forest multi strata for conversion to old forest single strata by removing the understory. The increased tree growth from thinning would accelerate the development of old forest structural stages, allowing the thinned stands to grow into the large size classes sooner.
Resiliency and Sustainability	Without treatment the resiliency and sustainability of the project area is at an increased risk from large scale disturbances.	Approximately 42% of the area diagnosed in the silvicultural specialist report in need for mechanical treatment is proposed for tree thinning and slash treatment. Thinned ponderosa pine stands would increase in growth and vigor as stand density is reduced. Conversion to early seral	Approximately 31% of the area diagnosed as being in need of mechanical treatment is proposed for tree thinning and slash treatment. About 20% fewer acres would be treated than proposed under Alternative 2 resulting in less areas with increased growth	Approximately 49% of the area diagnosed in need of mechanical treatment is proposed for tree thinning and slash treatment. About 20% more acres would be treated than proposed under Alternative 2 resulting in more areas with increased growth and vigor

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		species in mixed conifer stands would shift the species composition towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires	and vigor	
Insect Risk & Disease Risk	By not treating any acres in the project area the risk for insect and disease will continue to follow the severe outbreaks experienced in the last several decades.	The additional light and warmth in thinned stands is inhospitable for bark beetles, providing an immediate degree of protection to the trees. As the trees respond with increased growth over the next several decades after the thinning, their increased vigor would allow them to withstand attempted beetle attacks by successfully pitching out the invading insects. The removal of late seral species during the thinning operations would reduce the amount of trees susceptible to root diseases, eventually allowing the disease to fade to a minor role in the forest. The risk would remain at high levels for both insects and diseases in the leave patches (5-15% of the	Similar effects to Alternative 2, however the decreased thinning across the landscape would increase insect risk and stem and root diseases compared to Alternative 2	This alternative has similar effects to those described under alternative 2, but the increased thinning across the landscape would reduce insect risk and stem and root diseases since both the thinning and the conversion to early seral species prescriptions would reduce the primary host, late seral species

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		treated areas).		
Aspen stands	By not restoring aspen stands the effect would be a continued decline in the extent of aspen stands.	There would be a beneficial impact to aspen stands by thinning conifers resulting in the expansion of aspen stands.	There would be a beneficial impact to aspen stands by thinning conifers resulting in the expansion of aspen stands.	There would be a beneficial impact to aspen stands by thinning conifers resulting in the expansion of aspen stands.
Fuels				
Fire Hazard	Perpetuation of high fuel loads with an increase in fuel loads and fire risk.	Reduction in surface and ladder fuel loads resulting in a decreased risk of large-scale wildfires.	Reduction in surface and ladder fuel loads resulting in a decreased risk of large-scale wildfires.	Reduction in surface and ladder fuel loads resulting in a decreased risk of large-scale wildfires.
Fire Regime Condition Class	Within fire regime 1, in dry forests, condition classes would continue to depart further from natural fire regimes.	Within fire regime 1, in the dry forests, condition classes 2 and 3 would begin moving towards condition class 1.	Within fire regime 1, in the dry forests, condition classes 2 and 3 would begin moving towards condition class 1 but at a smaller scale than alternative 2	Within fire regime 1, in the dry forests, condition classes 2 and 3 would begin moving towards condition class 1 more rapidly than alternative2.
Fuel Loadings and Crown Fire Potential	There would be an increase in high to extreme crown fire potential due to the levels of fuel loads at the surface and in ladder fuels to the tree crowns.	Crown fire potential would be reduced overall by about 12%, due to reduction in fuel load at the surface and in tree crowns.	Crown fire potential would be reduced by about 7%, due to reduction in fuel load at the surface and in tree crowns.	Crown fire potential would be reduced overall by about 13%, due to reduction in fuel load at the surface and in tree crowns.

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Soils				
Commercial harvest: soil productivity, soil nutrients and organic matter	No impacts to soil productivity and no organic matter or nutrients would be removed.	*Skid trails*: effects would last for 20-50 years with soil productivity recovering over time. *Landing zones:* would displace topsoil and erosion could move soil several feet, having a minimal effect.	*Skid trails*: effects would last for 20-50 years on fewer acres than Alternative 2 with soil productivity increasing over time. *Landing zones:* would displace topsoil and erosion could move soil several feet, having a minimal effect.	*Skid trails*: effects would last for 20-50 years on more acres than Alternative 2 with soil productivity increasing over time. *Landing zones:* would displace topsoil and expose soil to erosion for a short time due to removal of vegetation. Helicopter lands would expose soil on 2 acres for a short term.
Road activities: soil productivity, soil nutrients and organic matter	No impacts to soil productivity and no organic matter or nutrients would be removed.	*New Roads*: remove soil productivity within the road prism for the long term. *Temporary Roads*: displacement and compaction would recover over several decades *Road Decommissioning*: short term increase in erosion (2 years), and a beneficial long-term effect on soil productivity.	*Road Decommissioning*: short term increase in erosion (2 years), and a beneficial long-term effect on soil productivity.	*New Roads*: remove soil productivity within the road prism for the long term. *Temporary Roads*: displacement and compaction would recover over several decades *Road Decommissioning*: short term increase in erosion (2 years), and a beneficial long-term effect on soil productivity.
Prescribed burning: soil productivity, soil nutrients and	No impacts to soil productivity and no organic matter or nutrients would be	Possible positive effect on soil productivity in the short term due to low fire intensity and recycling of nutrients. Possible slight decrease of soil	Possible positive effect on soil productivity in the short term due to low fire intensity and recycling of nutrients. Possible slight decrease of soil	Possible positive effect on soil productivity in the short term due to low fire intensity and recycling of nutrients. Possible slight decrease of soil

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
organic matter	removed.	productivity over the long term.	productivity over the long term.	productivity over the long term.
Watershed				
Commercial Harvest and Pre-Commercial Thinning	No direct or indirect effects to snowpack, annual water yield, peak flows, minimum flows, or water quality are anticipated and are expected to remain within their current range of variability.	Erosion and increased overland flow may occur, but would remain within unit boundaries. Erosion and overland flow from activities on hillslopes would not deliver increased sediment to streams. Peak flow would not be measurably altered since proposed activities would not remove more than 60% of trees.	Erosion and increased overland flow would occur, but would remain within unit boundaries, but on 2,800 less acres than Alternative 2. Erosion from activities on hillslopes would not deliver increased sediment to streams. Peak flow would not be measurably altered since proposed activities would not remove more than 60% of trees.	Effects would be similar to those described under Alternative 2, however, ground disturbing activities would occur on more acres, increasing overall disturbance proportionately.
Prescribed Burning	No direct or indirect effects to snowpack, annual water yield, peak flows, minimum flows, or water quality are anticipated and are expected to remain within their current range of variability.	There will be no effects to stream channels and water quality as well as water quantity or timing because of the Best Management Practices	There will be no effects to stream channels and water quality as well as water quantity or timing because of the Best Management Practices	There will be no effects to stream channels and water quality as well as water quantity or timing because of the Best Management Practices
Road Activities	No change to snowpack, annual	Removing roads from RHCAs would reduce direct	Since there would be no temporary roads constructed,	Removing roads from RHCAs would reduce direct

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	water yield, peak flows, minimum flows, or water quality are expected. Roads in RHCAs will continue to intercept and concentrate peak flows and decrease minimum flows.	sedimentation and overland flow reaching streams. New roads may affect watershed function by intercepting subsurface flow and, potentially, channeling and re-directing overland flow. Road decommissioning will have beneficial effects by reducing overland flow and sediment delivered to streams, increasing local floodplain storage, increasing shade, and improving stream channel function.	an additional 10 acres would be undisturbed reducing opportunities for impacts. Road decommissioning will have beneficial effects by reducing overland flow and sediment delivered to streams, increasing local floodplain storage, increasing shade, and improving stream channel function. Six miles of road would not be relocated out of the RHCA, allowing existing impacts to continue into the future.	sedimentation and overland flow reaching streams. Construction of two additional crossings would introduce up to 0.5 ft^2 of sediment, but would not change stream flow because culverts will allow passage of 100 year events. New roads may affect watershed function by intercepting subsurface flow and, potentially, channeling and re-directing overland flow. Shade may be reduced locally; however exposed to solar radiation would not to be measurable. Road decommissioning will have beneficial effects by reducing overland flow and sediment delivered to streams, increasing local floodplain storage, increasing shade, and improving stream channel function.
Aspen	Aspen will continue to decline throughout the project area and reduce stream	Added material to RHCAs will increase filtering and infiltration capacity. Activities will provide for future downed woody recruitment improving	Added material to RHCAs will increase filtering and infiltration capacity. Activities will provide for future downed woody recruitment improving	Added material to RHCAs will increase filtering and infiltration capacity. Activities will provide for future downed woody recruitment improving

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	shading and alter they hydrology of the area.	filtering and infiltration capacity and allow for sediment to be deposited and stabilized, reducing future erosion and improving stream shading.	filtering and infiltration capacity and allow for sediment to be deposited and stabilized, reducing future erosion and improving stream shading.	filtering and infiltration capacity and allow for sediment to be deposited and stabilized, reducing future erosion and improving stream shading.
Watershed hazard	Existing moderate watershed hazard would continue due to the impacts from past activities still persisting in the project area.	Increased watershed hazard in the short-term. Despite the increase, the watershed hazard would remain moderate and decrease as harvest units and decommissioned roads recovered.	Increased watershed hazard in the short-term compared to Alternative 1. Despite the increase, the watershed hazard would remain moderate proportional to the amount of harvest occurring under Alternative 2. Hazard would decrease except in the vicinity of the Category 4 tributaries where hazard would remain.	Watershed hazard would increase slightly compared to alternative 2, however it would remain moderate in the short term and would decrease as harvest units and decommissioned roads recover.
Aquatics				
Pool Frequency	Pool levels would remain below standard with no action instigating change.	During harvest activities, felling danger trees into streams may create pools. Aspen treatments may improve stream channels and pool habitat during conifer felling and provide for future LWD.	Effects to pool frequency are expected to remain the same as under Alternative 2.	Effects to pool frequency are expected to remain the same as under Alternative 2.
Water Temperatures and	Stream shading would remain at the	Aspen treatments may not measurably reduce stream	Effects to water temperature and stream shading are	Effects to water temperature and stream shading are

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Stream Shading	current rate.	shading within small portions of treatment areas in the short term; however conifer felling is expected to improve aspen stands increasing shade within 10-15 years.	expected to remain the same as under Alternative 2.	expected to remain the same as under Alternative 2.
Large Woody Debris (LWD)	LWD is likely to increase over the next 25 years as overstocked conifers die and fall into streams or due to large scale events that destroy stand health.	Felling danger trees may reduce supply of LWD if they cannot be felled into streams, however efforts will be made to use trees to increase stream LWD. Over the long term, road decommissioning within RHCAs is expected to improve LWD recruitment near streams. Aspen treatments may accelerate the recruitment of LWD in the short term and long term.	Effects to large woody debris are expected to remain the same as under Alternative 2.	Effects to large woody debris are expected to remain the same as under Alternative 2.
Embeddedness and Fine Sediments	Current levels would remain, having an adverse effect on aquatic habitat	Road maintenance may decrease chronic sedimentation in some locations, improving drainage and reducing erosive surface materials. Proposed road activities will be implemented with project design criteria, limiting impacts to streams from activities. Decommissioning roads may generate sediment in the short	Effects to embeddedness and fine sediments are expected to remain similar as alternative 2, however 6 miles of roads will not be relocated out of the RHCA, maintaining currently levels having an adverse effect on aquatic habitat.	Effects to embeddedness and fine sediments are expected to remain the same alternative 2.

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		term, but would provide for beneficial effects to aquatic habitat in the long term.		
Width to Depth Ratio	Ratios would remain at below standard levels for approximately half of the streams in the project area	Project design criteria are expected to minimize impacts to stream bank stability from harvest, prescribed fire, road activities or aspen treatments.	Effects to width to depth ratio are expected to remain the same as Alternative 2.	Effects to width to depth ratio are expected to remain the same as Alternative 2.
Bank Stability	Bank stability would remain at current levels	Prescribed burning has the potential to decrease bank stability in the short term where vegetation is removed; however it is unlikely that this would be of sufficient size to result in an overall decrease in bank stability.	Effects to bank stability are expected to remain the same as Alternative 2.	Effects to bank stability are expected to remain the same as Alternative 2.
Aquatic Species				
Steelhead	Mid-Columbia Summer Steelhead ESA: No Effect Mid-Columbia Summer Steelhead Sensitive Species: No Impact Steelhead Management	Mid-Columbia Summer Steelhead ESA: May Affect, Likely to Adversely Affect in the short term. Beneficial Effect in the long-term. Mid-Columbia Summer Steelhead Sensitive Species: May Impact Individuals or Habitat, but will not likely contribute to a trend towards	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	Indicator Species: No Impact to Viability Steelhead Designated Critical Habitat ESA: No Effect	federal listing or cause a loss of viability to the population or species in the short term. Beneficial Impact in the long-term. Steelhead Management Indicator Species: Continued Viability at the Forest Scale Steelhead Designated Critical Habitat ESA: May Affect, Likely to Adversely Affect in the short term. Beneficial Effect in the long-term.		
Redband Trout	Interior Redband Trout Sensitive Species: No Impact. Redband Trout Management Indicator Species: No Impact to Viability	Interior Redband Trout Sensitive Species: 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 in the short term. Beneficial Impact in the long term Redband Trout Management Indicator Species: Continued Viability at the Forest Scale	Same as Alternative 2	Same as Alternative 2
Bull Trout	Columbia River Basin Bull Trout ESA Determination: No Effect	Columbia River Basin Bull Trout ESA: May Affect, Likely to Adversely Affect in the short term. Beneficial	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	Columbia River Basin Bull Trout Sensitive Species: No Impact Bull Trout Management Indicator Species Determination: No Impact to Viability Bull Trout Designated Critical Habitat ESA: No Effect	Effect in the long-term Columbia River Basin Bull Trout Sensitive Species: 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 in the short term. Beneficial Impact in the long-term. Bull Trout Management Indicator Species: Continued Viability at the Forest Scale. Bull Trout Designated Critical Habitat: May Affect, Likely to Adversely Affect in the short term. Beneficial Effect in the long-term.		
MCR Spring-Run Chinook Salmon	Chinook Salmon Essential Fish Habitat: No Adverse Effect	Chinook Salmon Essential Fish Habitat: May Adversely Affect	Same as Alternative 2	Same as Alternative 2
Columbia Spotted Frog	Columbia Spotted Frog Sensitive Species: No Impact	Columbia Spotted Frog Sensitive Species: May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		or species in the short term. Beneficial Impact in the long-term		
Western Ridged Mussel	Western Ridged Mussel Sensitive Species: No Impact	Western Ridged Mussel Sensitive Species: May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species in the short term. Beneficial Impact in the long-term.	Same as Alternative 2	Same as Alternative 2
Shortface Lanx	Shortface Lanx Sensitive Species Determination: No Impact	Shortface Lanx Sensitive Species: May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species in the short term. Beneficial Impact in the long-term	Same as Alternative 2	Same as Alternative 2
Botany				
Open Uplands and Vernal Meadows	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of disappearing monkeyflower,	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of Henderson ricegrass, Wallowa ricegrass, Bolander's spikerush, disappearing monkeyflower, annual dropseed, least phacelia and	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	annual dropseed and least phacelia.	arrow-leaf thelypody.		
Forest and Woodland Areas	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of clustered lady's slipper	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of cordilleran sedge, clustered lady's slipper and schistidium moss, with a beneficial indirect effect to clustered lady's slipper	Same as Alternative 2	Same as Alternative 2
Wetland, Moist Forest and Riparian Areas	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of upward-lobed moonwart, crenulate grape-fern, common moonwart, Mingan moonwort, mountain moonwort, peculiar moonwort, stalked moonwort and Idaho sedge. There would be beneficial effects to northern twayblade	May Impact Individuals or Habitat but will not lead to a trend toward federal listing of upward-lobed moonwart, crenulate grape-fern, common moonwart, Mingan moonwort, mountain moonwort, peculiar moonwort, stalked moonwort, northern twayblade and Idaho sedge. There would be beneficial indirect effects to upward-lobed moonwart, crenulate grape-fern, common moonwart, Mingan moonwort, mountain moonwort, peculiar moonwort, and stalked moonwort.	Same as Alternative 2	Same as Alternative 2
Wildlife				

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Federally listed threatened and endangered species	None present	None present	None present	None present
Forest Service sensitive species (9 with habitat)	Habitat would remain in its current condition since no action is being proposed and there will be no impacts to species.	No impact to 7 species California wolverine: may impact (MIIH) white-headed woodpecker: may impact (MIIH) in the short term and beneficial impact (BI) in the long term	No impact to 7 species California wolverine: may impact (MIIH) white-headed woodpecker: may impact (MIIH) in the short term and beneficial impact (BI) in the long term	No impact to 7 species California wolverine: may impact (MIIH) white-headed woodpecker: may impact (MIIH) in the short term and beneficial impact (BI) in the long term
MNF management indicator species (MIS): Elk	Cover percentages, quantity and quality of forage and open road densities would remain in their current condition. In the mid to long-term, development of multi-strata stands would create additional satisfactory and marginal cover stands.	Reduction in satisfactory and marginal cover, change in the cover to forage distribution, and increase in overall habitat effectiveness resulting in beneficial impact (BI) to forest-wide population and habitat trends. Satisfactory summer range will decline from 8% to 7 % in Vinegar Creek SWS, marginal summer range from 21% to 20% in Little Boulder/Deerhorn SWS, and satisfactory winter range will stay at 5%. Marginal summer range will change from 38% to 27% in Vinegar Creek SWS, from 48% to 40% in Little Boulder/Deerhorn	Reduction in satisfactory and marginal cover, change in the cover to forage distribution, and increase in overall habitat effectiveness resulting in beneficial impact (BI) to forest-wide population and habitat trends. Satisfactory summer range will stay the same in Vinegar Creek SWS, marginal summer range from 21% to 20% in Little Boulder/Deerhorn SWS, and satisfactory winter range will stay at 5%. Marginal summer range will change from 38% to 29% in Vinegar Creek SWS, from 48% to 44% in Little Boulder/Deerhorn SWS, and	Reduction in satisfactory and marginal cover, change in the cover to forage distribution, and increase in overall habitat effectiveness resulting in beneficial impact (BI) to forest-wide population and habitat trends. Satisfactory summer range will decline from 8% to 7 % in Vinegar Creek SWS, marginal summer range from 21% to 19% in Little Boulder/Deerhorn SWS, and satisfactory winter range will stay at 5%. Marginal summer range will change from 38% to 25% in Vinegar Creek SWS, from 48% to 36% in Little Boulder/Deerhorn SWS, and

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		SWS, and marginal winter range will decrease from 30% to 25%.	marginal winter range will decrease from 30% to 25%.	marginal winter range will decrease from 30% to 25%.
MIS: Old growth dependent species (4 species)	While old growth would not expand under this alternative continuing to be below Forest Plan standards. Habitat would remain in its current condition and may not be self-sustaining over time. Old growth habitat would remain the same and there would be no impact to forest wide habitat or population trends.	Changes and additions to MA-13 would expand old growth by 1,941 acres across the project area, providing additional habitat. Also, 6,751 acres of created connectivity corridors will provide free movements between LOS habitats. Thinning will make treatment areas less suitable for nesting, but still suitable for foraging. Thinning will occur in approximately 1,148 acres of three-toed woodpecker habitat, which will benefit the species. New roads will open approximately 472 acres of potential habitat for firewood cutting and hazard tree removal, but an additional 1,673 acres will be removed from these risks. Additionally no new road construction will dissect any existing old growth.	Changes and additions to MA-13 would expand old growth by 1,941 acres across the project area, providing additional habitat. Approximately 6,751 acres of created connectivity corridors will provide free movements between LOS habitats. Additionally, 1,202 acres will be set aside as pileated woodpecker feeding areas. An inconsequential amount of new roads will open up areas to firewood cutting and approximately 1,309 acres will be removed from these risks. Conversion of stands to OFSS will benefit the white-headed woodpeckers. In the short to mid-term thinning and prescribed fire will have negative effects to pileated woodpecker and pine marten by reducing stand density and cover; however in the long	Changes and additions to MA-13 would expand old growth by 1,941 acres across the project area, providing additional habitat. Also, 6,751 acres of created connectivity corridors will provide free movements between LOS habitats. Thinning will make treatment areas less suitable for nesting, but still suitable for foraging. Thinning will occur in approximately 1,504 acres of three-toed woodpecker habitat, which will benefit the species. New roads will open approximately 509 acres of potential habitat for firewood cutting and hazard tree removal, but an additional 1,673 acres will be removed from these risks. Approximately 1/5 mile of new road construction would fragment old growth habitat under Alternative 4. Conversion of stands to OFSS

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		Conversion of stands to OFSS will benefit the white-headed woodpeckers. In the short to mid-term thinning and prescribed fire will have negative effects to pileated woodpecker and pine marten by reducing stand density and cover; however in the long term stand structure will better mimic historical sustainable conditions which are beneficial to old growth dependent species. There would be no change to forest-wide habitat or population trends for the species.	term stand structure will better mimic historical sustainable conditions which are beneficial to old growth dependent species. There would be no change to forest-wide habitat or population trends for the species.	will benefit the white-headed woodpeckers. In the short to mid-term thinning and prescribed fire will have negative effects to pileated woodpecker and pine marten by reducing stand density and cover; however in the long term stand structure will better mimic historical sustainable conditions which are beneficial to old growth dependent species. There would be no change to forest-wide habitat or population trends for the species.
MIS: Primary cavity nesters (7 species)	Hairy woodpecker, Lewis' woodpecker and northern flicker habitat would continue to be reduced as a result of stand structure and high stand densities. At risk stands may benefit black-backed woodpecker and high stand densities would benefit downy woodpecker, red-	Thinning would convert OFMS stands to OFSS benefitting habitat for hairy woodpecker, Lewis' woodpecker, northern flicker. Thinning would benefit Williamson's sapsucker by retaining old forest structure. Thinning and burning would reduce stand density and cover, thus reducing nesting and foraging habitat for black-backed woodpecker. Road closures will secure an	Thinning would convert OFMS stands to OFSS benefitting habitat for hairy woodpecker, Lewis' woodpecker, northern flicker. Thinning would benefit Williamson's sapsucker by retaining old forest structure. Thinning and burning would reduce stand density and cover, thus reducing nesting and foraging habitat for black-backed woodpecker. Road closures will secure an	Thinning would convert OFMS stands to OFSS benefitting habitat for hairy woodpecker, Lewis' woodpecker, northern flicker. Thinning would benefit Williamson's sapsucker by retaining old forest structure. Thinning and burning would reduce stand density and cover, thus reducing nesting and foraging habitat for black-backed woodpecker. Road closures will secure an additional 1,673 acres of habitat

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	naped sapsucker and Williamson's sapsucker. Continuing declines in aspen stands may impact down woodpeckers, red-naped sapsuckers and Williamson's sapsucker. There will be no change expected to forest-wide populations or habitats.	additional 1,673 acres of habitat from risks of firewood and hazard tree removal, but road construction will open 472 acres to these risks. Aspen restoration would benefit downy woodpecker, red-naped sapsucker. No change expected to forest-wide population and habitat trends.	additional 1,309 acres of habitat from risks of firewood and hazard tree removal. Aspen restoration would benefit downy woodpecker, red-naped sapsucker. No change expected to forest-wide population and habitat trends.	from risks of firewood and hazard tree removal, but road construction will open 509 acres to these risks. Aspen restoration would benefit downy woodpecker, red-naped sapsucker. No change expected to forest-wide population and habitat trends.
Migratory birds (5 habitat types)	Habitat would remain in its current condition and habitat would not change from the way it is currently being utilized, therefore there would be no effects to habitat, individuals or populations.	No impact to populations, in dry forests possible increase in individuals from converting OFMS stands to OFSS, in mixed-conifer habitats possible decrease to individuals from reducing tree species composition, positive and negative impacts to species from increasing edge habitat, positive impacts from increasing shrubs by opening forest canopy, in riparian and aspen habitats bird species benefit from aspen treatments, no impacts to sub-alpine	No impact to populations, in dry forests possible increase in individuals from converting OFMS stands to OFSS, in mixed-conifer habitats possible decrease to individuals from reducing tree species composition, positive and negative impacts to species from increasing edge habitat, positive impacts from increasing shrubs by opening forest canopy, in riparian and aspen habitats bird species benefit from aspen treatments, no impacts to sub-alpine	No impact to populations, in dry forests possible increase in individuals from converting OFMS stands to OFSS, in mixed-conifer habitats possible decrease to individuals from reducing tree species composition, positive and negative impacts to species from increasing edge habitat, positive impacts from increasing shrubs by opening forest canopy, in riparian and aspen habitats bird species benefit from aspen treatments, no impacts to sub-alpine forests

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		forests or montane meadows.	forests or montane meadows.	or montane meadows.
MNF featured species (3 species)	Habitats would remain in their current condition and continue to be utilized, which may not be self-sustaining over time. No impact to northern goshawk and osprey, suitable nesting and foraging habitat for blue grouse would remain the same.	Reductions in down wood, snags, future snags, dwarf mistletoe brooms, dense forests and closed canopy-forests are likely to reduce habitat preferred by featured species. However, no activities would occur within nest stands, and activities occurring in PFAs would enhance goshawk prey conditions. Blue grouse habitat would be reduced by the removal of roost trees and approximately 27 acres of subalpine habitat could be altered. Approximately 3,236 acres of thinning and 6.8 miles of road construction will occur within 2 km of the MFJDR potentially impacting osprey nesting sites. However, no impacts to featured species are expected in the long term.	Reductions in down wood, snags, future snags, dwarf mistletoe brooms, dense forests and closed canopy-forests are likely to reduce habitat preferred by featured species. However, no activities would occur within nest stands, and activities occurring in PFAs would enhance goshawk prey conditions. Blue grouse habitat would be reduced by the removal of roost trees. Approximately 2,028 acres of thinning will occur within 2 km of the MFJDR potentially impacting osprey nesting sites. However, no impacts to featured species are expected in the long term.	Reductions in down wood, snags, future snags, dwarf mistletoe brooms, dense forests and closed canopy-forests are likely to reduce habitat preferred by featured species. However, no activities would occur within nest stands, and activities occurring in PFAs would enhance goshawk prey conditions. Blue grouse habitat would be reduced by the removal of roost trees and approximately 89 acres of subalpine habitat could be altered. Approximately 3,816 acres of thinning and 7.8 miles of road construction will occur within 2 km of the MFJDR potentially impacting osprey nesting sites. However, no impacts to featured species are expected in the long term.
Heritage Resources				
Cultural properties	No effects on cultural resources	No effects, sites would be flagged during layout and avoided from harvesting or be protected by logging over	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		snow.		
Visual Resources				
Visual quality objectives (VQO)	VQOs would be maintained, with scenic stability continuing to decline and scenic integrity continuing to shift from reduced visual sight distances from overstocked stands.	Scenic stability would increase in the mid-to long term from the reduction in stand densities, and scenic integrity would be positively affected by increasing the resiliency of forested stands. Visual quality objectives would be maintained for all foreground and middleground in visual corridors	Same as Alternative 2	Same as Alternative 2
Roads				
Road density standards	Existing open road density = 1.8 mi/mi^2	Open road density would decrease to 1.4 mi/mi^2	Open road density would decrease to 1.4 mi/mi^2	Open road density would decrease to 1.4 mi/mi^2
Miles of open road	98	75.2	76.22	75.2
Miles of closed road	90	103.2	92.7	105.9
Miles of roads to be decommissioned	0	20.9	18	20.2
Recreation				
Recreation	No change to	No effects, ROS classes would	No effects, ROS classes would	No effects, ROS classes would

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
opportunity spectrum (ROS)	existing condition	not change	not change	not change
Developed and Dispersed Campsites	There will be no changes to developed campsites or access to dispersed campsites.	Developed campsites will not be directly impacted by the project, although the sights and sounds of harvest activities and burning may be present during implementation. Two dispersed campsites with current access will become inaccessible from road closure, and one dispersed campsite on a closed road will be decommissioned.	Same as Alternative 2	Same as Alternative 2
Hunting and other Recreation	Hunting and other recreational activities will continue to occur at their current rate. Access will slowly diminish due to road conditions declining.	The short-term effect of harvest and burning activities or increases in the sights and sounds from project activities may displace recreationists and hunters in the short term. Road closures may redirect recreationists over the long-term; improved road system could provide similar opportunities as the present time.	Same as Alternative 2	Same as Alternative 2
Developed Trails and Trailheads	There will be no effect to developed trails or trailheads in	Temporary impacts to snowmobile activities and roaded recreation along the	Same as Alternative 2	Same as Alternative 2

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	the project area	2010 road may occur as a result of haul and logging operations. Trail users will experience a variety of short term visual impacts along trails in the project area; however this will end after activity is completed. The 0.25 mile long road to the Blackeye Trailhead will be closed, however access will be available along the closed road to the trailhead.		
Air Quality				
Air quality standards	No effect	Air quality standards would be met. Short-term impacts to communities down-wind and adjacent to prescribed fire units.	Air quality standards would be met. Short-term impacts to communities down-wind and adjacent to prescribed fire units. The same number of acres would be burned as Alternative 2, however 2,172 less acres of pile-burning would occur compared to Alternative 2, producing less smoke.	Air quality standards would be met. Short-term impacts to communities down-wind and adjacent to prescribed fire units. The same number of acres would be burned as Alternative 2, however 1,439 more acres of pile-burning would occur compared to Alternative 2, producing more smoke.
Rangeland				
Forage production	Decrease in forage production and	In the long-term there would be an increase in forage	In the long-term there would be an increase in forage	In the long-term there would be an increase in forage production

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	quality from increased canopy closure.	production on 7,642 acres over the existing condition.	production on 7,324 acres over the existing condition.	on 7,930 acres over the existing condition.
Aspen treatment	No aspen treatment will continue	Aspen enhancement will take approximately 35 acres out of livestock grazing by fencing out the stands.	Same as Alternative 2	Same as Alternative 2
Road treatments	No Effect	Approximately 12.6 miles of new road construction will offer travel ways to livestock, increasing distribution through the allotment. Approximately 16.6 miles of closing and 21.9 miles of decommission roads can slow herding and pasture moves resulting in trailing and increase the time spent in grazing units.	Approximately 1.1 miles of new road construction will offer travel ways to livestock, increasing distribution through the allotment. Approximately 14.9 miles of closing and 19.9 miles of decommission roads can slow herding and pasture moves resulting in trailing and increase the time spent in grazing units.	Approximately 14.7 miles of new road construction will offer travel ways to livestock, increasing distribution through the allotment. Approximately 16.59 miles of closing and 21.2 miles of decommission roads can slow herding and pasture moves resulting in trailing and increase the time spent in grazing units.
Invasive Weeds				
Rate of spread	No effects	Spread would occur related to road use, construction of new roads (12.6 miles), tractor yarding, mobilization of equipment, and prescribed burning.	Spread would occur related to road use, construction of new roads (1.1 miles), tractor yarding, mobilization of equipment, and prescribed burning.	Spread would occur related to road use, construction of new roads (14.7 mi), tractor yarding, mobilization of equipment, and prescribed burning.
Economics				
Viability of Harvest	N/A	Commercial harvest shows positive bid rates producing a viable harvest, $971,186 is the	Commercial harvest shows positive bid rates producing a viable harvest, $511,367 is the	Commercial harvest shows positive bid rates producing a viable harvest, $81,207 is the

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
		estimated revenue from the sale.	estimated revenue from the sale.	estimated revenue from the sale.
Employment and Income	Declining trends in timber harvesting from National Forest lands would continue in the future and contribute to declines in wood products employment	Short term economic relief by providing commercial saw logs and biomass. Harvest related employment (211 jobs) would occur for 2 years.	Short term economic relief by providing commercial saw logs and biomass. Harvest related employment (125 jobs) would occur for 2 years.	Short term economic relief by providing commercial saw logs and biomass. Harvest related employment (272 jobs) would occur for 2 years.
Economic Efficiency	The public would incur no costs, nor realize any benefits.	A present net value of $-220,343 would be experienced under Alternative 2. This would produce 211 jobs, and $6,180,194 in local income.	A present net value of $-182,373 would be experienced under Alternative 2. This would produce 123 jobs, and $3,598,273 in local income.	A present net value of $-1,459,346 would be experienced under Alternative 2. This would produce 272 jobs, and $7,990,505 in local income.
Inventoried Roadless Areas				
Roadless characteristic	An increased risk of loss from large scale wildfire or insect/disease	No harvest or road building. Approximately 1,945 acres of prescribed fire and 6 acres of aspen restoration would help to maintain and restore the characteristics of ecosystem composition and function, and the activities would not impact roadless character or the area's eligibility for potential wilderness.	No harvest or road building. Approximately 1,945 acres of prescribed fire and 6 acres of aspen restoration would help to maintain and restore the characteristics of ecosystem composition and function, and the activities would not impact roadless character or the area's eligibility for potential wilderness.	No harvest or road building. Approximately 1,945 acres of prescribed fire and 6 acres of aspen restoration would help to maintain and restore the characteristics of ecosystem composition and function, and the activities would not impact roadless character or the area's eligibility for potential wilderness.

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Potential Wilderness Areas				
Dixie Butte Potential Wilderness Areas	No effects to existing 5,514 acre PWA within the project area	Timber harvest and 0.2 miles of road construction would reduce the PWA by approximately 60 acres. Prescribed fire would occur on 2,039 acres of the PWA, but would not remove the area from inclusion in a PWA inventory.	There would be no changes in acreages to the PWA. Prescribed fire would occur on 2,039 acres of the PWA, but would not remove the area from inclusion in a PWA inventory.	Approximately 2 miles of road would be constructed in the PWA outside of the IRA, thinning would occur within the PWA, outside of the IRA. These activities would reduce the PWA by 719 acres. The Dixie Butte PWA would still be over 5,000 acres including areas outside of the project boundary. Prescribed fire would occur on 2,039 acres of the PWA, but would not remove the area from inclusion in a PWA inventory.
Greenhorn Potential Wilderness Area	No effects to existing 3,183 PWA within the project area	Activities would not occur within the PWA within the project area, maintaining the 3,183 acres of PWA. Prescribed fire would occur on 663 acres of the PWA, but would not remove area from inclusion of a PWA inventory.	There would be no changes in the acreages to the PWA. Prescribed fire would occur on 663 acres of the PWA, but would not remove area from inclusion of a PWA inventory.	No road construction or harvest activities would occur in the PWA, maintaining the 3,183 acres of PWA. Prescribed fire would occur on 663 acres of the PWA, but would not remove area from inclusion of a PWA inventory.
Other Undeveloped Lands				
Acres of Other Undeveloped Lands	No effects to OULs within the project area. 9,965 acres would still remain undeveloped, but not	Activities occurring as part of the project will reduce the OULs by 3,223 acres. The project area will be approximately 41%	Activities occurring as part of the project will reduce the OULs by 1,855 acres. The project area will be approximately 45%	Activities occurring as part of the project will reduce the OULs by 3,675 acres. The project area will be approximately 38%

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	IRAs or PWAs. The project area will remain 50% undeveloped or within PWAs	undeveloped or within PWAs after implementation.	undeveloped or within PWAs after implementation.	undeveloped or within PWAs after implementation.
Climate Change				
Greenhouse gas emissions and carbon sequestration	No immediate effect, potential wildfires could release 3-5 times the quantities of CO_2 into the atmosphere as prescribed fire.	Prescribed burning will release reduced amounts of CO_2 into the atmosphere when compared to wildfire. Harvest and thinning is not expected to have a measurable change in the ability of the forest to sequester carbon.	Prescribed burning will release reduced amounts of CO_2 into the atmosphere when compared to wildfire. Harvest and thinning is not expected to have a measurable change in the ability of the forest to sequester carbon.	Prescribed burning will release reduced amounts of CO_2 into the atmosphere when compared to wildfire. Harvest and thinning is not expected to have a measurable change in the ability of the forest to sequester carbon.
Effects of climate change on project area	Species composition and stand density will remain the same or trend toward late seral species and increased density, which can lead to larger fuel loadings and higher potential for wildfire with increasing temperatures and shifting precipitation	Activities will increase the ability of the forest to withstand increased levels of wildfire and other disturbances and provide for a more resilient forest in the face of potential climate change.	Activities will increase the ability of the forest to withstand increased levels of wildfire and other disturbances and provide for a more resilient forest in the face of potential climate change.	Activities will increase the ability of the forest to withstand increased levels of wildfire and other disturbances and provide for a more resilient forest in the face of potential climate change.

Resource Areas	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
	patterns.			
Environmental Justice				
Minority and low income communities	Nearby low income communities would not see an increase in jobs related to treatment activities.	There would be no disproportionately high human health or environmental effects on minority or low income communities. Nearby communities would be positively affected by economic impacts connected with treatment activities	Similar effects to Alternative 2, however since less treatment is occurring compared to Alternative 2, less employment opportunities will exist.	Similar effects to Alternative 2, however since more treatment is occurring compared to Alternative 2, more employment opportunities will exist.

Some effects are the same for each action alternative due to the mitigation through the design criteria. Therefore, the table does not display difference in effects between alternatives.

Chapter 3 Environmental Consequences and Affected Environment

Chapter 3 summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on these environments. Chapter 3 also presents the scientific and analytical basis for the comparison of effects by alternative presented in Table 5, Chapter 2. Chapter 3 complies with the implementing regulations of the National Environmental Policy Act (NEPA) for analytic and concise environmental documents (40 CFR 1500-1508).

In the development of the environmental analyses that follow, best available science was considered and is documented in the project record for each resource area. Consistency with the Malheur National Forest Land and Resource Management Plan, as amended (Forest Plan) was built into the project design and the analyses. The environmental analyses incorporate issues identified through the scoping process. An environmental effect, impact, or consequence is defined as a modification of or change in the existing environment brought about by the action taken. NEPA regulations (40 CFR 1508.27) refer to effects that are direct, indirect, or cumulative as short term or long term. For this project, short term is defined as around 1-10 years and long term is defined as around 10-20 years, unless otherwise defined in the resource sections of this chapter. Effects can vary in degree, ranging from only a slightly discernible change to a measurable alteration in the environment.

Cumulative Effects

A cumulative effect is the impact to the environment resulting from the incremental impact of the action when added to effects from other past, present, and reasonably foreseeable future actions. Other actions are considered regardless of what agency or person undertakes such other actions and regardless of land ownership on which the other actions occur (40 CFR 1508.7). An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other actions, the effects may be significant.

Cumulative effects were assessed for this project in terms of how the alternatives would add to the past and present activities (Table 6). Existing conditions described under each resource section reflect the cumulative effects of past and present activities that have occurred in this area. Each resource section identifies specific past and present actions listed in Table 6 with a discernible effect on a particular resource as reflected in the existing condition.

Past Actions

The environmental analysis required under National Environmental Policy Act is forward-looking in that it focuses on the potential impacts of the proposed action that an agency is considering. Thus, review of past actions is required to the extent that this review informs agency decision making regarding the proposed action (Council on Environmental Quality Memorandum, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008). Specific past actions considered in the affected environment and cumulative effects analysis are summarized below. The past actions summary is not necessarily exhaustive, as records may not exist for all past activities by project. This is particularly true for those actions that predate the passage of the National Environmental Policy Act in 1970. Nonetheless, the effects of such past actions are accounted for in the assessment of the existing condition, as the current condition assessment necessarily reflects any relevant impacts of such actions.

Cumulative Effects of Present and Reasonably Foreseeable Future Activities

Each resource section describes any cumulative effects from the present and reasonably foreseeable future actions listed in this section. The reasonably foreseeable future activities overlap in time and location and may have environmental effects. The incremental effect of the action when added to the proposed activities was analyzed. Detailed descriptions of each present and future action are listed here and are referenced in each resource section. The foreseeable future actions for which the Galena Project's proposed activities may have a cumulative effect are those listed on the Malheur National Forest's Schedule of Proposed Actions dated December 31, 2010, located in the project record.

Table 6. Past and present activities in and around the Galena project area used for the cumulative effects analysis

Activity Name	Time Frame	Location	Activity Description
Timber Sales			
Historical timber harvest	1860-1980	Middle Fork John Day River	Timber harvest started with settlement and mining activities in the 1860s. The first large scale logging began with the arrival of the Sumpter Valley Railway in 1910. A main line was built down the MFJD River with numerous spurs reaching up both sides of the valley. Harvest was mostly clear-cutting with limited retention of older trees. In the middle of the century roads were built into higher elevation areas and mainly consisted of partial tree removal of high value timber such as large ponderosa pine.
Past Logging within the project area	1980-Present	Project area	Thinning and regeneration harvest from 1980 through the present is listed below with date, sale name, and acres harvested: 1985, X LP, 88 / 1985, Bates FW, 18 / 1985, Cogo, 278 1986, Ragged, 3 / 1987, Sota, 31 / 1987, Tipton, 208 1988, Gold LP, 294 / 1988, Vincent, 815 / 1989, Gar, 41 1989, Lass, 445 / 1989, Scent, 137 / 1989, Tincup, 561 1990, Vine, 171 / 1990, Skibowl, 128 / 1993, Wind, 248 1994, Morning, 150 / 1995, Granite Pine, 18 / 2001, VV, 293 2001, Moe, 2,166
Recent timber sales	2005-2011	Adjacent to project area	Crawford and Balance timber sales including commercial thinning, pre-commercial thinning, and prescribed burning. The Crawford area treated was 2,200 acres and the Balance treatment area was 1,200 acres.
Plantation Maintenance	2009-2012	Middle Fork John	Pre-commercial thinning and hand piling & burning of thinning slash on 12,195 acres of young trees in

Activity Name	Time Frame	Location	Activity Description
		Day River	plantations throughout the Middle Fork.
Wildfire/Timber Salvage			
Easy Fire	2002	Middle Fork head-water	Severe 7,000 acre wildfire salvaged and regenerated by planting and natural regeneration.
Summit Fire	1996	Middle Fork	Severe 30,000 acre wildfire salvaged and regenerated by planting and natural regeneration.
Reed Fire	1994	Below Sunrise Butte	Severe 2,000 acre wildfire salvaged and regenerated by planting and natural regeneration.
Indian Rock Fire	1994	Indian Rock Lookout	Severe 2,000 acre wildfire not salvaged and regenerated by only natural regeneration.
Other			
Bates saw mill	1917-1975 2011-2012	Adjacent to project area	Historic sawmill and pond no longer in operation. Few houses remain in the general location. Acquired by the State of Oregon for development of a new State Park.
Riparian Enhancement/ Channel Restoration	2008-2010	Middle Fork of John Day River	Confederate Tribes of Warm Springs, Nature Conservancy, and private landowners are restoring riparian areas along the Middle Fork. The channel restoration work includes a variety of actions to improve fish habitat.
Stream Channel Relocation	2010	Middle Fork below Galena	Moving the Middle Fork back into its former meandering channel, hardwood plantings, and placing large wood.
Wildfire suppression	1910-2010	Project area	In the recent past wildfires were actively suppressed leading to a buildup of ground fuels and overstocked stands. Because of current uncharacteristic fire behavior, all fires are being actively suppressed to reduce the chance of other major stand replacement fires.
Noxious weed treatment	1990-2010	Project area	Noxious weed treatment on NFS lands has been done by hand pulling. Noxious weed treatment on neighboring state and private lands used chemical and biological agents.
Historical grazing	1880-1940	Project Area	The Middle Fork area was intensively grazed during these years. After the 1930's the USFS established grazing regulations.
Present grazing	1990s-2010	Project Area	The Upper Middle Fork allotment covers the project area and has been regularly grazed with an average of 485 head

Activity Name	Time Frame	Location	Activity Description
			per season on a deferred rotation system.
Historical mining	1864-1910	Project Area	Extensive gold mining began in the 1860s resulting in major stream and riparian area alteration, hillsides eroded by hydraulic mining, mining ditches, and mine shafts are found up Vincent and Vinegar Creeks and between Placer and Davis Creeks. Dredging occurred in the main stem of the Middle Fork near Granite Boulder Creek and the Galena town site.
Watershed improvements	2004-2009	Project Area	Replacement of 6 culverts in 2004. One fish screen was constructed in summer 2009 on Vincent creek. Dead Cow Gulch riparian areas were restored by the Warm Springs Tribe.
Travel Management Plan	2011	Forest-Wide	The Malheur NF is required to develop a new vehicle use plan that will restrict cross country travel by motorized vehicles to only specifically designated roads.
Firewood Cutting	Ongoing	Project Area	Use is generally late spring through late fall.
Approx. 42 Placer Claims (varies from year to year)	Ongoing	Across the project area	Includes deposits of unconsolidated materials, such as sand and gravel containing free gold or other minerals and many nonmetallic bedded or layered deposits. The maximum size of a placer claim is 20 acres per locator. Present activity is mostly limited to small-scale part time operations with minor ground and stream disturbance.
Approx. 20 Lode Claims (varies from year to year)	Ongoing	Across the project area	These claims are usually parallelogram shaped with the longer side lines parallel to the vein or lode. They are limited by stature to a maximum of 1,500 feet in length along the vein or lode and 300 feet on either side. Present activity is mostly limited to assay work and minor claim work. No large commercial operations are active at this time.

Affected Environment

Landforms

The Galena project area encompasses 37,200 acres of the northern half of the Blue Mountain Ranger District on the Malheur National Forest. It is located about 28 miles northeast of the town of John Day, Oregon. The project area sits within the Camp Creek fifth field watershed and consists entirely of two sixth field subwatersheds: Vinegar Creek and Little Boulder Creek-Deerhorn. These subwatersheds are mountainous with elevations ranging from 3,800 to 7,500 feet. Distinctive landforms include Dixie Butte and Vinegar Hill as well as the Middle Fork of the John Day River.

About 90 percent of the project area is forested with the remaining 10 percent consisting of riparian areas, streams, scablands and rock outcrops. The project area is divided from east to west by the Middle Fork of the John Day River. Slopes range from 10-70 percent across the project. Southerly aspects are predominate on the north side of the river, while northerly aspects are predominate on the south side of the river. The project area is surrounded by National Forest System lands of similar terrain and vegetation types. There are approximately 1,000 acres of private land in and around the project area and along the Middle Fork of the John Day River.

Soils

The geology in the project area includes 5 major types of rock: Strawberry volcanic, Clarno formation, metamorphic, serpentine, and granite. Un-forested, shallow, rocky soils supporting low amounts of ground cover cannot absorb much water, and produce overland flow. These soils tend to be erodible. Serpentine rocks weather to an infertile soil, inhibiting vegetation growth and can create erosion problem areas. There is a cap of volcanic ash on much of the project area, countering overland water flow by absorbing water and enhancing vegetation productivity.

Watershed

The two subwatersheds comprising the project area drain into the Middle Fork of the John Day River, which empties into the Columbia River, about 150 miles to the north. There are 180 miles of streams in the project area. Eight streams or river segments are on the state of Oregon 303(d) List of Impaired Waterbodies. Streams are listed due to elevated stream temperatures.

Vinegar Creek subwatershed shows a typical distribution of intermittent streams to perennial streams while Little Boulder-Deerhorn subwatershed appears to have a greater proportion of perennial channels. The difference may be due to a narrower elevation range in the latter subwatershed and the fact that more of the stream channels are located on volcanic geology, which may direct groundwater to the surface.

The drainage network has developed in balance with the runoff regime, both of which are influenced by the landscape, climate, and natural disturbance processes. The hydrological characteristics of the soils and geology (limiting soil storage capacity) of much of the project area cause larger proportions of runoff to be contributed to seasonal or storm-related high flows and smaller proportions to late season base flows. Ephemeral draws, which have deeper soils and ephemeral swales, which are flatter and broader, may have disproportionate importance as key areas for infiltration of runoff from adjacent hill slopes. Even with deeper soils, overland flow is commonly observed during snowmelt and storms. Consequently, substantial amounts of runoff may not be available for late season base flows naturally.

Past harvest, roading, railroading, grazing, and mining have increased soil disturbance, provided pathways for concentrating overland flow, or decreased stream channel and riparian resiliency. Response to rare, large runoff events elsewhere in the watershed have caused gullying on hill slopes and increased sedimentation by eroding fill at stream crossings.

Aquatics

Of the 180 miles of streams in the project area, 39 miles are classified as Category 1 or fish bearing streams and are generally all perennial. Fish bearing perennial streams make up about 20% of the drainage network in each subwatershed. There are two fish species present that are listed as threatened under the Endangered Species Act (ESA). There is additionally one fish species, one frog species, one mussel species, and one snail species listed by the Regional Forester as sensitive. There is both proposed and critical habitat present for both of the listed fish species under ESA. There is essential fish habitat also present listed under the Magnuson-Stevens Act.

Fish habitat in the analysis area generally does not meet Forest Plan standards for pool frequency, large woody debris (LWD), sediment, temperature, and width-to-depth ratio. In part this is due to the condition of stringer meadow vegetation, past harvest, and concentrated overland flow along most streams in the analysis area, as well as low perennial flows in Windlass Creek and Caribou Creek and Dead Cow Gulch. However, the condition of important habitat elements including low pool frequency, high water temperatures, reduced LWD frequency, high fine sediment levels, and moderately high width-to-depth ratios indicate reduced fish habitat quality as a result of past management activities. Although bank stability does meet the riparian management objectives, this may be a reflection of the dominant channel type in the analysis area. Most streams in the analysis area are in a highly altered state, with conditions of important habitat elements strongly limiting quality of fish habitat. The Middle Fork of the John Day River, on the forest, is also in a highly altered state but appears to be on an upward trend based on recent range monitoring results found in the project record.

Roads

There are around 188 miles of open and closed NFS roads and 34 miles of historically decommissioned roads in the project area. The open and closed road density is 3.3 mi/mi^2 (Table 42). Road densities impact resource areas in many ways including erosion, wildlife disturbance from human presence, and impacts to fish habitats. Some roads in the project area are near stream channels and are contributing sediment into streams and concentrated flow. Road-stream crossings have the potential to directly and indirectly affect streams and water quality and fish passage.

From a qualitative standpoint, the following assumptions can be used as general indicators of sediment delivery risk associated with roads: 1) the higher the road density the higher the potential for sediment yield increases due to the larger acreage of exposed surfaces, 2) the more drainage ways that are crossed the higher probability that direct sediment introduction would occur, and 3) the greater the distance, or higher on the slope, that the road is from the drainage network, the less probability for delivered sediment to occur (erosion may occur but is less likely to be routed to the stream).

Surface erosion is highly dependent on soils, road surfacing and condition, road grade, traffic volumes, and the effectiveness and spacing of drainage structures. The greatest surface erosion problems occur in highly erodible terrain, particularly landscapes underlain by granitic soils, soils of the Clarno formation, and certain highly fractured or weathered rock types as found in the project area.

Wildlife

The project area is managed for habitat of wildlife species such as elk and many bird species. Dedicated and replacement old growth habitats are managed to support woodpeckers and pine marten. There is summer and winter range for deer and elk within the project area providing cover and browse for big game throughout the year. The Dixie wildlife emphasis area is located in the southwest portion of the project area.

Recreation

There are few recreation facilities within the project area. The Middle Fork and Deerhorn campgrounds, trail heads for the Davis Creek and Buckeye trails and Forest Road 2010, and a designated snowmobile trail are present. Firewood cutting also occurs within the project area.

Road development, including those constructed for timber harvest, have provided increased access to the project area for hunting, fishing, hiking, dispersed and developed site camping and other recreational activities over the last 60 years. From May through November, established campground and stream areas along the Middle Fork of the John Day River (MFJD) River receive continuous use.

In the fall, deer and elk hunting are popular recreation activities within the project area. Use of dispersed camp sites varies throughout the year, with the majority of sites showing heaviest use during the fall hunting season, coinciding with fall spawning of bull trout and Chinook salmon. Dispersed campsites are characterized by primitive structures such as toilets, fire rings, and benches built by campers. Campsites are concentrated primarily in flat areas off main transportation systems where water can be accessed. In some areas, road closures have been implemented to relocate camping towards the use of developed campgrounds, forest camps, and other dispersed sites.

Cultural Resources

Archeological sites in the area date back 11,000 years. The area has been occupied by Native Americans from the Columbia Plateau and the Northern Great Basin culture areas. There are historic (pre-1960s) and prehistoric (pre-1800s) sites documented within the project area, and culturally significant plants. The majority of sites are from old mining and logging operations concentrated in the northern two-thirds of the project area. There is a railroad grade in the project area listed on the National Register of Historic Places (NRHP). Some of the culturally significant plant species present include bitterroot, lomatium, yampa, biscuit root, wild rose, willow, cattails, camas, chokecherries, currants, and huckleberries.

Historic Mining, Logging, and Grazing

Other past activities which have impacted the physical landscape of the project area include historic mining, logging, and livestock grazing. The Galena area has been highly influenced by mining activities and many still continue at a decreased level of activity. The discovery of placer gold in the Middle Fork influenced settlement of European immigrants in 1864. Placer mining activity was the most intensive in the Vinegar, Vincent, Davis, and Placer Gulch drainages. The largest hard rock, or lode, mining operation in the project area was the Morning Mine in the Vinegar Creek Drainage. Mining features such as placer tailings, rock piles, hydraulic ditch systems and hydraulic mining, prospect holes, adits and shafts are common remnants.

While timber harvest for mining uses decreased, logging increased after 1910. Much of the lower and mid elevations of the project area was heavily harvested by railroad logging until 1945 when use of the Oregon Lumber Company Railway Middle Fork line was discontinued. These stands regenerated as second growth and were pre-commercial thinned in the 1960s and 1970s. Railroad logging remnants include linear segments of railroad grades in various conditions, trestle remains, railroad ties and spikes and logging camp sites.

Beginning in the mid-1800s the primary use of the area was for homesteading and ranching. From the 1880s to the 1940s hundreds of thousands of sheep grazed the Middle Fork including the project area. Livestock grazing on public lands prior to the 1930s was unregulated and proceeded all year long. Adverse effects, still present today in some areas, are soil erosion, loss of stream bank vegetation, modification of stream channels, and change in riparian vegetation species composition. The Forest Service has since taken substantial measures to regulate grazing, establish workable grazing seasons, and delineate allotments.

Forest Types

The forest stands in the project area are primarily divided into three forest types: hot-dry, warm-dry, and cool-moist (Figure 2).

Each of the three forest types cover around one-third of the project area. The remaining project area is covered by juniper, cool wet forests, cold dry forests, and non-forested vegetation.

Hot-dry forests occupy low to mid elevations and mainly south facing slopes with ponderosa pine as the dominant species. The ponderosa pine plant associations have ground vegetation of pine grass, elk sedge and common snowberry. These stands in the project area are young and even aged due to past harvest. Fire suppression has caused the stands to be dense and have multi-layer canopies, uncharacteristic of this forest type. There is low structural diversity and few large trees and snags. The limiting factor to vegetation growth in hot-dry forests is competition for water, sunlight, and soil nutrients.

Both the warm-dry and cool-moist forests are found in low to mid elevations and on south slopes at higher elevations within the project area. Warm-dry forests occupy south slopes at higher elevations with ponderosa pine, Douglas-fir, lodgepole, grand fir, and western larch. Cool-moist forests occupy north aspects and cool, wet draws with ponderosa pine, Douglas-fir, grand fir, lodgepole, western white pine, and western larch. The Douglas-fir and grand fir plant associations found in these two forest types have ground cover of pine grass, twinflower, and huckleberry. Past timber harvest and fire suppression have gradually converted the warm-dry and cool-moist forests from a fire maintained early seral species combination to a higher proportion of late seral species lacking fire return intervals. These stands are overstocked, and have multi-layer canopies at high risk of insect and disease attacks and stand replacing wildfires.

Aspen, a shade intolerant, early seral species occurs in small isolated stands throughout the project area. The amount of aspen stands present is much reduced from the historical extent. The Galena watershed analysis (USDA 1999) identified the remaining aspen stands in the project area as declining in health and vigor. Heavily encroaching conifers from fire suppression and continued-browsing by livestock and wildlife have hindered aspen stand health.

Mountain mahogany is present in several places in the project area. It is a unique tree that has been reduced in numbers from historical levels primarily from browsing from livestock and wildlife and conifer encroachment. The seedlings have difficulty becoming established due to these pressures.

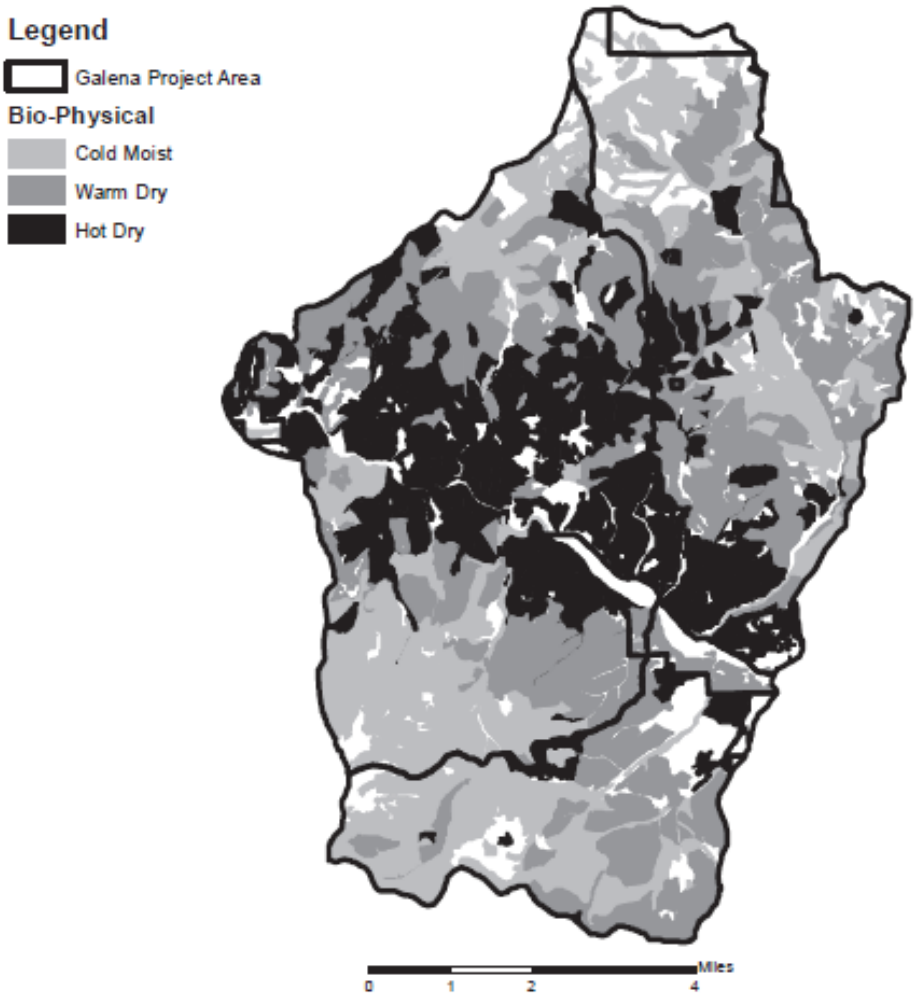

Figure 2. Primary forest types in the project area; hot-dry, warm-dry, and cool-moist

Botany

There are four documented sensitive plant species and 33 additional species that are expected to occur or for which suitable habitat exists in the project area. Most sensitive plants in the area including the four documented species are associated with wet meadows, seeps, springs, and riparian areas. There are several open upland species whose habitat consists of non-forested openings, rock outcrops, and seasonally wet meadows. A few forest upland species are found in the understories of juniper and conifer forests.

Insects and Disease

In the last three decades there have been several outbreaks of defoliating insects and bark beetles that have caused a large loss of trees in the area. From 1985-1992 a series of spruce budworm outbreaks caused widespread damage in the hot-dry, warm-dry and cool-moist forest stands by reducing tree growth and increasing mortality through defoliation. There are moderate levels of dwarf mistletoe in the hot-dry forests due to historical partial cutting in the project area which created openings allowing an understory to establish. The Armillaria root disease is present in the project area along Tin Cup Creek and Little Boulder Creek where small pockets of trees have been killed, creating openings. At severe levels these diseases could greatly inhibit the growth of trees and development of old forest structure.

Fuels

There is a high potential for a stand replacing crown fire within the project area. Past timber harvest and lack of fire due to fire suppression have changed the structure, species and size of trees. This has caused a continuity of vertical and horizontal fuels increasing the potential for intense, severe wildfire. Fuels in the project area consist of large downed wood and fine fuels such as duff, grass, tree litter, and small diameter wood, which influence the rate of spread and fire intensity.

Historical fire disturbance in the project area had a high frequency of occurrence (every 1-35 years) and low intensity in the hot-dry and warm-dry forest types. The historical fire disturbance in cool-moist forests was a mixture of frequent low intensity fire and patches of 20-200 acre stand replacement fire. These fires increased stability of the forests by maintaining fire tolerant species, creating less dense stands, burned lower limbs which reduced ladder fuel, and reduced surface fuels.

Effect of Each Alternative by Resource

The following resources were analyzed for anticipated effects from the implementation of each alternative: forest vegetation, fuels, soils, watershed, aquatics, botany, wildlife, heritage, visuals, roads, recreation, air quality, rangeland, invasive plants, inventoried roadless and potential wilderness areas, and economics. This section describes the effects analysis conducted by resource specialists by alternative. Specialist reports containing further documentation of the analysis and resulting effects can be found in the project record.

Forest Vegetation

Regulatory Framework

Forest Plan direction is to minimize losses due to insects and disease by establishing ponderosa pine and western larch where appropriate within 5 years after harvest (Forest Plan IV-38), manage forests for species composition, stand density and structure to move toward HRV in upland forests (Regional Forester's Forest Plan Amendment No. 2), and reducing the risk of fire severity and insect damage by maintaining stand vigor through the use of activities such as stocking level control (Forest Plan IV37). Both natural regeneration and planting are utilized to reforest the harvested areas.

The Regional Forester Forest Plan Amendment #2 (Eastside Screens) provides direction not to decrease old forest structural stages by cutting live trees over 21 inches (except for incidental trees cut for road and landing construction, and danger trees).

While this project is not being planned under the Healthy Forest Restoration Act (HFRA), the action alternatives are consistent with the requirement to retain large trees of fire-resilient species appropriate to forest types while removing mostly smaller trees. The project serves the HFRA purpose of imitating historical forest conditions in this fire-adapted ecosystem, by providing for less intense future wildfires and improving forest resiliency to damaging insects and disease causing less severe impacts on both natural resources and the human environment. Reducing stocking levels and the proportion of late seral tree species would improve the ability of the forest to tolerate potential climate change moving toward hotter and drier conditions.

Analysis Methods

To determine existing conditions of the forested stands within the project area, information was gathered through a combination of photo interpretation, formal timber stand exams in 1992 and 2000, and walk-throughs in 1999 and 2000. Additional field checking was done in 2008 and 2009 to update stand data to current conditions.

The district silviculturist identified treatment areas, primarily in the hot-dry and warm-dry forest types, for commercial harvest and pre-commercial thinning. Resource specialists were consulted on placement of the units and prescriptions within the units to increase the resiliency of the forest to disturbing agents such as insects and fire while maintaining adequate wildlife habitat. Within units, variable spacing, leave tree patches for wildlife and visual standards were built into the project design.

The data collected on stands was used as an input to the forest vegetation simulation (FVS) model to project development of future stand structures. The INFORMS program was used to run the FVS growth simulator with the Blue Mountain variant, on all forested stands within the project area. The model results were used to compare future stand structure, stand density, and the proportion of early seral species, by alternative. The long-term projections are estimates; however, results show trends which are useful for comparing alternatives. For a list of the assumptions used in running the model refer to the silviculture specialist report found in the project record.

Existing Condition

Forest Types

The plant associations are grouped into biophysical environments that function somewhat alike. There are six forested biophysical environments (plant association groups) that occur within the analysis area as displayed in Table 7 below.

Table 7. Forest types found within the project area

Forest Types	Acres	Percent of Project Area
Hot-dry	9,194	25 %
Warm-dry	11,364	31 %
Cool-moist	10,042	27 %
Cold-dry (lodgepole)	1,826	5 %
Cool-wet	121	<1 %
Juniper	1,167	3 %
Non-forest and other	3,486	9 %
Total	**37,200**	**100%**

The majority of the project area is in the hot-dry, warm-dry, and cool-moist biophysical environments. The plant association groups that comprise minor proportions of the analysis area (5% or less) are not discussed in detail in this section, refer to the Silviculture specialists report for detailed discussions of each biophysical environment.

Hot-Dry Forests:

Hot-dry forests occur across a range of soils and generally southerly to flat aspects along mid to lower elevations. Species composition includes nearly pure stands of ponderosa pine to mixes where ponderosa pine is the dominant species and Douglas-fir, grand fir, western larch, and lodgepole pine occur in lesser amounts. The hot-dry forests were subject to frequent, low intensity fires that favored older, thick barked ponderosa pine in the stands.

In some locations juniper is increasing its range into the hot-dry forests in the absence of frequent ground fires. Ponderosa pine and lodgepole pine are encroaching into meadows that historically were kept free of trees by frequent fire occurrences.

Species Compositions and Successional Development

The low intensity and high frequency disturbance regime common in this forest type favored fire resistant species, mostly ponderosa pine, and development of more open stands with a single high crown layer. Smaller understory trees were vulnerable to periodic fires surviving only in openings with too little fuels to carry a fire. The extent of these ground fires likely varied from areas less than 10 acres in size to entire slopes covering thousands of acres depending upon the season, topography, and climatic conditions. The intensity also varied in response to vegetative conditions.

Overall, fire frequency was an agent of stability in these forest ecosystems. Fires favored the ground vegetation dominated by fire adapted grasses (such as pine grass and elk sedge), while promoting and maintaining mature forest vegetation dominated by ponderosa pine.

Warm-Dry Forests:

Warm-dry forests occur across a range of soils on the higher south facing aspects and lower north facing aspects. Warm-dry forests are represented by an array of plant associations, indicating the wide range of environments they occupy. Species compositions range from nearly pure ponderosa pine to mixes of ponderosa pine, Douglas-fir, grand fir, western larch, and lodgepole pine. The warm-dry forest includes most of the Douglas-fir plant associations and the drier grand fir plant associations (up to and including the grand fir/grouse huckleberry association). Frequent, low intensity fires favored the early seral species.

Species Compositions and Successional Development

The low intensity/high frequency disturbance regime common in this forest type favored fire resistant species (ponderosa pine, western larch, and to a lesser extent Douglas-fir) and development of more open stands with a single high crown layer. Shade tolerant species (grand fir and Douglas-fir) were generally susceptible to these fires due to their thinner bark when young, and their persistent, low hanging crowns which carried fire into the crowns. This was also true for moist forests occurring in the transitional area with dry forests. Smaller understory trees were vulnerable to periodic fires, surviving only in openings with too little fuels to carry a fire. The extent of these frequent ground fires likely varied from areas less than 10 acres in size to entire slopes covering thousands of acres depending upon the season, topography, and climatic conditions. The intensity also varied in response to vegetative conditions. Areas missed by frequent fires (moister northerly aspects) developed conditions where subsequent fires could potentially be of moderate to high intensity, resulting in patches of stand replacement/regeneration.

Overall, the frequency of these fires made them an agent of stability in these forest ecosystems. They kept the ground vegetation dominated by fire adapted grasses (such as pine grass and elk sedge) and shrubs (ceanothus, snowberry, Oregon grape), while promoting and maintaining mature forest vegetation dominated by early seral species, such as ponderosa pine, western larch and, Douglas-fir. Because of the stabilizing effect of these fires, stands tended to be maintained with early seral species and larger fire resistant trees. Succession to shade tolerant species and associated multi-strata structures only occurred in areas that escaped several fire cycles.

Cool-Moist Forests:

Cool-moist forests occur on northerly aspects and higher elevations, and in cooler, wetter draw bottoms throughout the watershed. In the absence of a major disturbance (fire) cool-moist forests will develop forest vegetation dominated by grand fir, Douglas-fir, and spruce. Ponderosa pine, western white pine, western larch, and lodgepole pine are early seral species that are dependent on disturbances to maintain suitable growing conditions.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the cool-moist forests were largely dictated by the fire patterns of the last several mixed severity fires. Fires would burn with low severity in some areas and with high severity in others, resulting in a series of patches from 20 to 200 acres in size. Therefore, the historical conditions prior to European influences in the cool-moist forest were a mix of fire tolerant early seral species (ponderosa pine, lodgepole pine, and western larch) and lesser amounts of fire intolerant species (grand fir, western white pine, and Douglas-fir).

Earlier successional stages are dominated by early seral species such as lodgepole pine, ponderosa pine, western white pine, and western larch; while later stages show increased proportions of climax species such as grand fir, Douglas-fir, or spruce (in wetter areas). In the absence of a major disturbance such as fire, cool-moist forests will develop forest vegetation dominated by grand fir. Wetter and cooler areas (such as along riparian areas and headwater areas) have increased amounts of Engelmann spruce. Western white pine was likely present in greater proportions in the past, prior to the introduction of blister rust, an exotic disease.

Where frost is frequent, lodgepole pine is the dominant species. Lodgepole pine is the primary early seral species that initially occupies a site. In stands with a longer fire-free interval, climax species such as grand fir have become established. Stands with a short fire return interval were maintained in lodgepole pine because succession was continually reset never getting past the early seral stages.

Structural Stages

The current structure of the stands in the hot-dry and warm-dry forest types are young trees primarily in the stem exclusion (SEOC) and young forest multi-strata (YFMS) stages of development (Figure 3). In the stem exclusion stage, vigorous fast growing trees compete strongly for available light and moisture to

occupy available growing space. In the young forest multi-strata stage, several tree layers are present with a mixture of tree sizes (large trees are absent or scarce) providing high density and vertical and horizontal diversity.

There is currently a lack of old forest stand structures due to historical timber harvest and fire suppression resulting in overstocked, multi-strata stands. There is a need to increase the percentage of these old forest structure types, primarily old forest single-stratum (OFSS). The OFSS stage can consist of several age classes but there is only a single, fairly distinct overstory layer of large trees. These old forests would have open, park-like conditions. Thinning stands to increase growth and to remove the understories would increase the rate of development of old forest structural stages.

The current stand structure in the cool-moist forest consists of more multi-strata stands than would have occurred naturally due to ingrowth of shade tolerant trees. A limited amount of understory removal to convert some of the multi-strata stands to single story stands and to regenerate some stands would restore the balance of structural types.

Table 8. Existing condition and HRV compared with structural stages by the three main forest types

Structural stage [1]	Historic range of variability[2] (hot-dry)	Existing condition (hot-dry)	Historic range of variability (warm-dry)	Existing condition (warm-dry)	Historic range of variability (cool-moist)	Existing condition (cool-moist)
SI	5-15%	1%	5-15%	4%	1-10%	2%
SEOC	5-20%	69%	5-20%	36%	0-5%	2%
SECC	0-5%	2%	1-10%	3%	5-25%	3%
UR	0-5%	5%	1-10%	11%	5-25%	6%
YFMS	5-10%	14%	5-25%	35%	40-60%	56%
OFSS	20-70%	0%	15-55%	1%	0-5%	0%
OFMS	5-15%	7%	5-20%	10%	10-30%	30%

[1] *SI-Stand initiation, SEOC-Stem exclusion open canopy, SECC-Stem exclusion closed canopy, UR-Understory reinitiation, YFMS-Young forest multi-strata, OFSS-Old forest single-stratum, OFMS-Old forest multi-strata (Oliver and Larson 1996, O'Hara and others 1996, modified Tatum 2006)*

[2] *The HRV percentages are based on professional judgment of the historical extent of structural stages in the Blue Mountains (Powell, 1998)*

Stand Initiation (SI). Following a stand-replacing disturbance such as wildfire or timber harvest, growing space is occupied rapidly by vegetation that either survives the disturbance or colonizes the area. Survivors literally survive the disturbance above ground, or initiate growth from their underground roots or from seeds stored on-site. Colonizers disperse seed into disturbed areas, the seed germinates, and then new seedlings establish and develop. A single canopy stratum of tree seedlings and saplings is present in this class.

Stem Exclusion (SECC or SEOC). In this stage of development, vigorous, fast-growing trees that compete strongly for available light and moisture occupy the growing space. Because trees are tall and reduce sunlight, understory plants (including smaller trees) are shaded and grow more slowly. Species that need sunlight usually die; shrubs and herbs may become dormant. In this class, establishment of new trees is precluded by a lack of sunlight (**stem exclusion closed canopy**) or of moisture (**stem exclusion open canopy**).

Understory Reinitiation (UR). As a forest develops, new age classes of trees (cohorts) establish as the overstory trees die or are thinned and no longer fully occupy growing space. Regrowth of understory vegetation then occurs, and trees begin to develop in vertical layers (canopy stratification). This class consists of a sparse to moderately dense overstory with small trees underneath.

Young Forest Multi Strata (YFMS). In this stage of forest development, three or more tree layers are present as a result of canopy differentiation or because new cohorts of trees got established. This class consists of a broken or discontinuous overstory layer with a mix of tree sizes present (large trees are absent or scarce); it provides high vertical and horizontal diversity. This class is also referred to as "multi-stratum, without large trees" (USDA Forest Service 1995).

Old Forest (OFMS). Many age classes and vegetation layers mark this structural class and it usually contains large, old trees. Decaying fallen trees may also be present that leave a discontinuous overstory canopy. On cool moist sites without recurring underburns, multi-layer stands with large trees in the uppermost stratum may be present.

Old Forest (OFSS). Many age classes but only a single fairly distinct overstory layer marks this structural class and it usually contains large, old trees. Decaying fallen trees may also be present that leave a discontinuous overstory canopy. The diagram shows a single-layer stand of ponderosa pine that evolved with high frequency, low-intensity fire

Sources/Notes: Based on Oliver and Larson (1996) and O'Hara and others (1996). Modified, Tatum 2006

Figure 3. Description of forest structural classes by developmental stage and size

Forest Insects

The western pine beetle was the primary bark beetle working in the stands dominated by larger diameter ponderosa pine. Scattered individual tree mortality created small openings in stands where pockets of understory could establish. Mountain pine beetle and pine engraver were likely present at low levels due to the overall lack of suitable habitat (i.e. dense thickets of smaller diameter trees). Current dense stands with a high proportion of sapling to pole sized ponderosa pine have increased levels of mountain pine beetle and Ips beetle activity and associated mortality. At endemic levels, these forest insects play an important role in contributing to structural diversity, and providing dead wood habitat important for wildlife. At epidemic levels, they can create conditions for a time period after death that can lead to increased disturbance intensities such as uncharacteristically severe fires.

Defoliating insects such as the spruce budworm and Douglas-fir tussock moth were historically at relatively low levels due to the lack of grand and Douglas-fir trees and lack of multi-storied stand structures. With the changes in forest composition and structure that favor these insects, there have been a number of severe outbreaks in the last several decades. From 1985-1992 a series of spruce budworm outbreaks caused widespread damage in the hot dry, warm-dry, and cool moist forest stands by reducing tree growth and increasing mortality through defoliation. In general, the suppressed tree classes of grand fir, Douglas-fir, and Engelmann spruce exhibit poor crowns, reduced growth, and mortality due to repeated defoliation. High mortality levels can contribute to higher severity fires.

Large areas of dense stands of lodgepole pine that developed following fires created conditions conducive for outbreaks of mountain pine beetles resulting in subsequent stand reinitiation of lodgepole pine and grand fir as understory trees responded to increased available light, water, and nutrients. The current and past insect related mortality has provided significant increases in snag levels and down logs, providing increased amounts of cavity nesting species habitat. While it provides wildlife habitat, insect related mortality has also greatly increased fuel loads and the potential for a high intensity stand replacement fire.

Fir engraver and Douglas-fir bark beetles are other common insects. Historically, these two insects are endemic, causing low levels of mortality. Presently fir engraver activity is increasing in the project area, and causing noticeable mortality in fir trees. Douglas-fir bark beetle activity is present in association with larger diameter, heavily mistletoe infected Douglas-fir trees. The heavy mistletoe infection stresses these trees so that they are highly susceptible to opportunistic insects such as bark beetles.

Forest Diseases

The primary root diseases in dry and moist forests are Annosus and Armillaria that result in small "centers" of mortality and associated gaps in the forest canopy. These areas provided openings for understory vegetation (grasses, shrubs and seedlings) to establish and added to structural diversity. Overall levels were generally low because of the effects of fires maintaining increased abundance of species most tolerant to diseases (ponderosa pine and western larch), and increased ability of trees to ward off infections due to lower stand densities. Frequent fires also helped keep root diseases at low levels due to the promotion of soil fungi that compete with pathogenic fungi, and through beneficial effects of fire on soil nutrients and nutrient cycling. There are several pockets of Armillaria in the Tincup and Little Boulder Creeks areas that are causing noticeable mortality.

Historically dwarf mistletoe was present in low levels throughout the dry forests of the watershed. It predisposed the occasional tree to bark beetle attack or torching by fire. Brooms created by mistletoe infections were susceptible to fire, especially brooms in the lower crown. Thus, frequent fires likely helped keep overall levels of mistletoe low due to the "fire pruning" of infected branches and through potential negative impacts of heat and smoke on developing mistletoe plants. The primary species infected by dwarf mistletoe are ponderosa pine and Douglas-fir. Levels of mistletoe infection vary in the Galena project area with moderate infections occurring in both ponderosa pine and Douglas-fir with infected overstories in some locations that are spreading the disease to susceptible understory trees.

Stem diseases such as Indian paint fungus are prevalent in the grand fir trees common in the warm-dry and cool-moist forest types in the project area. These cause losses of heartwood volume and eventual weakening and collapse of the tree. White pine blister rust is common but the rates of severe infection and mortality are relatively low compared to other white pine stands in the Northwest. Other diseases such as gall rust and atropellis canker affect lodgepole pine in the project area, resulting in stem malformation and subsequent breakage, adding to the diversity of tree forms within stands.

As with insects, forest diseases play an important role in creating structural diversity, creating a source of snags and down logs, and providing important wildlife habitat and recycling nutrients ”locked up” in trees and logs to maintain soil productivity. At severe levels, these diseases can greatly inhibit the growth of trees and old forest structure. They also provide unique wildlife habitat, such as roosting sites for grouse.

Aspen

Aspen is a unique habitat found in 28 locations within the project area and is much reduced from its historical extent. A combination of fire suppression, heavy grazing by both domestic and wild ungulates, and conifer encroachment has reduced the survival of aspen and led to a deteriorating condition of the remaining stands.

Direct and Indirect Effects by Alternative

Effects by alternative for developing a resilient and sustainable forest were measured by the percent change in structural stages in relation to the HRV and by the number of acres to be treated to reduce overstocking and to change tree species composition compared to the acres in need of treatment.

Table 9. Expected changes to percent of forest structure types in 40 years, by alternative

Structure Types	Historic Range of Variation	Existing Structure	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Hot-dry forest types						
OFSS	20-70%	0%	26%	40%	35%	41%
OFMS	5-15%	7%	72%	58%	62%	57%
Warm-dry forest types						
OFSS	15-55%	1%	5%	15%	11%	17%
OFMS	5-20%	10%	69%	58%	61%	55%
Cool-moist forest types						
OFSS	0-5%	0%	0%	3%	2%	6%
OFMS	10-30%	30%	76%	73%	75%	70%
Total Acres treated			**0**	**8,339**	**6,167**	**9,778**

Alternative 1

Under this alternative, no commercial thinning, no pre-commercial thinning, and no prescribed burning would occur. Development of old forest structure in the dry forests would be at a slow rate with the species composition remaining skewed towards late seral species. As shown in Table 9, OFSS and OFMS would increase over the next 40 years in all three forest types. Disturbances would continue at a large scale creating large areas of young trees and even longer time spans to develop old forest structures.

Disturbances could cross subwatershed boundaries causing damage to surrounding areas. The currently high proportion of Douglas-fir and true firs would increase and the majority of the structure would be OFMS. Without thinning, the effect of this alternative on forest stands would be an increase of overstocking, species composition would not shift toward HRV and trees would become increasingly susceptible to large-scale disturbance.

Under Alternative 1, no aspen treatments would occur and encroaching conifers would continue growing into aspen stands. Continued browsing from wildlife and livestock would prevent new suckers from growing into trees. Not restoring the existing aspens stands would result in a continued decline in the size and number of aspen stands.

Alternative 2

Alternative 2 includes 8,339 acres of mechanical treatment and 19,913 acres of underburning. Most treatment is planned to take place in the hot-dry and the warm-dry biophysical environments. All treatments are designed to enhance the growth of young stands into old forest structural stages and to enhance the sustainability of the forest to have enough time to grow into the old forest stages. These environments are most in need of restoration to return the forest to a more resilient and sustainable condition. The stands not treated would have the same effects as discussed for the No Action alternative.

Composition and Density

Commercial thinning in overstocked stands would enable the remaining trees to respond by increasing their crowns and roots, increasing their ability to utilize nutrients, sunlight, and water. Growth would increase and the trees would grow into old forest structural stages sooner. The increased vigor of the trees would decrease their susceptibility to disturbance from insects and disease; and lessen the likelihood and potential severity of bark beetle outbreaks and mistletoe infestation. The decreased stand density, the increase in size, and the increase in the height to the bottom of the live crown would reduce the chances of torching and the potential for uncharacteristic crown fires. The overall resiliency to natural disturbances would be increased.

Reducing stand density would encourage natural regeneration to occur in the thinned stands. Observations show that when stand densities are below 50 ft^2/acre, ponderosa pine regenerates quite readily and can form another understory. Periodic prescribed fire is recommended to maintain the understory to an acceptable level to maintain the historical conditions of low stocking and few ladder fuels. Fire would remove a large number of the new seedlings, while leaving scattered patches for wildlife cover.

A number of stands dominated by late seral species trees are planned for conversion to early seral species. This treatment would remove many of the late-seral species trees, retaining the early seral species that are there, and reforesting openings with early-seral species. This would shift the species composition closer to the historical composition. The result would range in appearance from a commercial thin to a shelterwood harvest, depending on the existing stand species composition.

Treated stands would be more adapted to the natural conditions that exist, increasing the overall resiliency to natural disturbances, and would be in suitable condition for the reintroduction of fire. Resilient stands would decrease the risk that disturbance would “reset” the stands to earlier structural stages, enabling them to continue to grow into large trees. Disturbances would be closer to the historical scale of 200 to 2,000 acres.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. This alternative would convert 556 acres of old forest multi strata for conversion to old forest single strata by removing the understory.

The increased tree growth from thinning would accelerate the development of old forest structural stages, allowing the thinned stands to grow into the large size classes sooner. In the hot-dry biophysical environment old forest single strata is projected to increase from 0% to 40% and old forest multi strata from 7% to 58% in the next 40 years. In the warm-dry biophysical environment old forest single strata is projected to increase from 1% to 15% and old forest multi strata from 10% to 58% in the next 40 years as shown in Table 9.

There is a decreased risk that large-scale disturbances such as insect defoliators or stand-replacing fires would set back structural stage development, both for the treated stands and surrounding stands. Stands would be resilient to disturbance and would be less likely to "reset" to earlier structural stages, enabling them to continue to grow into large trees. Disturbances would be closer to the historical scale of only small patches and clumps of trees being removed at any one time.

The stands planned for conversion to early seral species would be more resistant to insects and disease than the current late seral species, however, seedlings would remain susceptible to fire until they are about 30 years old. After that time they would be more resistant to fire due to thicker bark and the lack of persistent lower limbs (ladder fuels). Treated stands would grow towards the Historical Range of Variability (HRV) for stand structure sooner, moving toward HRV. The area to be treated under this alternative is large enough to effectively reduce the severity and extent of large-scale disturbance.

Resiliency and Sustainability

Approximately 42% of the area diagnosed in the silvicultural specialist report in need for mechanical treatment is proposed for tree thinning and slash treatment. Thinned ponderosa pine stands would increase in growth and vigor as stand density is reduced. The quantity and vigor of grasses and shrubs would increase due to the reduction in shade and competition for nutrients and water. Conversion to early seral species in mixed conifer stands would shift the species composition towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires. This would allow the reintroduction of fire into stands and increase their sustainability. The risk of fire is discussed in detail in the Fire and Fuels Effects section.

Insect Risk

Thinning is prescribed in many of the ponderosa pine stands. The additional light and warmth in thinned stands is inhospitable for bark beetles, providing an immediate degree of protection to the trees. As the trees respond with increased growth over the next several decades after the thinning, their increased vigor would allow them to withstand attempted beetle attacks by successfully pitching out the invading insects. As fewer attacks are successful, the population outbreaks would decrease to low levels, reducing the amount or size of pockets of mortality. The reduction in the proportion of late-seral species would reduce the extent of defoliation by spruce budworm and Douglas-fir tussock moth (Mason 1998, Powell 1994).

The host tree species for spruce budworm, tussock moth, and fir engraver would be reduced by thinning mixed conifer stands. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. The incidence of fir engraver would also be reduced as the proportion of fir is reduced, and the remaining fir trees would be healthier and less susceptible to attacks. Stands not treated would benefit from the reduction of host species in nearby stands, which would lessen the severity and size of outbreaks.

Disease Risk

Stem and root diseases would be reduced since both the thinning and the conversion to early seral species prescriptions would reduce the primary host, late seral species. The removal of late seral species during the thinning operations would reduce the amount of trees susceptible to root diseases, eventually allowing the disease to fade to a minor role in the forest. Thinning would increase height growth rates which would

allow the remaining trees to outgrow the rate of upward dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing would reduce the lateral spread of mistletoe.

The risk would remain at high levels for both insects and diseases in the leave patches (5-15% of the treated areas). This would provide habitat diversity in the pockets of mortality but may also affect nearby trees in the treated areas.

Aspen

Aspen stands would be thinned by removing conifers and fenced from livestock and wildlife browsing. There would be a beneficial impact to aspen stands by a reduction in competition for light and water, resulting in the expansion of aspen stands to approximately twice their current size while increasing the vigor of the trees.

Alternative 3

Alternative 3 includes 6,167 acres of mechanical treatment and 19,913 acres of underburning. This alternative differs from Alternative 2 by dropping the 7 units between Deerhorn Creek and Davis Creek south of the Middle Fork and those units requiring new road building for access.

Composition and Density

This alternative has effects similar to those described under Alternative 2. Forest species composition and density would move closer to the historical composition on 20% fewer acres compared to Alternative 2.

Composition and Density

Effects to forest species composition and density in Alternative 3 would be similar to those effects from Alternative 2, but would occur on approximately 20% less acres, bringing less of the project area closer to the historical composition.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. This alternative would enter 350 acres of old forest multi strata for conversion to old forest single strata by removing the understory.

The increased tree growth from thinning would cause the development of old forest structural stages to accelerate, allowing the thinned stands to grow into the large size classes sooner. As shown in Table 9, the hot-dry biophysical environment old forest single strata is projected to increase from 0% to 35% and old forest multi strata from 7% to 62% in the next 40 years. In the warm-dry biophysical environment old forest single strata is projected to increase from 1% to 11% and old forest multi strata from 10% to 61% in the next 40 years.

This alternative does not move as many stands towards old forest single strata and allows more stands to grow into old forest multi strata than Alternative 2.

Resiliency and Sustainability

Approximately 31% of the area diagnosed as being in need of mechanical treatment is proposed for tree thinning and slash treatment. About 20% fewer acres would be treated than proposed under Alternative 2. Therefore, stand density would be reduced on fewer acres and an increase in growth and vigor would occur on 20% fewer acres of thinned stands compared to Alternative 2. The quantity and vigor of grasses and shrubs would increase due to the reduction in shade and competition for nutrients and water. Conversion to early seral species in the mixed conifer stand would shift the species composition towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires. This would allow reintroduction of fire into the stand and increase its sustainability.

Insect Risk

This alternative has similar effects to those described under alternative 2, however the decreased thinning across the landscape would allow for additional areas of stands that would be susceptible to insect risk compared with Alternative 2. This alternative would also reduce the percentage of late-seral species over less area than Alternative 2 in the project area, reducing the extent of defoliation by spruce-budworm and Douglas-fir tussock moth.

Disease Risk

This alternative has similar effects to those described under Alternative 2, however the decreased thinning across the landscape would increase stem and root diseases compared to Alternative 2 since both the thinning and the conversion to early seral species prescriptions would reduce the primary host, late seral species on less acres.

Aspen

The effects would be the same as described under Alternative 2 because the same amount of fencing and conifer competition reduction is planned for this alternative.

Alternative 4

Alternative 4 includes 9,778 acres of mechanical treatment and 19,913 acres of underburning. This alternative differs from Alternative 2 because approximately 20% more acres are mechanically treated. Some of the additional units would be helicopter yarded and a road would be constructed to connect the "orphan" road system between Deerhorn and Little Butte Creeks to access units located there.

Composition and Density

This alternative has similar effects to those described under Alternative 2 but forest species composition and density would move closer to the historical composition on 20% more acres when compared to Alternative 2.

Structural Stages

There is currently a lack of old forest stand structures due to past timber harvest, fires, and other disturbances. This alternative would convert 798 acres of old forest multi strata to old forest single strata by removing the understory.

The increased tree growth from thinning would accelerate the development of old forest structural stages, allowing the thinned stands to grow into the large size classes sooner. As shown in Table 9, the hot-dry biophysical environment old forest single strata is projected to increase from 0% to 41% and old forest multi strata from 7% to 57% in the next 40 years. In the warm-dry biophysical environment old forest single strata is projected to increase from 1% to 17% and old forest multi strata from 10% to 55% in the next 40 years.

This alternative moves more stands towards old forest single strata and reduces the number of stands growing into old forest multi strata than Alternative 2.

Resiliency and Sustainability

Approximately 49% of the area diagnosed in need of mechanical treatment is proposed for tree thinning and slash treatment. About 20% more acres would be treated than proposed under Alternative 2.

Therefore, the growth and vigor would increase on about 20% more area as stand density is decreased, when compared to Alternative 2. Thinned stands would increase in growth and vigor as stand density is reduced. The quantity and vigor of grasses and shrubs would increase due to the reduction in shading and competition for nutrients and water. Conversion to early seral species in the mixed conifer stand would

shift the species composition towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires. This would allow reintroduction of fire into the stand and increase its sustainability.

Insect Risk

This alternative has similar effects to those described under alternative 2, but the increased thinning across the landscape would allow for additional areas of stands with increased vigor and reduced successful insect attacks. This alternative would also reduce the percentage of late-seral species over more acres than Alternavei 2 in the project area, reducing the extent of defoliation by spruce-budworm and Douglas-fir tussock moth.

Disease Risk

This alternative has similar effects to those described under alternative 2, but the increased thinning across the landscape would reduce Stem and root diseases since both the thinning and the conversion to early seral species prescriptions would reduce the primary host, late seral species. The removal of late seral species during the thinning operations would reduce the amount of trees susceptible to root diseases, eventually allowing the disease to fade to a minor role in the forest. Thinning would increase height growth rates which would allow the remaining trees to outgrow the rate of upward dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing would reduce the lateral spread of mistletoe.

Aspen

The effects would be the same as described under Alternative 2 because the same amount of fencing and conifer competition reduction is planned for this alternative.

Cumulative Effects

The area considered for cumulative effects is the Vinegar Creek and Little Boulder-Deerhorn Creeks Subwatersheds and the immediately adjacent subwatersheds. The effects of past and present activities, listed in Table 6, have been integrated into and described under the affected environment. The effects of planned future activities in listed in the December 31, 2010 SOPA located in the Project Record have been considered in this analysis and also include the planned fire hazard reduction projects along Highways 7 and 26 to the east.

Most of the effects of the planned activities on the forest vegetation are mainly local in nature with limited geographic scope. These effects to species composition and density and structural stages have been discussed in the previous direct and indirect effects section.

Composition, Density and Structural Stages

Past activities in the 1990’s in this subwatershed have moved some areas closer to the HRV. The planned actions in each alternative, in combination with the past actions, would create a matrix of treated stands over most of the subwatershed and across ownership boundaries. These treatments would be over a sufficient proportion of the landscape (approximately 1/3 of the project area) to effectively increase the survivability of trees during a wildfire and also to reduce the chance of insects and disease reaching an outbreak situation.

Future disturbances within treated stands are expected to be reduced in intensity and duration as a result of better growing conditions and a more resistant species mix. Disturbances in stands not treated would be smaller in geographic scope and more within historical scales as there would be less unbroken blocks of stands in unhealthy condition. By creating large areas of land with a matrix of treatments, the risk of large-scale disturbances would be reduced over the landscape.

The large, currently unbroken forest south of the Middle Fork would be treated to a sufficient extent that there would be less chance of an uncharacteristic wildfire adversely affecting the western white pine stands on the north face of Dixie Butte.

There would be no cumulative effect from continued livestock grazing, active mining claims, or the treatment of noxious weeds on forest density, structure stage, composition and the large-scale hazard of disturbance. Under Alternative 1, the cumulative effect of nearby timber harvest would not moderate the overall potential of large-scale disturbance as much as if the thinning and underburning occurred in the Galena project area. There is likely to be a beneficial cumulative effect with future timber harvest activities under any action alternatives by moving the landscape farther towards HRV.

Insect Risk

Since each of the action alternatives will increase the vigor of stands, and past and future efforts will accomplish similar goals across the landscape there will reducing risk in one area also has a beneficial cumulative effect to the surrounding areas.

Disease Risk

The planned mechanical and prescribed fire treatments reduce the risk of large-scale disturbances to forested stands. These disturbances can cross subwatershed boundaries into surrounding areas causing varying amounts of change; therefore reducing risk in one area also has a beneficial cumulative effect to the surrounding areas.

Aspen

While aspen is in decline across the landscape, this project in combination of other projects in Table 6 and in the SOPA in the project record will cumulatively benefit aspen across the forest.

Fuels

Fuels management is a process of managing the hazard in relation to the size and severity of a potential fire event. A principal goal of fuel management is to reduce fireline intensities, reduce the potential for crown fires, improve opportunities for successful fire suppression, and improve the ability of forest stands to survive wildfire (Peterson et al.).

Fire behavior is a function of fuels, weather, and topography. Of these three components affecting wildland fire behavior, only fuels can be manipulated. To manage fuels, canopy, ladder and surface fuels can be manipulated in several ways to affect their size, arrangement, density, and loading to then affect fire behavior. This section summarizes the existing fuel conditions and the effects of treating and not treating canopy fuels, ladder fuels and surface fuels.

Regulatory Framework

Malheur Forest Management Plan and the Malheur National Forest Fire Management Plan

The Malheur Forest Plan includes forest-wide fire management direction consistent with other resource goals. The goals for fire management are to: 1) initiate initial management action that provides for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, and smoke management and 2) identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction (Forest Plan IV-4).

The Malheur National Forest Fire Management Plan (FMP), (USDA 2010) is an operational guide that defines how the Fire Management Program will be implemented on the forest. The following general forest-wide standards apply to National Forest system land administered by the Malheur. In some cases standards represent a minimum or maximum permissible level of an output or activity and under some circumstances more restrictive standards may be applied, provided changes in outputs or effects on other resources do not occur. They are intended to supplement, but in some cases may take the place of, national and Regional policies, standards, and guidelines found in Forest Service manuals and handbooks and the Pacific Northwest Regional Guide.

- Utilize prescribed fire to meet land management objectives. Normally, plan human ignition sources for prescribed fire; when appropriate, utilize lightning ignition sources for prescribed fire. (Forest Plan p. IV-45, Standard 180)
- Manage residue profiles at a level that will minimize the potential of high intensity wildfires and provide for other resource objectives in individual management areas. (Forest Plan p. IV-45, Standard 181)
- Use all methods of fuel treatment as prescribed by site-specific analysis to achieve resource management objectives. Encourage utilization of wood residue as a priority treatment, consistent with long-term site productivity and wildlife habitat needs. (Forest Plan p. IV-45, Standard 183)
- Integrate residue treatment with pest management practices. (Forest Plan p. IV-45, Standard 184)

The fuels management portion states that the appropriate type and amount of fuel treatment is tiered to the Forest Plan Management Area specific Standards and Goals. Levels and methods of fuel treatment will be guided by the protection and resource objectives of each management area. Emphasis will be on ecological restoration treatments. Where appropriate, fuels treatments will allow for the utilization of wood residues.

National Fire Plan

The National Fire Plan (USDA Forest Service & USDI Bureau of Land Management 2001) provides national direction for hazardous fuel reduction, restoration, rehabilitation, monitoring, applied research, and technology transfer. The agencies are developing a common strategy for reducing fuels and restoring land health in fire-prone areas. The Forest Service prepared a document outlining strategies for protecting people and the environment by restoring and sustaining land health: Protecting People and Sustaining Resources in Fire-adapted Ecosystems – A Cohesive Strategy (USDA Forest Service 2000). The 10-Year Comprehensive Strategy reflects the views of a broad cross-section of governmental and non-government stakeholders. It outlines a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration and rehabilitation on Federal, adjacent State, tribal, private forest and range lands. The Galena project area and the prescriptions being considered are part of this comprehensive management plan.

Analysis Methods

The Integrated Forest Resource Management System (INFORMS) software program was used for project analysis. INFORMS was designed for project level analysis and provides an interface to a variety of analysis tools such as the Most Similar Neighbor (MSN), Forest Vegetation Simulator (FVS), and the Fuels and Fire Extension for FVS (FFE-FVS). Long-term projections become estimates at best; however, results do show trends and are useful for comparing crown fire potential for different alternatives. With this analysis it should be remembered that, for any one stand, the total set of attributes will describe the stand well but any one attribute cannot be depended upon to be accurate (Informs User Guide).

Existing Condition

The Blue Mountains experience hot, dry east winds several times a month during the summer and fall. These winds have low relative humidity, can quickly dry the fine fuels that carry fire, and can be strong. Valleys that run east-west and have low saddles at their crest are likely to be affected by these winds more than north-south valleys or areas with more topographic definition. Local winds are associated with differential heating of the landscape are important throughout the Blue Mountains: diurnal up-valley winds during the day and down-valley winds at night. Topographic influences interact with weather, but have direct effects on fire as well. Steep slopes are more likely to burn than flat ones, southerly aspects more than northerly, and ridgelines more than valley bottoms.

The drainages flowing from the Galena project area generally flow north/south to the Middle Fork of the John Day River which runs east to west. All aspects are represented in the project area. Slopes are generally less than 40% except in the drainages and in areas to the south, closer to Dixie Butte, and areas to the north toward Vinegar Hill. Elevation ranges from approximately 3800 feet at the west end of the project to 7000 feet where the project area borders the Vinegar Hill Scenic Area. During the normal fire season, temperatures can exceed 76 degrees and relative humidity can drop below 13% at the 90th percentile. Winds in this area are generally out of the west to southwest or terrain influenced by the Middle Fork of the John Day River. Diurnal heating and cooling winds can exceed 10 mph. Average precipitation is 13-30 inches per year, depending on elevation, mostly in the form of snow. Dry lightning storms are common during the summer months.

County Road 20 passes through the middle of the project area. County Road 20 is listed in the Grant County Community Wildfire Protection Plan as a safety corridor where the management objective is to enhance fire suppression capabilities by modifying fire behavior inside the corridor and providing a safe and effective area for fire suppression activities.

The towns of Bates and Austin as well as other private residence are just to the east of the project, along Highway 7. The town of Galena lies to the west of the project area. The Oregon Dept. of Transportation (ODOT) maintains a road maintenance facility and the Malheur NF has a seasonal work center to the

east/southeast at the junction of Highway 26 and Highway 7. Along the west edge of the project, there are several structures including a private residence and the Confederated Tribes of the Warm Springs Middle Fork of the John Day River management headquarters.

Reducing the fuel loadings and fuel continuity keeps fire confined to the ground. When fires are contained on the ground, this reduces fire intensity and reduces firebrands, all of which increase the ability to control fires. Reducing the threat of ignition from firebrands requires reducing fuels both near and at some distance from the structure. Ignitions may result from firebrands originating as far away as 1 kilometer (0.6 miles) or more (Cohen 2000). Threat from firebrands, however, becomes greater the closer the fire moves to structures.

Adjacent to the southwest portion of the project area is the Dixie Wildlife Emphasis Area. While the area is primarily in the warm-dry biophysical environment with a historically frequent fire return interval, there has not been any documented fires greater than 10 acres since aggressive fires suppression started (Dads Fuels Reduction, Walker 2008). The 6,895 acre area is un-roaded and has not received any past fuels treatments to reduce fire hazard. The combination of these factors leaves the area at risk for a high severity fire in the future. Due to topography and fuel loads, a large fire in this area is likely to move into the Galena project area via the Dixie Butte Inventoried Roadless Area (IRA). The Dixie Butte IRA is adjacent to and within the County Road 20 safety corridor and private land. The Dixie Butte IRA encompasses 12,000 acres with 5,300 within the Galena project area and overlaps portions of the Dixie Wildlife Emphasis Area. The 5,300 acres within the project area is also primarily in the warm-dry biophysical environment with a historically frequent fire return interval and has a similar history with suppression and lack of fuel treatments. Therefore, the area is at risk for a high severity fire in the future.

Fire Hazard

Fire hazard for any particular forest stand or landscape is the potential magnitude of fire behavior and effects as a function of fuel conditions (Peterson et al. 2005). Fire hazard most commonly refers to the difficulty of controlling potential wildfire. Fire behavior characteristics such as rate-of-spread, intensity, torching, crowning, spotting, fire persistence, or resistance to control are generally used to determine and describe fire hazard. As Brown et al (2003) indicated; fire severity can be considered an element of fire hazard. Fire hazard must be reduced in order to protect life and property.

Large wildfire events burn quickly across the landscape and can consume hundreds to even thousands of acres in a single day. Fires that escape initial containment usually are ignitions that occur when fuel moistures and atmospheric conditions allow for extreme fire behavior, fires are in areas of high contiguous fuel loads, fires are not quickly or easily accessible, fires are in areas that don’t allow suppression resources to safely work in close proximity to the fire or a combination of the above.

The influences of fine fuels such as litter, duff, grasses and small woody fuels (< 3 inches diameter) have the most affect on rate of spread and intensity of fires. These fuels are used in fire behavior models developed for predicting the fire behavior of the initiating fire (Rothermel 1983). Coarse woody debris (>3 inches) have little influence on spread and intensity of the initiating fire; however, they can contribute to development of large fires and high fire severity. Fire persistence, resistance-to-control, and burnout time are significantly influenced by loading, size, and decay state of large woody fuel. Torching, crowning, and spotting contribute to large fire growth and are greater where large woody fuels have accumulated under a forest canopy. Course woody debris, especially containing large decayed pieces, are a suitable fuel bed for firebrands and can hold smoldering fire for extended periods of time (Brown et al 2003). Spot fires can also be started in rot pockets of standing snags. The distance a firebrand travels is dependent of size of the firebrand, wind speed, and height above ground of the source.

Crown fires are generally considered the primary threat to life, property, and ecological and human values. A crown fire is initiated when surface fires create enough energy to preheat and combust fuels well above the surface (Agee 2002). Crown fires pose the greatest threat to fire fighter safety from

increased fire line intensities and long distance spotting. These risks force the fire fighter to an indirect suppression strategy, which increases acres burned and thus increases fire severity on the landscape.

Within the Galena project area, existing fuel conditions are a result of effective fire suppression for the past 75 to 100 years, timber harvest, and livestock grazing. Past harvest activities have changed the structure and species composition so higher levels of fire susceptible species and greater numbers of smaller trees are now present on the landscape, increasing the amount of ladder fuels and increasing the fire hazard. A lack of fire has allowed increase in understory vegetation and surface fuels, a change in species composition, and an increase in the continuity of vertical and horizontal stand structure. Fine fuels as well as course wood debris have accumulated beyond historical conditions within the project area. These increases in the type and amount of fuels within the project area have increased the fire hazard, creating conditions that can be unsafe if a wildfire were to occur within the project area.

Fire Regimes and Condition Class

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention, but including the influence of pre-settlement burning (Agee 1993). Coarse scale definitions for natural fire regimes have been developed and interpreted for fire and fuels management. The five natural fire regimes are classified based on average number of years between fires combined with the severity of the fire on the dominant overstory vegetation (Hann et al. 2003). The five regimes include:

- I – 0-35 year frequency and low to mixed severity (less than 75% of the dominant overstory vegetation replaced)
- II – 0-35 year frequency and high severity (greater than 75% of the dominant overstory vegetation replaced)
- III – 35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced)
- IV – 35-100+ year frequency and high severity (greater than 75% of the dominant overstory vegetation replaced)
- V – 200+ year frequency and high severity

Table 10. Galena fire regime summary

Fire Regime Group		Plant Association Group	Mean Fire Interval and Replacement Fire %	Percent within Project area
I	Hot-Dry	Upland Forest	15 years and 10%	25%
I	Warm-Dry	Upland Forest	22 years and 24%	31%
III	Cool-Moist	Upland Forest	59 years and 30%	27%
IV	Cool-Dry	Upland Forest	111 years and 67%	5%
IV	Cool-Wet	Upland Forest	59 years and 30%	<1%

The Fire Regimes for non-forested vegetation is dependent upon the moisture regime and whether it is upland or riparian. The Fire Regime for these areas can be I, II, III, or IV.

A study completed by Emily Heyerdahl in the Blue Mountains of Eastern Oregon, found the historical fire return interval to be approximately 12 years in similar dry forest types as the ones found in the Galena

project. Frequent lightning and pre-settlement burning contributed to these frequent fires. The frequency of wildfires changed drastically in the late 1800's. The change to low frequency fire return intervals may be due to a dramatic increase in sheep and cattle grazing during the 1870's and 1880's, which significantly reduced the fine fuels (Heyerdahl and Agee, 1996). Other factors that reduced the overall frequency of wildfire on the landscape are fire suppression improvements and increased access as more roads were constructed.

A separate study was completed by Diana Olson in 2000 to assess fire history and return intervals within riparian habitats. Using the same fire history data from Heyerdahl's study along with sample plots within riparian areas, Diana found similar fire return intervals within the riparian areas as that found in the upland forested areas (Olson, 2000). These frequent fires burned with low severity. She concluded that keeping fire out of the riparian ecosystem will continue to alter structure and vegetation composition.

Fire regimes have been identified for all plant associations occurring across the Blue Mountains. In addition, fire frequency with the percent of any fire that may be mixed severity or stand replacing has been identified for all plant associations in the Blue Mountains. Within the project area, approximately 31% has been identified as plant associations within the warm-dry plant association groups and in Fire Regime 1 with an average fire return interval of 22 years and up to 24% of any fire potentially being stand replacing fire. Approximately 25% has been identified as plant associations within the hot dry plant association group and in Fire Regime 1, with an average fire return interval of 15 years and 10% of any fire potentially being stand replacing fire. This information is displayed above in Table 10. See the vegetation management section for more information on the Plant Association Groups.

A fire regime condition class (FRCC) is a classification of the amount of departure from the natural regime (Hann and Bunnell 2001). Coarse-scale FRCC classes have been defined and mapped by Hardy et al. (2001) and Schmidt et al. (2001). They include three condition classes for each fire regime. The classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure results in changes to one or more of the following ecological components:

- Vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern)
- Fuel composition, fire frequency, severity, and pattern
- Other associated disturbances (e.g. insect and disease mortality, grazing, and drought)

All wildland vegetation and fuel conditions or wildland fire situations fit within one of the three classes. The three classes are based on low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the natural regime (Hann and Bunnell 2001, Hardy et al. 2001, Schmidt et al. 2002). Low departure is considered to be within the natural (historical) range of variability, while moderate and high departures are outside (Hann et al. 2003).

A fire under current conditions would not burn as a low severity surface fire. Fires would be mixed severity to stand replacing with detrimental effects to other resources that did not likely occur historically.

Another ecological component that has changed and is contributing to the departure from the natural fire regime includes the vegetation condition. Tree densities are much higher in untreated stands and species composition has shifted to have a higher proportion of shade tolerant, fire susceptible trees. Insects and disease are also contributing to tree mortality in the area that will eventually contribute to surface fuel loading as trees fall to the ground.

The Forest FRCC coverage indicates that approximately 38% of the project is in Fire Regime 1 and a Condition Class 3 and 15% is Fire Regime 1 and a Condition Class 2.

Fuel Loadings

Table 11. Galena project area existing fuel model summary

Fuel Model	Acres	Percentage of Area	Average Flame Length
2	7772	21%	6
5	357	<1%	8
8	22553	61%	2
9	4679	12.5%	3
10	1159	3%	7
Percentages do not equal 100% because of non-forest and non-vegetated area			

Fuel models (FM), are used to help describe and quantify surface fuel situations and estimate fire behavior. Criteria for choosing a fuel model involve assessing the fuel strata that will support the fire as it spreads and generates heat intensity. Where fuel beds are fairly continuous with similar fuel characteristics, one model can provide a realistic representation of expected fire behavior. A brief description of the FM characteristics that are located in the project area and their representation follows:

- FM 2 includes open shrub lands and ponderosa pine stands. Grasslands being encroached by conifers, as well as light understory development is typical. These stands may include clumps of fuels or small concentrations of dead down material that could generate higher intensity fire and may produce firebrands. Fire spread is primarily through the fine curing grass, dead herbaceous fuels, and litter. Grazing can reduce grasses, decreasing the potential fire spread where grass is the primary carrier.
- FM5 represents short shrubs or young green stands with no dead wood. Fire is generally carried in the surface fuels that are made up of litter cast by shrubs and the grasses and forbs. Fires are usually not intense because of light fuel loads and the foliage contains little volatile material.
- FM 8 represents a closed canopy of short-needle conifers with a compact surface-fuel litter layer. Representative vegetation types are mixed conifers of lodgepole, Douglas fir, subalpine fir, white fir, and larch. The surface-fuel layer is mainly needles and occasional twigs with very little undergrowth. Fires are typically slow burning with low flame lengths. An occasional heavy fuel concentration may cause a flare up, but the chance of any erratic fire behavior is small. Only under severe weather conditions with high temperatures, extremely low relative humidity, and high wind speeds does this fuel bed pose a high fire hazard.
- FM 9 areas have mature stands with small amounts of understory development. Fires spread through surface litter that has accumulated under more dense stands of ponderosa pine. Concentrations of dead-down woody material will contribute to possible torching of overstory trees.
- FM 10 represents an area in which there is a moderate loading of larger size fuel at the surface layer. In this model, fires burn in the surface and ground fuels with greater fire intensity than the other fuel models. The fuel bed contains a moderate loading of large size fuels from insect/disease, wind damage, or natural mortality. High heat intensity, torching, spotting, and crowning may be expected during wildfire events; resistance to control is high.

Surface fuels vary widely across the project area. Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest (GTR-PNW-105) give a useful representation of fuel

loads and was used to correlate fuel loads with representative fuel models within the project. A majority of the project area has acceptable surface fuel loads currently due to past management, however future fuel loads will continue to build and increase the risk for crown fire.

Most stands (82%) have light surface fuel loads of approximately 2-8 tons per acre. Fuel models 2 and 8 are best to model fire behavior in these areas depending on whether grass or woody debris is the carrier of fire.

The moderate concentrations of surface fuels found in some stands (13%), is from insect and disease induced mortality and past harvest activities. Fuel loads in these stands are approximately 8-15 tons per acre.

Areas with heavy fuel loads (3%) most accurately predict fire behavior by using fuel models 10 or 11. Fuel loads in these stands can be as high as 30 tons per acre.

Duff levels over much of the project area range from .25” to 1” in depth. The exception is directly under the larger ponderosa pine trees. Bark from ponderosa pine constantly flakes off and accumulates within the first few feet of the bole of the tree. With the exclusion of fire over the past century these bark flakes have reached depths of up to 12” under much of the larger ponderosa pine. When these duff mounds burn completely, under low moisture conditions, high stress can be placed on the tree.

Table 12. Existing fuel loadings and percent of area

Size Class	Loading for Areas With Light Fuel Loads (82%) (Approximate)	Loading for Areas With Moderate Fuel Loads (13%) (Approximate)	Loading for Areas With Heavy Fuel Loads (3%) (Approximate)
0”- 0.25”	0.03 Tons per Acre	0.1 Tons per Acre	0.4 Tons per Acre
0.26” – 1”	0.9 Tons per Acre	1.6 Tons per Acre	2.5 Tons per Acre
1.1” – 3”	2.0 Tons per Acre	4.2 Tons per Acre	6.9 Tons per Acre
3” +	3.5 Tons per Acre	9.7 Tons per Acre	20.1 Tons per Acre
Total	6.43 Tons per Acre	15.6 Tons per Acre	29.54 Tons per Acre

Bark beetle populations in the project area are as high as they are throughout the Blue Mountains. Trees stressed from overstocking and drought-like conditions are susceptible to attack. The pockets of mortality are contributing to increased fuel levels in the project area.

Crown Fire Potential

Crown fires are generally considered the primary threat to life, property, ecological, and human values. Crown fires occurs when surface fires create enough energy to preheat and combust fuels well above the surface (Agee, 2002). Crown fires are typically faster moving than surface fires, more difficult to suppress, and pose the greatest threat to fire fighter safety from increased fire line intensities and long distance spotting. These risks force an indirect suppression strategy, which increases acres burned and thus increases fire severity on the landscape resulting in more tree mortality and smoke production.

Crown fires are generally classified two ways:

- Passive crown fire occurs when single trees or small groups of trees torch. After the trees torch the fire returns to the surface
- Active crown fire occurs when the fire moves through the crowns of adjacent tightly spaced trees until it reaches a more open stand or there are changes in topography or winds.

Both types of crown fire are dependent on the surface and ladder fuels for their initiation. The continuity and density of tree canopies in combination with wind and physical setting provide conditions required for rapidly moving crown fire. Canopy base height, canopy bulk density, and canopy continuity are key characteristics of forest structure that affect the initiation and propagation of crown fire. Reducing canopy bulk density by thinning is a means to minimize crown fire hazard. As surface fire intensity increases, or canopy base height decreases, it takes less wind to cause a surface fire to become a crown fire. As a stand becomes dense, active crowning occurs at lower wind speeds and the stand is more vulnerable to crown fire (Reinhardt, et al, 2003).

Through past harvest activities and the effects of fire exclusion, stand structure over much of the project area has moved from primarily single storied stands with large trees to overstocked stands with multiple stories of mid-size and small trees. Higher proportions of less fire dependent tree species are occurring such as white fir and Douglas fir. These species exhibit very dense crowns and grow in tighter spacing than the more fire dependent ponderosa pine and western larch. Canopy base height is low enough and canopy bulk density is high enough in many forested stands that with current surface fuel conditions, there is potential for passive crown fire on 8% of the area and active crown fire on approximately 6% of the area. Much of the larger ponderosa pine and western larch in the project area have smaller grand fir and Douglas fir growing as ladder fuels underneath. Stands that received stand conversion to seral species treatments in the past are now susceptible to crown fire from overstocking of planted or naturally regenerated trees. Many stands in the northern half of the project area are in a condition that through past thinning and underburning can now be maintained with prescribed fire.

Table 13. Existing condition crown fire potential

Crown Fire Initiation Potential	Percentage of Project Area
Extreme	<1%
Very-High	5%
High	8%
Medium	80%
Low	3%
Percentages do not equal 100% because of non-forest and non-vegetated areas	

Direct and Indirect Effects by Alternative

Alternative 1

This alternative does not reduce or increase fuels by commercial harvest, pre-commercial thinning, mechanical surface fuel treatment, or prescribed fire. The effect of no action would be more difficult and less successful protection of life and property because of increased potential for uncharacteristic crown fire behavior. Fire severity with detrimental effects to vegetation and soils would be high.

Fire Hazard

The effect of no action would be to see increased potential for uncharacteristic crown fire behavior. With increases in ladder fuels from the high stocking levels in the understory, low canopy base height, and high canopy bulk density, the expected fire behavior for much of the project area is not of low severity surface fires, as it was historically, but has the potential for high severity effects to the vegetation and soils.

Fire Regime Condition Class

As stated earlier, Fire Regime I represents the dry upland forest such as the ponderosa pine and the Douglas-fir plant associations or the warm-dry plant association group (PAG) and comprises approximately 56% of the project area. A fire under Alternative 1 would not burn as a low severity surface fire. Fires would be mixed severity to stand replacing with detrimental effects to other resources that did not historically occur.

The vegetation condition is another ecological component that would continue to contribute to the departure from the natural fire regime. Tree densities would continue to increase and species would continue the shift to having higher proportions of shade tolerant, fire susceptible fir. Stand conditions would increase susceptibility to insect and disease effects at levels that are highly departed from the natural fire regime. The fire regime condition class for the project area would continue to depart further from the natural fire regime.

Fuel Loadings

Surface fuels including downed-woody material, needle litter, and duff accumulation would increase from current levels, contributing to the potential for stand replacing fire.

Table 14. Change in fuel model from existing condition over 40 years

Fuel Model	Acres	Percent of Forested Area (Existing Condition)	Percent of Forested Area (40 Years)	Percent Change
2	3,061	21%	8%	-13%
3	1,957	5%	5%	0%
5	177	<1%	<1%	0%
8	5,810	61%	16%	-45%
9	3,465	12.5%	9%	-3.5%
10	22,621	3%	61%	+58%
12	1,376	0%	3%	+3%

The representation of fuel models across the project area changes over time as does the fuel loading of each fuel model. It can be expected that a 58% increase in fuel model 10. There is a 3% increase in fuel model 12 that was not represented in the existing condition as displayed in Table 14. The increases in these fuel models mean more area with larger size down woody material comprising the surface fuels. This indicates fires would burn with higher intensities and crowning and spotting would occur. The severity on the landscape would increase resulting in high levels of mortality.

In 40 years, the total area having a heavy fuel load will increase. These departures from the existing condition and from the desired condition to fuel models with heavier fuel loadings indicate that high heat intensity, torching, spotting, and crowning may be expected during wildfire events and resistance to control would be high. This makes protection of life and property more difficult and chances for successful suppression less.

Ladder and Crown Fuels

The continuity and density of tree canopies would provide conditions that enable rapidly moving crown fire. Overstocked stands would continue to slow in growth. Stand density would increase and tree vigor would decrease. The overall resiliency to withstand natural disturbances would continue to decrease. Late seral species would continue to increase in mixed species stands causing increases in horizontal and vertical fuel loading.

Crown Fire Potential

This area historically had rather short fire free periods that prevented high fuel loads to accumulate and limited the layers within the stand. In 40 years there will be a 43% increase in area with high to extreme crown fire initiation potential (Table 15). Overall, there are at least 56% (Table 16) of the forested stands within the project area that have higher potential for crown fire than would have occurred under conditions characteristic of Fire Regime I. The amount of active and passive crown fire increases and the amount of surface fire decreases across the project area. If no action is taken, the project area would increase in the potential for stand replacing fire rather than the low-intensity-and-severity fires that historically occurred.

Table 15. Crown fire potential in 40 years with no treatments

Crown Fire Potential	Existing Crown Fire Potential - % of the project area	Crown Fire Potential in 40 years - % of project area	Percent Change from Existing Condition
Extreme	<1%	12%	+12%
Very-High	5%	23%	+18%
High	8%	21%	+13%
Medium	80%	37%	-43%
Low	3%	6%	+3%

Table 16. Fire type in 40 years with no treatments

Fire Type	Existing Fire Type - % of the project area	Fire Type with No Treatments in 40 years - % of project area	Percent Change from Existing Condition
Active Crown Fire	6%	35%	+29%
Passive Crown Fire	8%	21%	+13%
Surface Fire	83%	43%	-40%

Alternative 2

Treatments are mainly planned within the hot-dry and warm-dry plant association groups. These areas are most in need of restoration to return the forest to a more resilient and sustainable condition. The overall effect of this action would be a reduction of canopy, ladder, and surface fuels which contribute to the success of suppression and protection under most fire scenarios. Stands not receiving treatment would have effects similar to those discussed under the No Action Alternative. Crown or canopy fuels and ladder fuels would be treated by commercial harvest treatments and precommercial thinning. Surface

fuels would be treated by hand or mechanical piling followed by burning of the piles, removal of slash for utilization (biomass) and/or underburning. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity.

Non-commercial falling of small diameter trees would also reduce ladder fuels and the continuity of the tree crowns. This is proposed within areas treated commercially and in areas where there is little commercial material but there is still a need to remove the smaller trees.

Of the 37,200 acre project area, this alternative reduces the horizontal and vertical fuel continuity by mechanically treating 8,339 acres and utilizing prescribed fire on up to approximately 19,913 acres within the project acres perimeter. As a result of the treatments proposed under Alternative 2, there would be a decrease (approximately11% of the subwatershed) of the area with a high to extreme potential for crown fire.

Fire Hazard

An overall effect of the proposed action would be a reduction of canopy fuels, ladder fuels, and surface fuels which would contribute to successful fire suppression and protection of life and property under most fire scenarios. Mechanical fuel treatments that reduce ladder and canopy fuels would have a direct effect on canopy base height and crown bulk density. The continuity of the fuels within the project area is broken up especially along boundaries with private lands.

Fire Regime Condition Class (FRCC)

Treatments will change vegetation characteristics including stand density, species composition, and structural stage. Treatments will also change fuel composition and potential fire severity, components relating to change from reference conditions. After completion of all mechanical treatment and prescribed burning within the project area, these stands will begin moving towards a Condition Class 1. Maintenance burning in these stands will further move them towards Condition Class 1.

Untreated Fire Regime I stands (low severity/high frequency burning stands) will remain in the existing FRCC and most will depart further from the reference conditions, moving them further toward FRCC 3.

The increased tree growth from thinning would cause the development of old forest structural stages to accelerate, allowing the thinned stands to grow into the large size classes. As stand structure approaches the historical range of variability and with continued maintenance burning to sustain low fuel levels, the FRCC percentage number will decrease (moving into FRCC 1) as the ecological departures decrease.

Fuel Loading

Surface Fuels

There is a short-term increase in fire hazard following treatment and prior to slash disposal when fuels remain in the units and on the ground. Existing surface fuels and created slash would be treated by one or a combination of methods. Yarding tops to landings for utilization as biomass or disposal by burning is one method. Pile burning would occur during the first burning window after piling is complete. Another method proposed is removal of the slash for utilization where feasible. Other treatments include handpiling and burning, grapple piling and burning, and application of understory prescribed fire (within approximately 1-2 years following thinning). These treatments reduce the surface fuel load. All units include treatments to reduce the surface fuels to mitigate the possible increase in surface wind movement and drier fuels. A prescribed burning program into the future will be needed to maintain the desired fuel levels and limit regeneration from becoming a ladder fuel as well as increasing stand density.

Van Wagtendonk (1996) found in fire simulations that a reduction in fuel loads decreased subsequent fire behavior, increased fireline control possibilities and decreased fire suppression costs. Efficient fireline

construction rates are also enhanced where fuel reduction has occurred, which decreases resistance to control (Agee et al 2000). Increased fireline control leads to enhanced firefighter safety.

The beneficial effects of prescribed fire on altering fuel structure and wildfire behavior and effects have long been observed and reported. Prescribed fire is a useful tool to alter potential fire behavior by influencing multiple fuel bed characteristics, including:

Reducing loading of fine fuels, duff, large woody fuels, rotten material, shrubs, and other live surface fuels, which together with compactness and continuity change the fuel energy stored on the site and potential spread rate and intensity.

Reducing the horizontal fuel continuity (shrub, low vegetation, woody fuel strata), which disrupts growth of surface fires, limits the buildup of intensity, and reduces spot fire ignition probability.

Increasing compactness of surface fuel components, which retards combustion rates (Graham et al. 2004).

In 40 years following the proposed treatments, nearly 15% more area will be classified as having a low fuel load compared to no action. Surface fuel conditions will further improve if follow up maintenance burning is implemented at least one more time in the next 40 years. Surface fuels will become dominated with grasses (fuel model 2) in treated stands. The rate at which a fire moves through these stands will be higher than stands with a greater component of larger woody fuels and denser tree stocking. Wind will be less restricted and fine fuels such as cured grasses burn more readily. While increased surface-fire intensity (flame-length) under extreme fire-weather conditions is not desirable, the combination of modified surface, ladder, and canopy fuels still suggests improved firefighting capability even under difficult weather circumstances, and also reduced fire severity (resource impacts). These expected outcomes are the result of less crown-fire potential and thus lower overall intensity and lower severity to soils. Ongoing and past grazing in the project area can also effect fire intensity and rate of spread as flame lengths will be less in areas where grazing has reduced the grass loading.

Ladder and Crown Fuels

Mechanical thinning can be effective in reducing vertical fuel continuity that contributes to the initiation of crown fires, especially when the thinning emphasizes the smaller trees. The net effect of removing ladder fuels is that surface fire burning through treated stands are less likely to ignite the overstory canopy fuels (Graham et al. 2004). Thinning is potentially effective at reducing the probability of crown-fire spread, and is precise in that specific trees are targeted and removed from the fuels bed. Commercial and pre-commercial cutting would be accomplished by thinning from below so the smaller diameter trees would be cut and the larger trees retained. This would reduce canopy fuels, ladder fuels, and continuity of the tree crowns.

The overall reduction in surface, ladder, and crown fuels in addition to reducing the fuel continuity reduces crown fire potential and improves firefighter's ability to control a wildfire. Commercial and pre-commercial treatments in overstocked stands reduces the ladder fuels, increases the average distance between the ground and the crown of the trees, increases the distance between the crowns of the trees, and decreases the continuity of the overstory.

Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to mortality from insects and disease. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. See the vegetation section for additional effects on composition and density, and structural stages.

Reducing the fuel loadings, fuel continuity, and the availability of ladder fuels keeps fire confined as a surface fire and reduces the occurrence of firebrands, which increases the ability to control fires. Proposed

treatments reduce the likelihood of firebrands being lofted from fires onto private land and structures. This improves the ability to protect life and property.

Crown Fire Potential

Commercial and pre-commercial thinning overstocked stands would reduce ladder fuels, increase the average distance between the ground and the crown of the trees, and increase the distance between the crowns of the trees. Created slash and existing surface fuels would be treated by one of or a combination of the following: yarding tops attached, handpiling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments reduce the surface fuel load. Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to disturbance from insects and disease. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased.

As a result of the treatments in Alternative 2, there is a decrease of approximately 11% of the subwatershed with at least a high potential for crown fire (Table 17).

A maintenance burning program is needed in the future to limit regeneration and maintain low levels of surface fuels. The modeling for this project applied prescribed burning once and doesn't include any future maintenance burning over the next 40 years. By implementing a maintenance burning program the crown fire potential would be kept similar to that directly after completion of the treatments in the proposed action as regeneration would be kept at low levels, not creating ladder fuels and the surface fuels would be kept at low levels.

Table 17. Crown fire initiation potential 40 years after proposed action

Crown Fire Initiation Potential	Percentage of Project Area	Percentage of Project Area After Treatments	Percentage change Compared to No Action Alternative
Extreme	12%	11%	-1%
Very-High	23%	19%	-4%
High	21%	15%	-6%
Medium	37%	35%	-2%
Low	6%	18%	+12%

Table 18. Fire type in 40 years after proposed action

Fire Type	Fire Type with No Treatments in 40 Years - Percentage of Project Area	Fire Type 40 after proposed action Years - Percentage of Project Area	Percent Change from Existing Condition
Active Crown Fire	35%	30%	-5%
Passive Crown Fire	21%	15%	-6%
Surface Fire	43%	53%	+10%

The stands proposed for treatment, stands currently with a low crown fire potential, non-forested and non-vegetated stands all contribute on the landscape to breaking up fuel continuity. When all these stands are considered, the pattern on the landscape will modify fire behavior and reduce fire growth, allowing for protection of life and property.

Alternative 3

This alternative reduces the horizontal and vertical fuel continuity by mechanically treating 6,167 acres and utilizing prescribed fire on up to approximately 24,070 acres. When compared to Alternative 2, Alternative 3 commercially treats approximately 2,172 fewer acres of overstocked timber stands. This alternative also pre-commercially thins 670 more acres than Alternative 2 because of units deleted from commercial thinning for other resource issues but would have pre-commercial thinning and fuels treatment prior to underburning.

Compared to the No Action alternative, Alternative 3 has a 7% decrease in crown fire potential. Treatments under Alternative 3 would have a 4-5% increase in area with at least a high to extreme crown fire initiation potential compared to the treatments under Alternative 2 (Table 19).

The beneficial effects of prescribed fire and mechanical treatment are the same as discussed under Alternative 2. Stands that are not treated would be subject to the same effects as discussed for the No Action Alternative.

Fire Hazard

An overall effect of the proposed action would be a reduction of canopy fuels, ladder fuels, and surface fuels which would contribute to successful fire suppression and protection of life and property under most fire scenarios. Mechanical fuel treatments that reduce ladder and canopy fuels would have a direct effect on canopy base height and crown bulk density. The continuity of the fuels within the project area is broken up especially along boundaries with private lands.

Fire Regimes and Condition Classes

The acres treated are less than when compared to Alternative 2, but the treatments will change vegetation characteristics including stand density, species composition, stand structural stages and will change fuel composition and potential fire severity, components relating to change from reference conditions. After completion of all treatments, these stands will be moving to a Condition Class 1. Maintenance burning in these stands will be needed to maintain them in Condition Class 1.

Mechanical treatment of stands not followed by prescribed burning will improve the stand Condition Class but stands wouldn’t be considered to be FRCC1 until prescribed fire is applied. Untreated stands will remain in their existing FRCC and most will depart further from the reference conditions resulting in changes from FRCC 2 to FRCC 3.

At the landscape scale, the project area moves closer to the reference condition. There is less of a move closer to the reference condition compared to Alternative 2 because fewer acres are being treated.

Fuels Loading

The prescribed burning design would be the same as discussed in Alternative 2. The effect of treatments to reduce surface fuels, prescribed fire, and piling and burning are the same as discussed in Alternative 2, but with fewer acres.

Prescribed burning that occurs within the acres not being thinned under Alternative 3 may result in higher mortality than if they had been thinned as under Alternative 2. The mortality would still be within the acceptable range as burning would occur under prescribed conditions that would meet these ranges.

Crown Fire Potential

Commercial and pre-commercial thinning in overstocked stands proposed with this alternative reduce the ladder fuels, increase the average distance between the ground and the crowns of the trees, and increase the distance between the crowns. Created slash and existing surface fuels would be treated by one of or a combination of the following: yarding tops attached, hand piling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments would reduce the surface fuel load. Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to disturbance from insects and disease. Observations by Cram (2006); show that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. See the vegetation section for additional effects on composition and density, and structural stages.

Within stands that are treated, canopy base height is changed. In these units, the crown base height would be maintained at sufficient height from frequent fires that only occasional torching may occur. Treating these stands also decreases crown bulk densities. The resultant crown bulk densities would be sufficiently low that even if surface flame length were high enough to reach the crown, fire wouldn't spread in a stand replacing type of crown fire.

Table 19. Alternative 3 – crown fire potential in 40 years after treatment

Crown Fire Initiation Potential	Percentage of Project Area	Percentage of Project Area After Treatments	Percentage change Compared to No Action Alternative
Extreme	12%	11%	-1%
Very-High	23%	21%	-2%
High	21%	17%	-4%
Medium	37%	36%	-1%
Low	6%	13%	+7%

Over the next 40 years, periodic burning would be needed to maintain lower levels of surface fuels and limit regeneration. The effects on stands that are not mechanically treated or burned would be similar to those discussed under the No Action Alternative and would result in an increase in the areas of high and extreme crown fire potential.

Alternative 4

This alternative reduces the horizontal and vertical fuel continuity by mechanically treating 9,778 acres and utilizing prescribed fire on approximately 19,913 acres. This alternative treats the most number of stands identified as needing treatment to meet the desired condition of the action alternatives. When compared to Alternative 2, Alternative 4 treats approximately 1,439 more acres of overstocked forested stands. When compared to Alternative 3, this alternative treats approximately 3,611 more acres.

Treatments under Alternative 4 would have a 12% decrease in area with at least a high crown fire initiation potential compared to the No Action Alternative and is 1% more when compared to Alternative 2 (Table 20) after 40 years.

Commercial and pre-commercial thinning would reduce ladder fuels and open the canopy to increase the distance between tree crowns. The beneficial effects of prescribed fire are the same as discussed in Alternative 2. Alternative 4 thins more acres mechanically prior to burning. The changes in stand densities will help meet the acceptable tree mortality ranges.

Fire Hazard

An overall effect of the proposed action would be a reduction of canopy fuels, ladder fuels, and surface fuels which would contribute to successful fire suppression and protection of life and property under most fire scenarios. Mechanical fuel treatments that reduce ladder and canopy fuels would have a direct effect on canopy base height and crown bulk density. The continuity of the fuels within the project area is broken up especially along boundaries with private lands. This would result in a reduction in the large scale fire hazard within the project area.

Fire Regimes and Condition Classes (FRCC)

More acres are treated in this alternative when compared to Alternative 2, and the treatments will change vegetation characteristics including stand density, species composition, stand structural stages and will change fuel composition and potential fire severity with the same effects but at a larger scale. After completion of all treatments, these stands will move closer to a Condition Class 1. Maintenance burning in these stands will be needed to maintain them in Condition Class 1.

Mechanical treatment of stands not followed by prescribed burning will improve the stand Condition Class, but stands wouldn't be considered to be FRCC 1 until prescribed fire is applied. Untreated stands will remain in the existing FRCC and most will depart further from the reference conditions resulting in changes from FRCC 2 to FRCC 3.

At the landscape scale, the project area moves closer to the HRV. There will be more of a move to the reference condition compared to Alternative 2 because additional stands will have prescribed fire after mechanical treatment.

Fuel Loadings

With Alternative 4, stands identified for commercial and pre-commercial thinning, canopy fuels are reduced under this alternative. In addition, thinned stands are expected to respond to the thinning as the stands would be in a condition where stand basal areas are reduced. Because of the lower tree density over more of the prescribed burn area, when compared to Alternatives 2 and 3, burning could occur under dryer conditions. If burning occurs under dryer conditions, acceptable mortality ranges, and surface fuel loadings would be reduced at a higher rate with the first entry. It is likely to take fewer underburn entries to reduce the surface loading as fuels with lower moisture content will consume more completely.

This alternative does the most to meet the desired condition by thinning the most stands to the desired density. The stands not treated would have the same effects as discussed under the No Action Alternative.

The effect of treatments to reduce surface fuels, are the same as discussed in Alternative 2, except on more acres. Approximately 1,437 acres more than Alternative 2 and 3,611 acres more than Alternative 3 are proposed to be commercial and pre-commercial thinned prior to burning. Some 1,339 acres more of piling (hand or grapple) and pile burning are proposed compared to Alternative 2 and approximately 3,406 acres as compared to Alternative 3. Biomass acres remain the same to Alternative 2 (2,061 acres) but 800 acres more than Alternative 3.

Crown Fire Potential

Commercial and pre-commercial thinning in overstocked stands proposed with this alternative reduce the ladder fuels, increase the average distance between the ground and the crowns of the trees, and increase the distance between the crowns. Created slash and existing surface fuels would be treated by one of or a

combination of the following: yarding tops attached, hand piling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments would reduce the surface fuel loads. Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to disturbance from insects and disease. Observations by Cram (2006); show that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased.

Within stands that are treated, canopy base height is changed. In these units, the crown base height would be maintained at sufficient height from frequent fires that only occasional torching may occur. Treating these stands also decreases crown bulk densities. The resultant crown bulk densities would be sufficiently low that even if surface flame length were high enough to reach the crown, fire wouldn't spread in a stand replacing type of crown fire.

Table 20. Alternative 4 – crown fire potential 40 years after treatment

Crown Fire Initiation Potential	Percentage of Project Area After No Action Alternative	Percentage of Project Area After Treatments	Percentage change Compared to No Action Alternative
Extreme	12%	10%	-2%
Very-High	23%	19%	-4%
High	21%	15%	-6%
Medium	37%	35%	-2%
Low	6%	20%	+14%

Over the next 40 years, periodic fire would maintain lower levels of surface fuels and limit regeneration. Stands that are not mechanically treated would have effects similar to those described under the No Action Alternative. Stands that are not treated would increase the areas of high and extreme crown fire potential. Removing the understory will facilitate the reintroduction of fire into these stands resulting in a slight shift towards historical conditions.

Cumulative Effects

The following cumulative effects discussion focuses on those past, ongoing, and foreseeable activities that may contribute effects to fire or fuels. The area considered for cumulative effects is the Galena project area and adjacent subwatersheds. The time period considered for cumulative effects begins approximately 100 years ago when active forest management, domestic livestock grazing and fire suppression started occurring extensively in the area and continues into the future following the initial operations planned with this project.

Past actions including fire suppression, timber harvest, and grazing have contributed to the current conditions of fuels and the departure from the natural disturbance. These actions have resulted in increases in understory vegetation and surface fuels, changes in species composition and vegetative continuity. The past road construction enabled fire suppression personnel to more easily access fire starts and contributed to successful fire suppression. Approximately 6,000 acres of mechanical harvest have occurred in the past that have converted some stands to more fire resistant tree species but are in the early seral stage and currently overstocked and at risk to high mortality from fire. Almost 6,000 acres of past underburning and broadcast burning has reduced some of the surface fuels and ladder fuels. Fire

suppression would continue as an ongoing activity but would get increasingly more difficult as fuels increase.

Any future prescribed burning would not likely occur under Alternative 1, as heavy fuel loadings would make it difficult to control. The present and ongoing actions described in Table 6 are considered in the incremental impact of the actions proposed under each alternative when added to other past, present, and reasonably foreseeable future actions.

Fire Hazard

The planned mechanical and prescribed fire treatments in each action alternative would reduce the risk of large-scale disturbances to forested stands in each alternative proportionately to the acres being treated. A maintenance burning program would be needed when desired fuel loadings were met to maintain those fuel loadings to support future acceptable fuel loadings and reduced crown fire potential. Disturbances within treated stands are expected to reduce in intensity and duration, as a result of reduced surface, ladder, and canopy fuels. Foreseeable future actions in adjacent areas are anticipated to reduce the potential for crown fires and increase the overall resiliency of the forest, especially those activities planned in nearby subwatersheds. The amount of treatment by alternative would leave a relative proportion of forested stands at risk to large scale disturbances, decreasing by a relative amount by alternative the risk to forested areas outside the project area.

The fire hazard in adjacent areas would be less relative to large-scale disturbances and would have a lesser affect to adjacent subwatersheds since it proposes the most mechanical treated acres in Alternative 4.

Fire Regimes and Condition Class

The cumulative effects on fuel for each action alternative were analyzed together since each action alternative will change vegetation characteristics similarly, but at relative scales. After completion of all treatments within the project area, these stands will move closer to a condition class 1. Activities that occurred in the past have created the current condition and future management activities will continue to manage fuels in an effort to move the forest closer to a condition class 1. Stands not treated in adjacent watersheds will remain in the existing FRCC and most will depart further from the reference conditions. However, these treatments across the landscape will reduce fuel continuity and improve the condition class, even if at a marginal pace.

Fuel Loadings

The cumulative effects on fuel loading for each action alternative will affect surface and ladder fuels similarly, but at scales relative to the amount of treatment occurring. Activities that occurred in the past have created the current fuel loads and future management activities will continue to reduce and manage fuel loads across the landscape

Past grazing reduced fine fuels likely decreasing a fire’s rate of spread, flame length, and potential size. Ongoing grazing can also reduce the fine fuels. Fire in an area that has been grazed may have decreased rates of spread and decreased flame lengths.

Personal use firewood would have an incidental increase in surface fuels which will not affect overall potential fire hazard.

Crown Fire Potential

Commercial and pre-commercial thinning in overstocked stands proposed with each alternative will reduce the ladder fuels, increase the average distance between the ground and the crowns of the trees, and increase the distance between the crowns. Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to disturbance from insects

and disease. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. Planned future projects will continue to apply similar treatments to manage fuel loads and reduce crown fire potential. Other projects occurring in the area will reduce contiguous surface, ladder and crown fuels, decreasing the potential for a crown fire to move outside of the project area, or for a crown fire to move within the project area. The matrix of treated stands across the adjacent subwatersheds will provide for additional support making potential future fires less difficult to suppress. This can provide for additional fire fighter safety from reduce fire line intensities and reduced distance spotting.

Any other future actions will look at the effects from that action cumulatively when they overlap in both time and space.

Soils

Regulatory Framework

Forest Plan Standards 101 and 125-129 relate to soil disturbance expected from this project. Standard 126 states that the acreage of detrimental conditions, including landings and roads, shall not exceed 20% of the total acreage in any activity area (unit).

Forest Service Manual Region 6 Supplement 2500.98-1, states objectives of soil management are "to meet direction in the National Forest Management Act of 1976 and other legal mandates. To manage National Forest System lands ... without permanent impairment of land productivity and to maintain...soil...quality. Soil quality is maintained when soil compaction, displacement, puddling, burning, erosion, loss of organic matter and altered soil moisture regimes are maintained within defined standards and guidelines". If an action maintains detrimental impacts within the standards of the Forest Plan, legal requirements for soil conservation would be met.

Analysis Methods

Effects were determined based on past monitoring, personal observation, professional judgments, field visits and reviews of applicable scientific literature. The Terrestrial Ecological Unit Inventory (TEUI) was used to identify geology and soil types present. A geology map (Brooks et al., 1983) was also used to identify locations of serpentine.

The project soil specialist trained technicians to assess soil condition in proposed harvest units, collecting information about impacts of past and ongoing activities, and inspecting if special design criteria are needed to protect soil. These assessments were done in two phases. In 2003 most units in Vinegar and Vincent Creek catchments were examined during walk-throughs, during which the technicians rated apparent soil impacts. For units with the highest impact ratings, a technician went back and did quantitative assessments. The second phase of soil assessments was done in 2008 and 2009 when technicians did quantitative assessments on most of the rest of the proposed units.

Professional judgments by the project soil scientist are summarized in the "Quantitative logging effects on detrimental soil conditions" found in the project record. The effects estimates are based on existing condition, log volume to be removed, the amount of draws, the amount of slopes steeper than 35%, the presence of volcanic ash cap, the amount of uphill skidding, and the presence of short skid trails.

The analysis areas for soils are proposed units. Unless otherwise stated, effects are described for the time period immediately after the proposed actions, when effects are at a maximum. The soils specialist report is incorporated by reference. Several topics are described in more detail in the specialist report.

Existing Condition

Soil Types

Soil types vary in their response to logging, based on such things as the presence of a volcanic ash cap, geology, soil depth, and rockiness.

There is a cap of volcanic ash of variable thickness over more than half of the project area. Soils with ash caps are more productive than non-ash because they supply more water to plants. In addition, ash soil has a high porosity and little clay, so it has a high infiltration rate. Ash is more easily displaced and compacted than non-ash soil. The ash cap provides protection against erosion by absorbing water flow and by producing abundant ground cover. However, if runoff does occur on ash cap soils, the soil particles are easily detached and eroded. A map in the analysis file shows the distribution of geology and the ash cap.

Geology is a cause of variation in soil types. The geology in the project area includes five major different types of rock: Strawberry volcanics, Clarno formation, metamorphic, serpentine, and granite-like. The Strawberry volcanics comprise the largest portion of the project area and consist mostly of andesite and basalt. The Clarno formation includes lava flows and volcanic mudflow breccias and tuffs, as well as andesite and basalt. Metamorphic rocks are highly variable and include metamorphosed volcanic and sedimentary rocks originally deposited on or beneath the ocean floor. Serpentine is a metavolcanic rock of special interest, which weathers to infertile soil inhibiting vegetation growth. Granite-like rocks occur among the metamorphic rocks in the project area.

Basalt and andesite tend to weather to loam and clay loam, breccias and tuffs weather to clays, metamorphic rocks weather to highly variable soils ranging from sandy loam to clay, serpentine produces infertile soils which are often shallow and rocky (when not capped by volcanic ash), and granite-like weathers to sandy, erodible soil (when not capped by volcanic ash). Clayey soils have a low infiltration rate.

Sensitive soil types in the project area are un-forested, shallow, rocky soils supporting low amounts of ground cover, mainly in juniper woodlands or non-forested areas. Soils in these areas cannot absorb much water, and produce overland flow. These soils have low amounts of ground cover, tend to be erodible, and generally are not found in timber harvest units but can be adjacent to units.

Detrimental Impacts, Erosion, and Nutrients

Detrimental impacts exist on tractor units, resulting from past timber sales and fuel treatments (Table 21, existing impacts column). Table 21 shows only the 44 units in which existing impacts exceed 3%; 85 units (not shown) have impacts less than 3%, and 9 more logging units in the Vincent and Vinegar Creek catchments were examined during "walk-throughs," and had low impacts. Existing detrimental impacts range from 0 to 12%. The assessments reveal all impacts from past and ongoing activities, including logging, roads, fuel treatments, livestock grazing, firewood gathering, and Off Road Vehicles.

Forested soils have abundant ground cover, so the potential for erosion exists only where ground cover has been removed. Because little ground cover has been removed, erosion in forested areas is negligible. The erosion hazard of forest soils is low on slopes less than 30% and moderate on slopes more than 30%.

Decades of fire suppression have resulted in heavier forest floors on most soils than would occur under the natural frequent fire regime. Fire usually decreases the amount of nutrients on the land (though easily available nutrients often increase for one to a few years). Significant underburning has not occurred in the area for many decades, so the loss of nutrients during fires has not occurred. Nutrients have accumulated as inputs from the atmosphere and mineral weathering accumulate. Thus, more nutrients occur in the forest floor and in plants now than in the 1800s. This increase in nutrients has been partially offset by nutrient removals during past logging and fuel treatments.

Table 21. Existing soil impacts within proposed units with 3% or more existing detrimental impacts and predicted soil impacts under all action alternatives

Unit	Detrimental Impacts, Existing Condition (Percentage of unit)	Detrimental Impacts, After Thinning (Percentage of unit)	Special Design Criteria*	Treatment Occurring by Alterative		
				Alt 2	Alt 3	Alt 4
011	6	17	d	HRS	HRS	HRS
021	6	17		HTH/SPC	HTH/SPC	HTH/SPC
031	5	13		HTH	HTH	HTH
035	3	13		HTH		HTH

Unit	Detrimental Impacts, Existing Condition (Percentage of unit)	Detrimental Impacts, After Thinning (Percentage of unit)	Special Design Criteria*	Treatment Occurring by Alterative		
				Alt 2	Alt 3	Alt 4
037	8	16		HTH	HTH	HTH
038	7	17		HTH	HTH	HTH
040	7	16		HTH	HTH	HTH
044	8	16		HTH	HTH	HTH
045	8	17		HTH	HTH	HTH
046	9	15	s	HTH	HTH	HTH
106	5	15		HTH		HTH
114	3	15		HRS		HRS
116	5	14		HTH		HTH
118	5	13		HTH	HTH	HTH
119	7	16		HTH	HTH	HTH
122	4	17	d	HRS	HRS	HRS
126	6	16		HTH/SPC	HTH/SPC	HTH/SPC
132	7	16		HTH	HTH	HTH
134	5	16				HRS
136	3	12		HTH	HTH	HTH
206	6	17		HTH/SPC	HTH/SPC	HTH/SPC
230	5	16				HRS
236	7	17				HRS
238	9	16	s	HRS	HRS	HRS
256	8	16	b	HTH/SPC	HTH/SPC	HTH/SPC
266	3	13		HUR	HUR	HUR
278	4	16		HTH/SPC	HTH/SPC	HTH/SPC
290	6	16	d	HTH/SPC	HTH/SPC	HTH/SPC
296	8	14	s	HTH/SPC	HTH/SPC	HTH/SPC
304	4	13		HUR	HUR	HUR
310	4	16	d	HRS	HRS	HRS
322	11	16	s	HUR		HUR
324	12	17	s	HTH/SPC	HTH/SPC	HTH/SPC
326	8	15	s	HUR	HUR	HUR
332	6	15		HUR	HUR	HUR

Unit	Detrimental Impacts, Existing Condition (Percentage of unit)	Detrimental Impacts, After Thinning (Percentage of unit)	Special Design Criteria*	Treatment Occurring by Alterative		
				Alt 2	Alt 3	Alt 4
438	3	17	d	HRS	HRS	HRS
456	8	17	d b	HRS	HRS	HRS
458	5	16	d b	HRS		HRS
496	8	16		HTH	HTH	HTH
502	3	13		HTH	HTH	HTH
618	8	14	s	HTH		HTH
620	4	14		HTH/SPC	SPC	HTH/SPC
628	4	13		HTH		HTH
658	4	15		HTH		HTH

** Special design criteria (for complete description, see Chapter 2):*

b = biomass harvest only at the time of logging, using the logging equipment to maintain soil disturbance below 20%

d = dry or winter conditions, or subsoiling, restricted biomass harvest

s = winter conditions or subsoiling, no heavy equipment for fuels treatment

HRS – Conversion to early seral species

HTH – Commercial thin to average of 50ft^2/acre basal area

HUR – Understory removal

SPC – Pre-Commercial thin

Direct and Indirect Effects by Alternative

Detrimental soil condition is the primary concern related to the proposed activities, and is due to impacts by heavy machinery causing soil compaction and displacement.

Alternative 1 – No Action

Under this alternative, no activities would take place, resulting in no additional detrimental impacts to soil productivity or erosion. No organic matter or nutrients would be removed. The existing detrimental impacts range from 0-12% (Table 21). Root action, animals that burrow in the soil, and freezing water would slowly loosen compacted soil over decades. There would be no new road construction or road reconstruction. No road decommissioning would occur, so there would be little recovery on un-needed roads. In the event of a wildfire, current and future fuel accumulations would lead to larger fires and more severe fire effects (see the Fuels section of this EIS). There would be more complete burning of the forest floor and removal of ground cover and formation of hydrophobic layers, which could result in increased overland flow and subsequent erosion, and also result in more volatilization of nutrients.

Alternatives 2, 3, 4

Under all action alternatives, proposed activities that would impact soil include skidding and landings from commercial harvest, road construction, prescribed burning, and pile burning.

Commercial harvest: Skidding and Landings

Most detrimental soil impacts would be caused from skidders during commercial harvest used to move cut trees to landings. Other equipment may be used including forwarders, but less detrimental impact is expected with this machinery. The use of skidders would cause soil displacement and compaction resulting in bare soil, decreased infiltration, and channeled overland flow, resulting in erosion. Sediment is normally deposited less than 15 feet down-slope from skid trails as water is slowed by groundcover and percolates into soil. Skidding on steeper slopes is expected to cause more detrimental impacts than flatter slopes, and uphill skidding is expected to have more impacts than downhill skidding.

Design measures found in Chapter 2 have been developed by the project soils specialist to limit soil displacement and compaction and comply with Forest Plan standards. Impact to soil productivity would be kept to a practical minimum. More details about effects of the various practices are given in the analysis file. After activities are completed compaction on skid trails would slowly recover, until it reaches natural levels after 20-50 years, or until the skid trail is reused.

Some soil on landings will be displaced or compacted. Reusing existing landings would keep impacts to a minimum. Under Alternative 4, helicopter landings about 2 acres in size would expose soil to erosion for a year or two. Detrimental impacts of helicopter yarding would be negligible within units because no heavy equipment would be used on soil. The total acres disturbed in the project area due to landings would be relatively small compared to the size of the units.

Road Activities

Creating temporary roads and new road construction would create additional detrimental impacts. Under Alternatives 2 and 4, there would be temporary road construction. These roads would be rehabilitated after project implementation. On subsoiled temporary road segments, most productivity lost to compaction would be restored; perhaps half the area of the roads would be in a restored condition. During construction and use of these temporary roads, soil may be eroded and deposited up to 20 feet from the edge of the road. Soil productivity lost to displacement and compaction from temporary roads would recover over several decades.

Under Alternatives 2 and 4 there would be new roads constructed. These roads would remain on the forest road system in the long term. Some erosion would occur during construction but erosion would decrease through about three years. After three years, ground cover would be well established on the non-running surfaces and soil would be stabilized resulting in minimal erosion. The entire road prism is detrimentally impacted for the long term.

Under all action alternatives, Forest roads would be decommissioned. The road surfaces would be subsoiled where feasible, seeded and mulched, and drainage provided. Subsoiling would slightly increase erosion for up to 2 years, but subsoiling is an effective way to increase infiltration and reduce compaction, resulting in increased soil productivity and decreased erosion when ground cover re-establishes. Proposed road closures that are not intermittently used would have a beneficial long-term effect on erosion. Closed roads that are intermittently used could cause erosion due to the roads not being maintained and due to the intermittent disturbance.

Impacts under the action alternatives result from temporary and permanent road construction, compaction and displacement from skid trails (greatest impacts on steep slopes greater than 30% and uphill skidding), grapple piling (adds 1% to unit disturbance), harvesting biomass (adds 2-5% to unit disturbance) and pile burning (adds 1% to unit disturbance). The difference between the "existing condition" and "after

logging" columns in Table 21 shows the additional impact of the proposed action. In summary, additional detrimental impacts expected under the action alternatives would range from 4 to 14% and would average 10% in the logging units and 7% in the biomass only units. Harvest under dry or winter conditions, or with forwarders, would cause less detrimental impact.

Prescribed Burning and Pile Burning

Slash remaining from commercial harvest and pre-commercial thinning would be piled and burned. Piling, using a grapple machine, would compact about 1% of each unit where this method is used. When piles are burned the soil directly beneath the pile would lose productivity and experience has shown may take 20+ years to recover. However, the forest soil specialist has rarely, if ever, observed detrimentally burned soil that occupied more than 1% of a unit and similar results are expected under all action alternatives.

Prescribed burning would remove some ground cover. However, burning would be controlled to avoid decreasing ground cover below Forest Plan standards. Ground cover would be expected to recover in one to five years.

Harvest, road construction, and fuel reduction activities would cause small areas of exposed soil. However any erosion would be localized, staying within several feet of the exposed soil, and would cease about three years after disturbance.

Organic Matter and Nutrients

Nutrients and organic matter are important contributors to soil productivity that are not counted by Forest Wide Standard 126. Thinning and fuels control would decrease nutrients and organic matter, along with fuels, by removing them in logs, in foliage, in biomass, and by burning. However, most nutrients and organic matter would remain on site in soil, forest floor, and remaining trees. Also, over the course of a cycle of projects, nutrient input from precipitation, rock weathering, and nitrogen fixation probably completely offset losses. Also, decreased nutrients and organic matter are similar to the situation before wildfire control in the early 1900s. Some loss of nutrients and organic matter was common then due to high fire frequency. Prescribed burning may have a positive effect on growth for up to three years due to release of nutrients into available forms.

The action alternatives would decrease the hazard of severe wildfire (see the Fuels section of this EIS) and resulting volatilization of nutrients. However, it is unknown if total nutrients lost would be greater under the No Action Alternative or the action Alternatives.

In summary, action alternatives move soil organic matter and nutrients toward levels similar to the 1800s.

Effects Summary

The total impacts of the action alternatives are shown in the “detrimental impacts after logging” column of Table 21. The “Special Design Criteria” column in Table 21 identifies design criteria specific to units that would limit total detrimental impacts to 17% or less, meeting the Forest Plan standard. The units not included in this table also are all expected to meet the Forest Plan standard. The Soils specialist report is included in the project record.

Cumulative Effects

The existing condition of soils in the project area, as described above, reflects the cumulative effects of past and present activities on detrimental impacts, erosion, nutrients, and organic matter. Past and ongoing activities which resulted in detrimental impacts to soils are mainly timber harvest (Table 6) and fuels control. There was no cumulative effect of nearby timber projects because the Crawford, Balance, and plantation thinning projects did not overlap proposed Galena units. Effects, of past and present livestock

grazing (in forested units), wildfire suppression, off road vehicles, and mining on detrimental impacts, erosion, nutrients, and organic matter, are negligible.

Ongoing and foreseeable future actions such as grazing and firewood cutting, would continue to compact a negligible amount of soil as in the past, because the intensity of these activities are not expected to change greatly. This continuing compaction would be counter-balanced by recovery from similar impacts in the past, so the level of detrimental impacts from these ongoing and foreseeable actions would remain at about current, negligible levels. ORV use may decline slightly as Travel Management is implemented, reducing potential future impacts to soils. Any future cumulative effects from mining claims would be disclosed in the NEPA documents associated with those claims. Treatment of invasive plants infestations is proposed in the upcoming Invasive Plants EIS. That EIS will disclose the cumulative effects of those treatments. It is unlikely that treatments approved in that document, which may include application of herbicides, would have significant effects on detrimental soil conditions, erosion, or nutrients. No other foreseeable actions would affect detrimental soil conditions, erosion, nutrients, and organic matter.

Watershed

Regulatory Framework

This project is consistent with Forest Plan direction for water resource protection because it would not measurably increase watershed impacts, including stream temperature, over the existing conditions. The "Forest Service R6 General Water Quality Best Management Practices" (1988) and the 2012 National Best Management Practices would be followed under all action alternatives. Interim Strategies of Managing Anadromous Fish Producing Watersheds (PACFISH) standards and guidelines and Forest Plan standards for riparian areas not included in PACFISH, providing direction for riparian buffers were used.

This project is consistent with the Clean Water Act and Forest Service responsibilities under the Clean Water Act as described in a Memorandum of Understanding (MOU) with the Oregon Department of Environmental Quality (2002) because it would not measurably increase watershed impacts, including stream temperature, over the existing condition. The MOU also directs that the Forest Service cannot further degrade water quality impaired streams, although short term adverse impacts which occur with long term benefits are allowed. Several streams in the project area are on the Oregon 303(d) list for above normal stream temperatures. All alternatives comply with the Clean Water Act, since none raise stream temperatures, and since all follow Best Management Practices as specified in "Forest Service R6 General Water Quality Best Management Practices" (1988).

The Forest Service is directed to comply with State requirements in accordance with the Clean Water Act for protection of waters of the State of Oregon (OAR chapter 34041) through planning, application, and monitoring of Best Management Practices (BMPs), which are recognized as the primary means to control non-point source pollution on National Forest lands. BMPs would be monitored by the Blue Mountain Ranger District hydrologists, fish biologist, sale administrators, and harvest inspectors. The MOU also directs that the Forest Service cannot further degrade water quality impaired streams. As shown in the Effects section, none of the alternatives would raise temperature in streams that are the included on the 303(d) listed water bodies in the project area.

The streams or portions of them, listed in Table 22 and Table 23 are on the 2004/2006 Oregon Department of Environmental (ODEQ) Quality Clean Water Act (CWA) Section 303(d) List of Water Quality Impaired Water Bodies for the reasons described.

Table 22. Middle Fork of the John Day River (Camp Creek Watershed) – river segments in Galena project area included on the ODEQ Clean Water Act Section 303(d) list of water quality impaired water bodies

Stream	Subwatershed	Parameter for Listing	Season	Criteria	Beneficial Use
Middle Fork John Day River	Vinegar Creek	Temperature	September 1 - June 15	Salmon and steelhead spawning: 13.0 degrees Celsius 7-day-average maximum	Salmon and steelhead spawning
Middle Fork John Day River	Vinegar Creek	Temperature	Year Around (Non-spawning)	Core cold water habitat: 16.0 degrees Celsius 7-day-average maximum	Core cold water habitat
Middle	Vinegar Creek	Temperature	Year	Bull trout spawning	Bull trout spawning

Stream	Subwatershed	Parameter for Listing	Season	Criteria	Beneficial Use
Fork John Day River			Around (Non-spawning)	and juvenile rearing: 12.0 degrees Celsius 7-day-average maximum	and juvenile rearing

Table 23. Streams in the Galena project area included on ODEQ Clean Water Act Section 303(d) list of water quality impaired water bodies

Stream	Subwatershed	Parameter for Listing	Season	Criteria	Beneficial Use
Vinegar Creek	Vinegar Creek	Temperature	Year Around	Rearing 17.8 degrees Celsius	Anadromous fish passage; Salmonid fish rearing
Vincent Creek	Vinegar Creek	Temperature	Summer	Rearing 17.8 degrees Celsius	Anadromous fish passage; Salmonid fish rearing
Davis Creek	Vinegar Creek	Temperature	Summer	Rearing 17.8 degrees Celsius	Anadromous fish passage; Salmonid fish rearing
Placer Gulch	Vinegar Creek	Temperature	Summer	Rearing 17.8 degrees Celsius	Anadromous fish passage; Salmonid fish rearing
Caribou Creek	Little Boulder Creek-Deerhorn	Temperature	Summer	Rearing 17.8 degrees Celsius	Anadromous fish passage; Salmonid fish rearing
Little Boulder Creek	Little Boulder Creek-Deerhorn	Temperature	Summer	Rearing 17.8 degrees Celsius	Anadromous fish passage; Salmonid fish rearing
Little Butte Creek	Little Boulder Creek-Deerhorn	Temperature	Summer	Rearing 17.8 degrees Celsius	Anadromous fish passage; Salmonid fish rearing

Davis Creek, above stream mile 3.9, and Little Boulder Creek, above stream mile 2.1, meet water quality standards for temperature according to the ODEQ database with 7-day average maximum temperatures below 16 degrees Celsius.

Analysis Methods

The district hydrologist used multiple methods to determine the existing condition and to analyze the potential effects to the subwatersheds from proposed activities. By using professional knowledge of the project area, data collected from stream surveys, and reviewing other data and literature, the hydrologist analyzed the effects of the proposed alternatives. Alternatives were compared in terms of effects from

proposed actions to stream channels, water quality, quantity and timing to infiltration rates and overland flow which in turn may lead to a change in the quantity and timing of water flows through the stream system ultimately affecting the watershed hazard.

Existing Condition

The overall condition of the watershed in this analysis is based on: stream channel and riparian area condition, water quality, water quantity and timing as impacted by infiltration rates and tendencies for overland flow, and management activities that have modified these characteristics away from the desired condition.

The Vinegar Creek and the Little Boulder Creek-Deerhorn subwatersheds drain to the Middle Fork of the John Day River. There are approximately 180 miles of streams in these two subwatersheds. The primary streams in the Vinegar Creek subwatershed are Vinegar Creek, Vincent Creek, Placer Gulch, and Davis Creek. Primary streams in the Little Boulder Creek-Deerhorn subwatershed are Caribou Creek, Flat Creek, Hunt Gulch, Murdock Creek, Windlass Creek, Tincup Creek, Dead Cow Gulch, Deerhorn Creek, and Little Butte Creek. There are also small areas of wet meadows, springs, and seeps in the project area.

Management Activities Impacting Watershed Condition

Past harvest, roads, railroads, grazing, and mining have increased soil disturbance, provided pathways for concentrating overland flow, and decreased stream channel and riparian resiliency in these two subwatersheds. Legacy practices have altered runoff patterns and areas that are up and down slope proposed harvest units, resulting in greater amounts of overland flow. Some of these flows infiltrate in downslope forested stands, including those proposed for harvest, because ground cover is abundant and slopes are gentle. Some of the overland flows enter the drainage network more efficiently or extend existing areas of erosion.

Roads within 100-250 feet of streams impact streams by delivery of overland flow and sediment, especially where runoff from roads is channelized below culverts, where outsloping road surfaces concentrate flows, or where road location limits the amount of canopy shade provided to streams. Hillslope roads (those outside RHCAs) account for around 160 miles and most commonly hillslope roads re-direct overland flow away from natural drainage patterns. Hillslope road density approaches 3 mi/mi^2. Similarly roads located on the hillslope portions of Riparian Habitat Conservation Areas (RHCAs) are more likely to deliver concentrated overland flow and sediment to streams because filter strips are narrower than for roads on higher slopes. The location of these roads may prevent the growth and recruitment of large wood to streams. Depending on the proximity relative to streams, shading is reduced and stream temperatures increased above normal.

Stream channels and water quality

There are eroded channels along some streams resulting from past activities such as livestock grazing and mining. Stream channels have downcut into valley bottoms, resulting in altered physical characteristics and function. The alterations to channel profile, pattern, and dimensions reduce channel resiliency and the ability to dissipate water during high flow events. Many stream channels are disconnected from floodplains as a result of past activities. This disconnection has resulted in reduced floodplain water storage and shifts in riparian vegetation, both of which are contributing to reduced ability to dissipate energy associated with high flows. Riparian ecosystem habitat including cottonwood trees, aspen, willows and riparian herbaceous species are not present in amounts as they would be if the stream channels were connected to floodplains.

Ephemeral draws are considered the connection between hillslopes and stream channels and are low in down wood, reducing their filtering capacity. Approximately 9 miles of ephemeral draws in the project area show small amounts of active erosion and are most frequently located in the lower third of hillslopes.

Most of the erosion was initiated by past activities that either channeled overland flow down draws or reduced ground cover. In some cases past grazing practices such as salting in draw bottoms, poorly designed or poorly located culverts or poor road location concentrated overland flow that resulted in erosion. Other draws have been eroded by historical hydraulic mining. Active erosion continues partly due to lack of downed wood in draw bottoms.

There are 7 streams and one river in the project area on the State of Oregon Clean Water Act Section 303(d) List of Impaired Waterbodies. The streams are on the list because the summer water temperatures are too high. The Middle Fork of the John Day River is on the 303(d) List for the parameter of water temperature.

Water Quantity and Timing

The amount and timing of peak flows are directly influenced by the infiltration rate and overland flow across the two subwatersheds. The geology, soils, topography, vegetation and climate play a role in how water flows through the watershed. The volcanic rocks in the project area constrain groundwater movement and weather into clayey soils. The geology has an influence on the absorption and flow of runoff because soils are shallow with high amounts of clay. A greater proportion of runoff is shed as overland flow rather than entering the groundwater system. The clayey soils are also considered to have high erosion hazard ratings and are prone to slumping when saturated. Where present, the surface ash layer moderates the erosive characteristics of the clayey soils since infiltration and water storage are naturally higher in the ash soils proportional to the depth of the ash layer. The combination of soil characteristics and climate contribute to low rates of infiltration and naturally elevated overland flows.

Ground cover moderates the soil response to water movement by increasing surface roughness and enhancing infiltration. Most of the forested areas in the project area have effective ground cover where infiltration is at or near the desired potential and overland flow is generally only produced during intense precipitation events, depending on slope. Slopes range from 10-70% within the subwatersheds. Topography varies from canyon-like drainages to shallow depressions. Stream valley width varies from narrow to broad, up to ten times the width of tributary streams. The semi-arid climate brings most precipitation as snow, although summer and fall rains and convectional thunderstorms contribute to the totals. Moist and wet meadows found on valley floors provide key hydrologic function by capturing and storing seasonal and storm runoff that exceed infiltration.

Observation and comparison with similar drainages indicate that peak flows occur from mid-March to early June depending on annual weather patterns and drainage size. Following melt off, stream flows decline gradually until fall when low flows occur. Ephemeral draw condition is a primary influence on changes in seasonal runoff volume and rates. Ephemeral draws are considered the connection between hill slopes and stream channels. Around 9 miles of ephemeral draws in the project area show small amounts of active erosion in the lower third of hill slopes in both subwatersheds.

Watershed Hazard

Watershed function relies on the condition of connections between streams, and between stream channels and floodplains, and between hill slopes and streams. Increased connectivity between these features causes increased overland flow and is the basis for evaluating watershed hazard. The project area has a existing watershed hazard of low to moderate due to the highly erosive soils with a tendency to generate overland flow.

When the legacy effects of past actions are considered in assessing watershed hazard, the roads present in the project area have increased the comprehensive watershed hazard toward moderate. The factors of greatest influence on watershed hazard, resulting from past and ongoing management activities, appear to be the presence of riparian roads, the hydrologic and vegetative condition of riparian areas, the condition of hill slopes above forested areas, and the extension of stream channels and modification of both

channels and some hill slopes by past mining. Hillslope conditions resulting from past logging, however are generally recovering and the impacts of hillslope roads are limited in extent and intensity.

Direct and Indirect Effects by Alternative

The overall concern of impacts from the proposed alternatives is determining if there would be a release of sediment that impacts the amount and timing of stream flows. As changes to the landscape resulting in more water and earlier timing could cause an increase in channel erosion, causing a departure from desired conditions. The infiltration rate of soils in the watershed in combination with the tendency to produce overland flow, determines the threshold at which proposed activities cause changes in amount and timing of stream flows. If the proposed activities would decrease the infiltration rates and increase overland flow to a point where the amount and timing of stream flows change, then the overall watershed function would be impacted resulting in an elevated watershed hazard.

Alternative 1

Under Alternative 1, ongoing watershed processes would continue to function in response to the existing conditions. Where erosion has stabilized, ephemeral draw and upland conditions would gradually recover from past impacts over decades. Small amounts of coarse woody debris, such as branches, would accumulate in the draws, slowing run-off and enhancing infiltration. Where erosion is not stabilized, conditions are likely to continue or gradually expand downslope or widen into more extensive riling over decades. Accelerated erosion may result downslope of areas where flows are concentrated, especially where downslope ground cover is not abundant, either naturally or as a result of past disturbance.

The effect under Alternative 1 is little to no change in RHCA condition for up to three to ten years because of lag time associated with the establishment and growth of riparian species, particularly hardwood shrubs and trees. Existing conditions described for riparian roads would continue and associated impacts on riparian functioning would persist. Segments of Vinegar Creek, Vincent Creek, Davis Creek, Placer Gulch, and other streams would continue to be constrained by various roads. Roads in RHCAs will continue to intercept and concentrate peak flows and decrease minimum flows. The pool of large woody material for future recruitment into streams and riparian areas would continue to be reduced due to the location of roads.

Stream bank and channel stability and coarse woody debris recruitment would be expected to remain about the same for up to three to ten years. Since no activities are proposed, no direct or indirect effects to snowpack, annual water yield, peak flows, minimum flows, or water quality are expected. The gradual recovery of most upland, RHCA and stream channel conditions such as narrow, deep streams and shade from riparian vegetation would contribute to lower summer water temperatures. The existing moderate watershed hazard would continue.

The hazard of an uncharacteristic wildfire would be increased and if a fire occurred it would result in the loss of conifer and hardwood shade, resulting in increased temperatures for about 10-30 years or until streamside vegetation either matured (riparian hardwoods) or conifers became re-established.

Wildfires would be likely to burn with high intensity resulting in uncharacteristic amounts of medium and high severity impacts to the soils. Wildfire impacts such as hydrophobic soil and over-drying, would increase watershed hazard. Exposed mineral soils and hydrophobic soils increase watershed hazard and would result in delivery of sediment and increased run-off into streams or onto the outer portion of valleys. Locally severe fire would be expected in some RHCAs. Locally severe fire may also occur in other RHCAs depending on the pattern of burning. Most trees in some RHCAs would be killed, providing relatively small coarse woody debris within ten years, and delaying the growth and recruitment of large woody debris for decades. Cover in many of the RHCA's would be reduced until forest stands are re-established (see Vegetation Section). Some larger trees may be killed and would provide large woody debris for future recruitment earlier than in the absence of fire.

The watershed hazard would remain the same as the existing condition for the short-term. The condition of riparian roads would continue to limit stream channel recovery. Over the long-term watershed hazard would generally decrease as recovery from past activities continues, although localized areas of active erosion would continue as chronic, localized hazards

Alternative 2

Commercial Harvest and Pre-Commercial Thinning

The commercial harvest proposed under Alternative 2 would cause disturbance that may impact infiltration rates and overland flow. In areas where vegetation is cleared for landing zones and skid trails, minor amounts of erosion and overland flow would occur, especially on hill slopes. Overland flow is expected to infiltrate within unit boundaries since ground cover will be maintained over most of the area. Although sediment may be detached where mineral soil is exposed within harvest units, it is likely to be trapped by ground cover and would be unlikely to be transported beyond unit boundaries.

Some units are located on hillslopes in sub-drainages which have been previously disturbed by management activities increasing the chance that previous disturbance would become connected to ground disturbance associated with the proposed actions. This could possibly extend the drainage network headward or create concentrations of runoff or sediment that could be transported beyond unit boundaries during large, rare runoff events. However, generally overland flow is not expected to be concentrated enough to cause accelerated erosion or to deliver increased sediment to live streams in most locations under common rainfall events.

The proposed activities would not remove 60% of trees in either subwatershed or create large openings that measurably alter snow accumulation and melt off rates. Based on Helvey and Fowler's work (1995) on the Umatilla National Forest and other work, harvest activities below these thresholds are not expected to alter peak flow response measurably.

Prescribed Burning and Pile Burning

The pile burning would not change infiltration rates or overland flow due to the piles being small in size and limited to localized areas. Prescribed burning would also not impact infiltration or overland flow since burning would be at a low intensity and would not expose the mineral soil. There will be no effects to stream channels and water quality as well as water quantity or timing from prescribed burning and pile burning activities because of the Best Management Practices that have been incorporated into the project and are included in Appendix G.

Road Activities

Road activities which could impact infiltration within the subwatersheds are temporary roads, construction of new roads, and decommissioning roads. Segments of temporary road would not be restored to productivity for up to ten years after use. However, BMPs are expected to control sediment and concentrated runoff on temporary roads for one to several years. Re-establishment of ground cover would control sediment and runoff until productivity was restored.

Under Alternative 2, the amount of authorized roads would be about 95% of the existing condition, with most of the change occurring in riparian areas. In addition constructing of new road on higher hillslopes would allow about six miles of road located in riparian areas to be decommissioned. Relocating the roads from RHCAs would reduce direct sedimentation and overland flow reaching streams. Decommissioning crossings in these settings is expected to reduce sediment inputs into intermittent streams, and eventually into the stream network. This will allow the gradual rehabilitation of floodplain interactions and shallow groundwater storage in these valleys, particularly in the immediate vicinity of the crossings

The location of the proposed new road construction would continue to affect watershed function by intercepting subsurface flow and, potentially, channeling and re-directing overland flow, but to a lesser extent since they are located farther from streams and riparian areas. The new roads would be built to the current standards for drainage. Drainage structures built to standard condition and spacing, including outsloping, is expected to divert surface water downslope and to minimize additional concentration of overland flows. At a landscape scale the re-location of the roads out of riparian areas would reduce the risk of connections forming with the drainage network. New culverts are to be installed to replace the fords at Davis Creek and Dead Cow Gulch.

Soil in ephemeral draws is not expected to be disturbed except at designated crossings. Consequently new erosion pathways and the headward extension of the drainage network are not expected to occur.

Within the RHCAs in both subwatersheds around six miles of roads would be decommissioned and around 29 miles of road would remain. Most of the decommissioning would occur near Category 4 (intermittent) streams and are native surface. The remaining roads, which are generally near Category 1 and 2 (fish-bearing and perennial non-fish-bearing) streams are major travel routes that will be left open and many are gravel or rock surfaced. Decommissioning of native surface roads along perennial and fish-bearing segments of Vincent Creek is proposed. The proposed activities include decommissioning a few segments of road that nearly parallel streams and roads. Floodplain interactions would be expected to improve. The water table would be expected to rise, resulting in more abundant riparian vegetation. As trees fall into these areas over the next few decades, channel – floodplain interactions would begin to recover. The groundwater table would be expected to rise. Riparian vegetation may become more abundant and stream channels would develop riffle-pool or step-pool sequences more in balance with the landscape and re-develop functional streams patterns, plans and dimensions.

Implementing the proposed road decommissioning is likely to reduce the concentrated overland flow and sediment delivered to the smaller streams, and, potentially, the perennial and fish-bearing streams. Decommissioning roads in riparian areas is expected to increase local floodplain storage, increase shade, and improve stream channel function. While water temperatures in streams near these activities are expected to decrease, the change may not be measurable due to the limited spatial extent of the activities.

Aspen

Felling conifers would add downed woody material to RHCAs, increasing filtering and infiltration capacity. Girdling conifers would provide additional material for future downed woody recruitment over the next ten to thirty years, maintaining or improving filtering and infiltration capacity. The recruitment of downed wood would counter erosion and allow for sediment to be deposited and stabilized, reducing future erosion. The establishment of mature aspen stands with few conifers would improve shade locally and contribute to reductions in stream temperatures.

Watershed Hazard

The activities proposed in RHCAs are not expected to contribute to watershed hazard or to detrimentally affect stream or riparian conditions in the long-term. Effects of harvest activities are expected to remain within units and would recover over 20-50 years. Activities expected to improve riparian and stream conditions over the long-term and reduce the watershed hazard are the reduction of roads in RHCAs, the maintenance and reconstruction of roads in RHCAs, aspen restoration, and prescribed burning. Short term effects, such as those from road decommissioning or re-location would result in long-term improvements. Most of the activities proposed in valley bottoms and RHCAs would contribute to the resiliency of stream systems and riparian areas to dissipate large runoff events.

Overall the activities proposed under Alternative 2 would increase watershed hazard in the short-term. Despite the increase, the watershed hazard would remain moderate. The effect would be proportional to the amount of ground disturbance associated with harvest and to the remaining roads, especially those in

riparian areas, in the first ten years. Hazard would decrease in the long term as harvest units and decommissioned roads recovered.

Alternative 3

Commercial Harvest and Pre-Commercial Thinning

The effects to infiltration rates and overland flow under Alternative 3 would be similar to those described for Alternative 2 except that ground disturbing activities would occur on fewer acres, reducing overall disturbance proportionately and connectivity could develop. The distribution of units where yarding is proposed, would also change under Alterative 3. The proportion of units located on the more sensitive soils is larger under this alternative, although the overall amount of disturbance would be decreased since yarding and landing would not occur on about 2,800 acres. The wider distribution of units would tend to reinforce the reduction in watershed hazard, but the inclusion of yarding on a proportionally larger amount of sensitive soils would tend to offset part of the reduction. Designated stream crossings would be located in fewer ephemeral draws (about 55%) since tractor harvesting is proposed on fewer acres.

Prescribed Burning and Pile Burning

Effects from prescribed burning on stream channels and watersheds would be similar to those in Alternative 2 since the same number of acres will be burned. Prescribed burning would also not impact infiltration or overland flow since burning would be at a low intensity and would not expose the mineral soil. The pile burning would not change infiltration rates or overland flow due to the piles being small in size and limited to localized areas.

Road Activities

Temporary roads would not be constructed under this alternative, resulting in around ten additional acres undisturbed, further reducing opportunities for watershed connections to develop. About four miles of road, mostly on hillslopes, between Dead Cow Gulch and Deerhorn Creek would be included in the road decommissioning. Under Alternative 3 new roads would not be constructed and the 6 miles of road relocation out of RHCAs would not occur. In other RHCAs, road decommissioning planned for Alternative 2 would still occur under Alternative 3. The new culverts at Davis Creek and Dead Cow Gulch to replace the existing fords would not occur in Alternative 3. Decommissioning the proposed roads for this alternative will reduce interception of subsurface flows and channeling of overland flow in those locations.

Aspen

The effects to aspen in Alternative 3 would be the same as Alternative 2 since there are no changes in the proposed activities.

Watershed Hazard

The overall potential for reducing watershed connectivity would be proportionally greater under Alternative 3. Consequently watershed hazard associated with hillslope roads are slightly lower for Alternative 3 than for Alternative 2. Water quantity and timing response is likely to be about midway to those of Alternatives 1 and 2. Watershed hazard is considered to be about the same as Alternative 2, but the areas of hazard would shift from the hillslopes (reduced amounts of harvest and no new or temporary road construction) to the riparian areas. Normal events would have no effects due to BMPs, however rare events may have vulnerability to hazard.

Overall the activities proposed under Alternative 3 would increase short term watershed hazard compared to Alternative 1. Despite the increase, watershed hazard would remain moderate, proportional to the amount of ground disturbance associated with harvest and to the remaining riparian roads, in the first ten years. Hazard would decrease toward low in the long term as harvest units and decommissioned roads

recovered except in the vicinity of the Category 4 tributaries where hazard would remain about equal to that of the existing condition.

Alternative 4

Commercial Harvest and Pre-Commercial Thinning

The effects to stream channels, water quality, water quality and timing as well as infiltration rates and overland flow under Alternative 4 would be similar to those described under Alternative 2, however, ground disturbing activities would occur on more acres, increasing overall disturbance proportionately. However, just as in Alternative 2, best management practices would reduce most of the impacts from these activities. Soil would be disturbed at designated stream crossings in ephemeral draws on about 600 more acres of tractor yarded harvest. Most of this yarding would occur west of Deerhorn Creek and would contribute to a very slight increase in watershed hazard in that area.

Prescribed Burning and Pile Burning

The pile burning would not measurably change infiltration rates or overland flow due to the piles being small in size and limited to localized areas. Prescribed burning would also not impact infiltration or overland flow since burning would be at a low intensity and would not expose the mineral soil.

Road Activities

Hillslope roads would increase by 0.5 miles. Similar to Alternative 2 watershed hazard associated with roads would shift to the hillslopes except in the vicinity of Deerhorn Creek, where two new stream crossings are proposed. Around two miles of additional road would be constructed to access units in the southwestern portion of the project area, on the west side of Deerhorn Creek, to tie into the system of roads east of Little Butte Creek. The effects of these roads and of other hillslope roads would be similar to those described under Alternative 2, and would increase watershed hazard proportionately.

Construction of two additional stream crossings in RHCAs on Deerhorn Creek and a tributary would introduce up to 0.5 cubic feet of sediment during construction and may constrain subsurface flows in the floodplain, up-stream and down-stream of the activities. Constructing additional crossings on Deerhorn Creek is not expected to change stream flow quantity and timing measurably because culverts will allow for passage of 100 year flow events.

In addition the adjacent segments of road would be located on soil derived from Clarno parent material on relatively steep side slopes. Intensive BMPs and design elements would be expected to control sediment produced during construction and during the life of the road. The effects of decommissioning other riparian roads are similar to those described for Alternative 2.

Shade may be reduced locally for 7 to 10 years along a very short segment of Davis Creek and on Deerhorn Creek, but an increase in stream temperature from additional area (less than 500 feet, total) exposed to solar radiation would not to be measurable.

Aspen

The effects to aspen in Alternative 4 would be the same as Alternative 2 since there are no changes in the proposed activities.

Watershed Hazard

Watershed hazard would increase slightly in the short term compared to Alternative 2 due to the increase in yarding and by the increased density of units in parts of the Vinegar subwatershed. Helicopter yarding itself is not expected to increase watershed hazard because only 1-2% of the ground is expected to be disturbed by felling and yarding. Disturbance at helicopter landings, including service landings, may increase watershed hazard depending on the proximity of ephemeral draws and legacy disturbances.

Despite the increase, watershed hazard would remain moderate in the first ten years. Hazard would decrease long term toward low as harvest units and decommissioned roads recovered except in the vicinity of Deerhorn Creek where hazard would remain slightly elevated compared to the existing condition and to other alternatives.

Cumulative Effects

Alternative 1

Effects from legacy activities and invasive weed infestations persist on the project landscape due to local climate, geology, elevation and soil characteristics. During periods of runoff, overland flow from these disturbances and from interactions between them may continue to cause erosion, reduce infiltration and concentrate flow in a self-reinforcing manner. These interactions are most intense under large, rare runoff events although they may persist at low, chronic levels during common runoff events. In contrast, over time, as trees, mature, die and fall, and ground cover increases, the recruitment of coarse wood and surface roughness in stream channels, draws and valleys, and hillslopes is likely to ameliorate some portions of the legacy disturbance. Since amelioration is likely to be in proportion to the intensity of recruitment and the intensity of the legacy disturbance and the balance between them, it is not possible to predict a detailed pattern of accelerated erosion or recovery. Currently flows and sediment may reach the Middle Fork John Day River following rare run-off events.

Low intensity, high frequency natural wildfires were common in much of the project area before Euro-American settlement. Changes in fuel condition may result in uncharacteristically intense wildfires. Effects of these more intense wildfires and related suppression may exacerbate legacy disturbances cumulatively and increase watershed hazard in the short term (approximately 5 years). These effects cannot be predicted although some effects of wildfire and suppression may be ameliorated by Burned Area Emergency Rehabilitation (BAER) practices and rehabilitation of ground disturbance associated with suppression. As ground cover increases and other fire-related impacts recover, watershed hazard would decrease over the long term.

The list of past, ongoing, and foreseeable activities displayed in Table 6 and the SOPA were reviewed for consideration of cumulative effects. Since no management activities are proposed which would further impact infiltration rate and overland flow beyond the already analyzed existing condition, no additional interactions and no cumulative effects additional to those associated with past, ongoing or foreseeable activities are expected in the short or long term. Cumulative effects for future activities would be evaluated in the environmental analysis associated with those activities.

Alternative 2

Effects from legacy activities, described for Alternative 1 Cumulative Effects, persist in the project area where Alternative 2 would be implemented. Since direct or indirect adverse effects from the proposed activities, including interactions with legacy disturbance, are expected to remain within unit boundaries, during common runoff events, adverse cumulative effects from the proposed harvest activities are not expected. The effects from rare runoff events would be similar to those described for Alternative 1 except that proportionally more connections between various kinds of disturbance are likely to occur. Increased connections may contribute to accelerated erosion over larger areas. Prior to five years after project activity, additional flows and sediment may reach the MFJDR following rare run-off events. Increases in run-off would not be measurable compared to the magnitude of the response under Alternative 1 and the variability associated with measuring watershed parameters.

Modifying fuels and other conditions influencing fire behavior in the project area may reduce fire intensity as described in the Fuels Specialist Report and reduce watershed hazard in adjacent areas. Fire behavior is expected to change from uncharacteristically high to characteristically low intensity; ground disturbing effects from either uncharacteristic wildfire itself or suppression activities are expected to be

reduced. Consequently, cumulative interactions between these effects and those of legacy disturbances are expected to be reduced resulting in a reduction in watershed hazard.

Also, by implementing proposed activities combined with treatments on private land, uncharacteristic wildfire would be less likely to enter private land in the middle of the project area, further reducing possible effects from fire and suppression activities. The proposed activities would also break up the continuity of fuels and limit fire spreading from the mixed conifer and cold forest zones into developed areas where active watershed restoration is occurring.

Decommissioning roads in riparian areas and introducing downed wood in RHCAs and draws with aspen are likely to improve water quality and flows in the vicinity of the activities initially. These projects combined with on-going watershed restoration projects in other locations in Camp Creek Watershed (Camp Creek drainage) and in Upper Middle Fork and Big Creek watersheds would contribute to the cumulative recovery of the upper portion of the MFJDR sub-basin.

Alternative 3

Cumulative effects in alternative 3 would be similar to those described for Alternative 2. Cumulative effects that are unique to this alternative include the introducing downed wood in RHCAs and draws with aspen would improve water quality and flows only in the limited project area initially. Fewer roads would be decommissioned, leaving larger amounts of legacy disturbance on the landscape. Also, the number of riparian roads decommissioned would be reduced, limiting the recovery of resilient riparian areas, and maintaining a higher watershed hazard and potential for cumulative interactions between legacy disturbances to develop or between legacy disturbances and proposed activities to develop under large runoff events. Since proposed watershed restoration activities are less extensive than would occur under the Proposed Action, the contribution to the cumulative recovery of Camp Creek and Big Creek watersheds and to the cumulative recovery of the upper portion of the MFJDR sub-basin is expected to be smaller.

Alternative 4

Introducing downed wood in RHCAs and draws with aspen would improve water quality and flows only in the local vicinity initially. Although proposed watershed restoration activities are as extensive as those included in the Proposed Action (Alternative 2), the contribution to the cumulative recovery of Camp Creek and Big Creek watersheds and to the cumulative recovery of the upper portion of the MFJDR sub-basin is expected to be slightly smaller due to the extension of roads between Davis Creek and Deerhorn Creek and the installation of two additional culverts on Deerhorn Creek and its intermittent tributary. Although the culvert on Deerhorn Creek will be installed according to Region 6 standards (and will permit the passage of 100 year runoff events), its installation and the installation of an additional culvert on the tributary would increase watershed hazard which may cumulatively interact with legacy disturbances during large, rare runoff events.

Aquatics

Regulatory Framework

The Executive Order 12962 of 1995 (aquatic systems and recreational fisheries) requires federal agencies to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. The Order requires federal agencies to evaluate the effects of federally funded actions on aquatic systems and document those effects.

The Endangered Species Act (ESA) of 1973, as amended provides direction relative to fisheries. The ESA requires the Forest Service to manage for the recovery of threatened and endangered species and the ecosystems upon which they depend. Forests are required to consult with the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) if a proposed activity may affect the population or habitat of a listed species.

The Forest Plan, as amended provides direction to protect and manage aquatic resources. Only direction pertaining to fish and fish habitat that has project relevance is included here. Forest Plan goals (p. IV-2), objectives (p. IV-17, 18), and standards (p. IV-33) were incorporated into the project design criteria.

Forest Plan amendments applicable to aquatic resources are amendment 29 (1994) and PACFISH (1995). Amendment 29 incorporated recommendations for managing and restoring aquatic habitat from the Columbia River Basin Anadromous Fish Habitat Management Policy and Implementation Guide (January 25, 1991). This amendment established numeric desired future conditions (DFCs) for aquatic habitat by modifying Forest Plan standard 5 for management area 3B, anadromous riparian areas. Modification included incorporation of numeric DFCs for sediment and substrate, water quality, channel morphology and riparian vegetation.

PACFISH is the Regional Forester Forest Plan amendment which is the Interim Strategy for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). PACFISH provided ecosystem-based management strategies designed to arrest the degradation and begin the restoration of aquatic habitat and riparian areas on the lands administered by the Forest Service and BLM, specifically in watersheds outside the range of the northern spotted owl that provide habitat for Pacific salmon, steelhead, and sea-run cutthroat trout (anadromous fish). Activities in the project area fall under direction of PACFISH because the location is within the range of anadromous fish.

PACFISH established Riparian Habitat Conservation Areas (RHCAs) which are differentiated by stream categories. Category 1 streams (fish bearing) have a buffer of 300 feet either side of the stream, Category 2 streams (non-fish bearing perennial streams) have a 150 foot buffer, Category 3 streams (ponds, lakes, wetlands over 1 acre) have a 150 foot buffer, and Category 4 streams (non-fish bearing intermittent streams and ponds, lakes, wetlands under 1 acre) have a 100 foot buffer.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of Chinook salmon Essential Fish Habitat (EFH) descriptions in federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. EFH consultation with NMFS regarding effects of the proposed action on EFH for Chinook salmon is occurring concurrently with ESA section 7 consultations.

Management Indicator Species

Management Indicator Species (MIS) are species of vertebrates and invertebrates whose population changes are believed to best indicate effects of land management activities. Through the MIS concept, the total number of species found within a project area is reduced to a subset of species that collectively represent habitats, species and associated management concerns. MIS are used to assess the maintenance

of populations (the ability of a population to sustain itself naturally) and biological diversity (which includes genetic diversity, species diversity, and habitat diversity), and to assess effects on species in public demand.

The Malheur Forest Plan identifies the following aquatic species as Management Indicator Species for healthy stream/riparian habitats: westslope cutthroat trout, redband/rainbow trout, steelhead, and bull trout (USDA 1989). These aquatic MIS were selected to indicate healthy stream and riparian ecosystems across the landscape. Riparian ecosystems occur at the margins of standing and flowing water, including intermittent stream channels, ephemeral ponds, and wetlands. Attributes of a healthy aquatic ecosystem include: cold and clean water; channel substrates; stable stream banks; healthy streamside vegetation; complex channel habitat created by large wood, cobbles, boulders, streamside vegetation, and undercut banks; deep pools; and waterways free of barriers. Healthy riparian areas maintain adequate temperature regulation, nutrient cycles, natural erosion rates, and provide for in stream wood recruitment.

In general, the aquatic MIS have similar stream and riparian ecosystem requirements. However, they do represent a range of minor differences in habitat conditions found and utilized across the MNF. As an example, bull trout require slightly colder water when compared to redband trout. Because the habitat requirements for each species are generally similar and often overlap, they were collectively chosen to represent healthy stream and riparian ecosystems. All aquatic MIS on the Blue Mountain Ranger District of the MNF are currently listed as Threatened or Sensitive.

Analysis Methods

Information for the aquatic analysis was compiled from multiple sources. Region 6 stream survey reports provided existing condition data. Surveys were completed on the following streams between 1992 and 2008: Tincup Creek, Windlass Creek, Little Boulder Creek, Caribou Creek, Vincent Creek, Vinegar Creek, Blue Gulch, Placer Gulch, Davis Creek, Dead Cow Gulch, Deerhorn Creek, Little Butte Creek, eastern tributary to Little Butte Creek, and the Middle Fork John Day (MFJD) River.

The existing condition for potential fish bearing streams that have not been surveyed was evaluated qualitatively, based on principles of applied fisheries and watershed science, professional judgment and knowledge of the area. Other sources of information considered for this report include field trips to perennial portions of fish bearing streams within the project area, the forest GIS system providing spatial and tabular data, Forest water temperature monitoring data, streamnet.org, discussions with the Oregon Department of Fish and Wildlife (ODFW) personnel from the John Day Watershed District, and discussions with personnel from the Confederated Tribes of the Warm Springs Reservation of Oregon. A biological evaluation was completed and is found in the project record. Analysis for aquatic habitat was conducted by analyzing at the impacts of the action from each alternative on the six aquatic habitat elements.

Existing Condition for Aquatic Habitat

For over 100 years lands within the project area have been subjected to a variety of land-use activities. Practices have included past silvicultural treatments, fire suppression, prescribed fire, road construction, and livestock grazing on public and private land, in addition to wildfire throughout the landscape. These activities have reduced aquatic species habitat quality, and complexity of streams within the analysis area. Past logging and road construction in the riparian areas have reduced canopy cover in some areas, resulting in less shade over streams.

Roads in the project area that occur within 100 feet of streams or cross streams commonly impact fish and fish habitat more than roads located in uplands. Approximately 72% of roads in RHCAs in the project area are native surface roads which contribute fine sediment to streams that adversely affect aquatic habitat. Total open and closed road densities are approximately 3.3 mi/mi^2 (Table 42). There are approximately 40 miles of roads in the project area that impact streams due to proximity (100 feet or

less). These conditions reduce availability of subsurface cool water storage and have caused streams to become disconnected from floodplains.

Road-stream crossings have impacted local stream channels and water quality. Some crossings were poorly designed with improperly sized culverts and misalignment relative to the natural stream channel. The biggest concern associated with the road system is sediment delivered to streams from hydrologically connected disturbed areas.

Past grazing management practices (prior to the Forest Plan in 1990) impacted existing aquatic habitat and water quality due to reductions in shade and bank-stabilizing wetland vegetation, stream bank alteration, increases in width-to-depth ratios and fine sediment levels. Improved management practices, on both private land (such as the corridor fence along the Middle Fork on Confederated Tribes of Warm Springs land) and Forest Service land, have resulted in improved aquatic conditions.

Recreation has contributed to impacts to streams due to road development providing increased access to the project area for hunting, fishing, hiking, firewood cutting, and dispersed camping. In the fall deer and elk hunting are popular recreation activities within much of the project area. Dispersed campsites have impacts to aquatic habitat and use of these sites varies throughout the year, with the majority of sites showing heaviest use during the fall hunting season, coinciding with fall spawning of bull trout and Chinook salmon.

Six habitat elements:

Important aquatic habitat elements as defined by PACFISH and Forest Plan amendment 29, include 1) pool frequency, 2) water temperature and stream shading, 3) large woody debris, 4) embeddedness and fine sediment, 5) width-to-depth ratio, and 6) bank stability. These habitat elements are important in maintaining aquatic habitat function and health.

Pool Frequency

Pool frequency is a gage of aquatic habitat diversity, and is an indicator of the degree to which streams are capable of supporting a varied and complex community of fish species. Pools are important for providing rearing habitat for juvenile fish and cool-water refuge areas for adult fish during periods of low flow and elevated temperatures. Deep pools provide important habitat for fluvial bull trout and adult Chinook salmon and steelhead.

Stream surveys indicate that Forest Plan and PACFISH standards are not being met. Pool spacing is higher for reaches compared to potential channel types in the analysis area. This indicates a loss of pool habitat as a result of past management activities, especially riparian logging and channel modification during railroad logging and road building.

Water Temperature and Stream Shading

Water temperature influences the metabolism, behavior, and health of fish and other aquatic organisms. Fish can survive at temperatures near extremes of suitable temperature ranges; however, growth is reduced at low temperatures because all metabolic processes are slowed. At the opposite extreme, growth is reduced at high temperatures because most or all energy from food must be used for maintenance needs.

Riparian stream shading is critical in regulating water temperature extremes and providing in-stream cover against predation. Vegetation along streams in the project area is highly variable. Only a few streams have stands of large trees with closed canopies stretching along the stream. Most streams have a patchy distribution of forest and non-forest open vegetation types. The presence of stringer meadows in the project area, instead of forest vegetation, contributes to high stream temperatures from an increase in solar exposure.

Mean maximum water temperatures are above the suitable range for salmonid species present during summer months in the project area. The Forest Plan standard for water temperature is for no measurable increase in maximum water temperature, and the PACFISH riparian management objective (RMO) is for maximum water temperatures below 64°F within migration and rearing habitat and below 60°F within spawning habitats. The average 7 day maximum stream temperature in eight streams across the project area range from 59-68°F in upper stream reaches which typically have spawning habitat and 75-85°F in lower stream reaches which typically have migration and rearing habitat.

Large Woody Debris

Large woody debris (LWD) plays an important role in forested stream reaches by dissipating stream energy, trapping sediment, and forming pools. Riparian forests, especially individual trees that are within ½ to ¾ tree length of the stream channel, produce LWD that is recruited into a stream where it creates critical habitat features for aquatic species. Forest Plan amendment 29 specifies a range in the number of pieces of LWD to be maintained for each mile of stream in certain ecotypes. Standards for LWD are located in the aquatics specialist report.

Timber has been harvested from areas adjacent to streams in the analysis area. In the past, firewood was taken from streamside areas. In extreme cases, large increases in peak flows and large increases in channel width resulted in destabilization of in-stream pieces and subsequent transport downstream thus resulting in a decrease in LWD. Stream surveys indicate that Forest Plan and PACFISH standards for LWD are not being met in Tincup Creek, Placer Gulch, Davis Creek, Dead Cow Gulch, and the MFJD River. Forest Plan standards for LWD are not being met in Windlass Creek, Little Boulder Creek, Caribou Creek, Vincent Creek, Vinegar Creek, Blue Gulch, and eastern tributary to Little Butte Creek.

Embeddedness and Fine Sediment

Composition of the stream substrate is an important feature of aquatic habitat. Cobble and gravel substrates provide habitat for macroinvertebrates as well as eggs and early life stages of numerous fish species. Macroinvertebrates represent a substantial portion of the diet available to fish. Filling of interstitial spaces (i.e. the gaps between rocks on the stream bottom) with fine sediment (particles < 2 mm in size) eliminates habitat for many macroinvertebrates. Fish eggs, early life stages, and winter habitat for juvenile salmonids can also be buried and smothered when interstitial spaces are embedded with fine sediment.

Of the 7 surveyed streams in the analysis area where pebble count data was available, fine sediment was high in Tincup Creek and Dead Cow Gulch. Little Boulder Creek, Caribou Creek, Vincent Creek, Deerhorn Creek, and eastern tributary to Little Butte Creek and did not meet Forest Plan standards in 1992-1993. These conditions persist today. The likely sources for fine sediment are activities in riparian areas, including channel modification from railroad logging, channel erosion, livestock grazing (especially past grazing), and roads. Several roads in the project area have been identified as potential sources of fine sediment.

Width-to-Depth Ratio

Forest Plan standards for width-to-depth ratios are based on wetted width and depth. A large wetted width-to-depth ratio indicates a wide and shallow stream channel. Wide and shallow streams are prone to increases in stream temperatures due to high surface area to volume ratio and provide little habitat for fish, due to the lack of water depth.

Stream surveys indicate that Forest Plan and PACFISH standards wetted width-to-depth ratios are met in Tincup Creek, Little Boulder Creek, Vincent Creek, Blue Gulch, Deerhorn Creek, Little Butte Creek, and eastern tributary to Little Butte Creek; they are not met in Windlass Creek, Caribou Creek, Vinegar Creek, Placer Gulch, Davis Creek, Dead Cow Gulch, and the MFJD River.

Windlass Creek, Caribou creek, and Dead Cow Gulch have intermittent to very low perennial flows which result in less growth of bank-stabilizing vegetation. With less stream bank vegetation the creeks are wide and shallow with a high width-to-depth ratio. Water withdrawals from the MFJD River for irrigation decrease summer flow a small amount, and contribute to an increase the wetted width-to-depth ratio in the MFJD River.

Bank Stability

The PACFISH standard for stream bank stability is for 80% of banks to be stable. Channel types differ in their sensitivity to management activities due to differences in bank erosion potential and the influence of streamside vegetation on bank stability. Stream surveys indicate that PACFISH standards for bank stability, is being met in all streams in the project area where stream survey data are available. Forest Plan standards for bank stability are not being met in Little Boulder Creek and Deerhorn Creek.

Direct and Indirect Effects by Alternative

Aquatic habitat can be potentially impacted from the types of activities being proposed. Primarily, activities within RHCA buffers have the highest likelihood of causing habitat impacts that could affect fish species. Proposed activities within RHCAs include road decommissioning with the purpose of relocating certain road segments away from streams to minimize impacts to streams and fish. Use of some roads within RHCAs would occur during logging operations including road construction, reconstruction, maintenance, and product haul which could contribute sediment to streams. Installation of fish passage culverts within RHCAs on two fish bearing streams is proposed, which would likely deliver and mobilize sediment in those streams. Aspen restoration is proposed in some aspen stands located within RHCAs. Prescribed fire ignition would occur within some RHCAs and would be allowed to back into RHCAs in some places during underburning operations.

The six habitat elements have the potential to be impacted from various disturbances. Pool habitat can be reduced when pool forming elements such as LWD are reduced, large increases in fine sediment, or changes in channel morphology (e.g. widening or straightening) occur. Stream temperatures increase following disturbance to riparian vegetation (i.e., harvest, grazing, or wildfire) (Beschta and Taylor 1988). Width-to-depth ratios change with increases in peak flows, decreases in low flows, direct bank alteration, and increases in sediment. Conversely, reductions in these factors can lead to reductions in width-to-depth ratios. Bank stability can be directly affected by mechanical damage to banks or indirectly through changes in bank vegetation. Increases in fine sediment can occur from both transport of fine sediment from upland areas and destabilized stream banks. Increases can result from both episodic sources such as wildfires or from chronic sources such a native surface roads. Episodic sources normally result in short-term increases that return to pre-disturbance levels through recovery processes. Chronic sources can result in long-term changes of stream channels and aquatic habitat.

Alternative 1 – No Action

Under Alternative 1, there are no proposed activities, resulting in no activity-related benefits or impacts to aquatic species and their habitat. Effects on the six habitat elements are as follows. This alternative would maintain pool levels below standards. Levels of stream shading would be maintained at the current rate. Water temperatures would likely remain the same due in part to the influence of valley bottom roads on streamside vegetation. Amounts of large woody debris would be maintained below standards for the streams that have been surveyed showing low levels. Large woody debris (LWD) is likely to increase over the next 25 years as conifers die and fall into streams.

The current levels of embeddedness and fine sediment would be maintained. Existing fine sediment levels are having an adverse affect on aquatic habitat including reduced spawning success for salmonids and reduced quality of winter habitat for juvenile salmonids. By not moving the road segments out of riparian

areas or replacing the Davis Creek ford with a fish passage culvert, as proposed under Alternatives 2 and 4, sediment would continue to be deposited directly into streams. This continued sediment flow would result in filling the interstitial spaces between substrate reducing habitat for macroinvertebrates, a food source for fish.

The current width-to-depth ratios would be maintained, which do not meet standards for around half of the surveyed streams. The elevated ratios have adverse effects to aquatic habitat primarily through resulting elevated stream temperatures. Roads within riparian areas are influencing stream channel morphology of several of these streams and the intermittent to very low perennial flows in Windlass Creek, Caribou Creek, and Dead Cow Gulch make establishment and growth of riparian vegetation even more difficult. Bank stability would remain at current levels, which is generally sufficient in the project area.

Alternative 2, 3, 4

Timber Harvest

Timber harvest units, landings (including helicopter landing zones in Alternative 4), grapple and hand piling areas, and temporary roads would not be located within RHCAs under Alternatives 2, 3, and 4. RHCA widths are of a sufficient distance so as to prevent adverse impacts to all six habitat elements from these activities occurring outside of RHCAs.

The amount of haul routes within RHCAs by alternative would be 13.0 miles in Alternative 2, 11.6 miles in Alternative 3, and 13.8 miles in Alternative 4. Danger trees would be felled along haul routes and would vary by alternative based on the miles of haul routes. Danger trees felled within or into RHCAs would be felled into the stream where feasible, left within the RHCA, or transported off-site for watershed restoration projects. Water withdrawals from streams for dust abatement during log haul activities would occur on Clear Creek, Bridge Creek, Vinegar Creek, and on the MFJD River approximately ¼ mile downstream from the confluence with Tincup Creek. Water withdrawals would be in accordance with the project design criteria, including NMFS guidance, resulting in no impacts to all six habitat elements.

New road construction within RHCAs would occur only under Alternatives 2 and 4. Under Alternative 2, 0.1 miles of new roads would be within RHCAs and under Alternative 4 there would be 0.2 miles in RHCAs. Alternative 4 includes installation of a fish passage culvert on a new crossing of Deerhorn Creek and associated new road construction within the RHCA. Related activities to road maintenance and reconstruction would occur on a stream crossing on Windlass Creek and immediately adjacent to Davis Creek. Conifers felled within or into RHCAs would be felled into streams where feasible, left within the RHCA, or transported off-site for watershed restoration projects.

Prescribed Fire

Prescribed fire activities in RHCAs, would mimic low intensity fires characteristic of natural burning patterns that tend to occur in riparian areas. Ignition would occur outside some RHCAs and be allowed to back into RHCAs from adjacent upslope areas. Some ignition would occur within RHCAs but would not occur within 100 feet of the stream channel. These techniques would result in a patchy distribution of burned and unburned areas in RHCAs, based on the forests past experience with underburning in RHCAs using the same technique. Prescribed burning would occur when moisture and climate conditions would minimize potential for a high intensity burn. Mortality of understory trees would occur in burned patches but few overstory trees would be killed. Methods would be implemented as described in the fuels implementation measures, to protect large trees, prevent fire intensities that would be high enough to consume trees or downed wood large enough to function as LWD in stream channels, and retain at least 95% of the shrub and tree shade directly shading perennial streams. Further, no firelines would be constructed within RHCAs.

Road Closures and Decommissioning

Road closures and decommissioning are proposed in RHCAs under all action alternatives. Closed roads remain on the forest roads system and are left in a stable condition and maintained. Decommissioned roads are removed from the forest roads system and the impacts of the road on the environment are reduced to an acceptable level. The goal of decommissioning is to leave the road in a "hydrologically disconnected" state and convert the former roadway to other resource use. Watershed design criteria identify specific measures for decommissioning. Roads would be decommissioned within RHCAs on fish-bearing reaches of Windlass, Vincent, Vinegar, and Davis creeks.

Aspen Restoration

Under all action alternatives, conifers less than 21 inches dbh would be pre-commercially thinned from up to 100 feet outside of aspen stands to encourage expansion of the stands. Some conifers would be girdled and left as snags including trees larger than 21 inches dbh and any conifers within 25 feet of stream channels. Smaller diameter trees and slash from larger trees would be cut, hand piled and burned, or left to provide a protective barrier to ungulate grazing. Fences would also be constructed around aspen stands to reduce livestock grazing pressure. No heavy equipment would be operated within RHCAs and no off road vehicles would be used within 100 feet of streams. The 28 aspen stands total around 17 acres, about 6.3 acres of which are within RHCAs. Around 2 acres are within Category 1 RHCAs, although a larger acreage of RHCAs would be treated due to work extending up to 100 feet outside the stands. Conifers felled within or into RHCAs would be felled into streams where feasible, left within the RHCA, or transported off-site for watershed restoration projects.

Habitat Elements

Pool Frequency

Timber Harvest
Felling danger trees for safety and road construction would reduce the supply of LWD to stream channels and indirectly effect pool habitat if they cannot be felled into the stream. Where trees are felled into the stream, they may create pools.

Prescribed Fire
Methods used would protect large trees and prevent fire intensities high enough to consume trees or downed wood large enough to function as LWD in stream channels. Burning activities would not result in a reduction of pool habitat.

Road Closures and Decommissioning
Activities would not remove trees that could function as LWD in stream channels; therefore reductions in existing pool habitat would not occur. Conifers would be planted in decommissioned road segments in RHCAs as part of the decommissioning process. Over the long-term (70 to 100 years) LWD would increase as conifers become established and grow to a size that enables them to function as LWD and therefore increase pool habitat in the future.

Aspen Restoration
Aspen restoration treatments would not likely result in adverse impacts to existing and future pool habitat due to the scale of treatments. Trees may be felled into stream channels and create pool habitat. The reduction in stocking densities following treatments would increase new growth of aspen and the vigor of larger aspen in the overstory for future LWD.

Water Temperature and Stream Shading

Timber Harvest
Tree removal for road construction and reconstruction activities would not likely result in a measurable increase in water temperature of Category 1, 2, or 4 RHCA stream channels. Where possible, conifers

would be dropped across the channel, which would provide cover and some additional shade, as well as potentially raising the water table. Further, only a small percentage of conifers removed would be close enough to the channel to affect shading.

Prescribed Fire
With a low intensity burn, very little stream vegetation providing shade is expected to be consumed under the more moist conditions encountered in riparian areas associated with perennial streams. Any loss of shade would be under 5% and is not expected to have any effect on stream temperature.

Road closures and Decommissioning
Road decommissioning and closure actions would not have any immediate effect on shade. Conifers would be planted in decommissioned road segments as part of the decommissioning process. Over the long-term (50 to 70 years) shading would increase as conifers become established.

Aspen Restoration
Most thinning in these small areas would occur away from streams towards the uplands. Additionally, girdling of conifers within 25 feet of these streams would preserve the majority of shade, due to narrow stream width and short time period between needles falling off conifers and new growth of aspen. Under the most extreme case, shade may be reduced down to a minimum 30% within the small portions of the aspen treatment areas. Where possible, conifers would be dropped across the channel, which would provide cover and some additional shade, as well as potentially raising the water table to further facilitate aspen restoration. As a result of the silviculture prescription to release shade for the expansion and accelerated growth of these aspen stands, it is expected that heights and densities of the units should be sufficient to return baseline shade conditions within 10 to 15 years.

After the first 10 to 15 years, shade is expected to improve beyond baseline. Other benefits include improved resiliency to fire within these aspen stands, an increase in deciduous leaf litter, bank root strength, an increase in riparian under and overstory complexity, and an increase in both width and length of a true riparian community. As a result, it is expected that a 10 to 15 year reduction in shade may impact habitat through an increase in solar radiation resulting in minor changes to the riparian microclimate. These changes in stream water temperature are not likely to be measurable.

Large Woody Debris

Timber Harvest
Felling danger trees for safety and road construction would reduce the supply of LWD to stream channels if they cannot be felled into the stream. Where trees are felled into the stream, they may create pools.

Prescribed Fire
Fire intensities would not be high enough to consume trees or downed wood large enough to function as LWD in stream channels. The reduction in stocking densities following burning activities would increase the vigor of larger trees in the overstory. Consumption of coarse wood near stream channels greater than 4” dbh would be minimized. Beche et al. (2005) found that prescribed fire did not change the amount or movement of LWD in their study reach relative to unburned streams.

Road closures and Decommissioning
Activities would not include removal of trees that could function as LWD in stream channels. Conifers would be planted in decommissioned road segments in RHCAs as part of the decommissioning process. Over the long-term (70 to 100 years) LWD would increase as conifers become established and grow to a size that enables them to function as LWD in the future.

Aspen Restoration
Aspen restoration treatments would not likely result in adverse impacts to LWD due to the scale of treatments, trees felled within RHCAs would be felled into stream channels where feasible and become LWD, girdled trees with potential to fall into stream channels would eventually fall naturally, and thus LWD development may be accelerated in the short term. The reduction in stocking densities following

treatments would increase new growth of aspen and the vigor of larger aspen in the overstory for future LWD.

Embeddedness and Fine Sediments

Timber Harvest

Road maintenance may decrease chronic sedimentation in some locations. Improving drainage, removing ruts and rills from the driving surface, and adding less erosive surfacing material would reduce detachment and transport of sediment. This is especially important for roads within RHCAs. Proposed road maintenance, road construction, road reconstruction, and haul activities in RHCAs would likely result in creation and transport of a negligible amount of fine sediment to stream channels due to loosening of sediment particles and destruction of ground cover by maintenance, reconstruction, construction, and haul. However, project design criteria would be implemented during these activities, and are expected to limit fine sediment delivery to streams, keeping amounts reaching stream channels to negligible levels for other than rare precipitation events. There is a short-term risk of mobilizing and/or delivering sediment to streams during and shortly after culvert installation activities on Davis Creek under Alternatives 2 and 4, and Deerhorn Creek under Alternative 4. Design criteria include those identified in the National Marine Fisheries Service (NMFS) 2008 and U.S. Fish and Wildlife Service (FWS) 2007 Aquatic Restoration Programmatic Biological Opinion (ARBO) as well as design criteria developed by the Blue Mountain Ranger District interdisciplinary team. The ARBO PDCs specific to this project will be implemented as described in the NMFS 2008 and FWS 2007 ARBOs regardless of any changes that occur through subsequent revisions in Appendix E. In addition, Reasonable and Prudent Measures (RPMs) and Terms and Conditions (T&Cs) from ESA section 7 consultation with NMFS and the USFWS are non-discretionary and must be implemented as part of the Galena Project proposed action to minimize the amount or extent of incidental take of bull trout and steelhead. The RPMs and T&Cs are included as Appendix H. The proposed design criteria and RPMs/T&Cs would reduce the probability and magnitude of this short-term risk. After about 2 years, effects of culvert installation are beneficial for water quality and fish habitat, including reduced sediment yield from the road prism.

Prescribed Fire

Fire intensities would not be high enough to consume downed wood that plays a role in trapping fine sediment. Some ground cover would be consumed but would be quickly replaced as litter fall occurs in the first year following burning and herbaceous plants recover in the second year following burning. A measurable increase in fine sediment in stream channels as a result of burning activities is unlikely due to the combination of a patchy, low intensity burn in RHCAs, typical recovery of ground cover within 2 years of burning, and the low erosion potential for the subwatersheds.

Road closures and Decommissioning

Drainage structures would be self-maintaining after closure. Closure of these roads poses a negligible risk of sedimentation to fish bearing streams since dry land "filtration" lies between the closure sites and any streams, and since the amount of land disturbed during gate construction is too small and too flat to produce significant sediment. However, since these roads are being kept as part of the forest road system, the benefits of the closures would likely not be “permanent”.

There is a short-term risk of generating sediment during and shortly after decommissioning activities which could reach streams, primarily in the vicinity of stream crossings where culvert removal, scarification, or subsoiling is needed to discourage vehicle use and improve infiltration. Design criteria include culvert removal guidelines, as well as standard contract clauses, which incorporate BMPs. The proposed design criteria and application of BMPs would reduce the probability and magnitude of this short-term risk. After about 2 years, effects of road decommissioning are beneficial for water quality and fish habitat. The improved infiltration and ground cover condition of the decommissioned roads would help restore natural watershed function, including reduced sediment yield from the road prism.

Aspen Restoration

Since proposed aspen restoration treatments do not involve ground-disturbing activities, inputs of fine sediment are not expected to occur.

Width-to-Depth Ratio

Timber Harvest
Proposed road maintenance, road construction, road reconstruction, and haul activities in RHCAs would likely result in minor impacts to stream bank stability, however these impacts would not be of a scale that would result in destabilization of stream channels or result in increased width-to-depth ratios. Project design criteria would be implemented during these activities, and are expected to limit impacts to bank stability and width-to-depth ratios.

Prescribed Fire
Minor impacts to stream bank stability would occur as a result of prescribed burning activities in RHCAs. However, these impacts would not be of a scale that would result in destabilization of stream channels or result in increased width-to-depth ratios.

Road closures and Decommissioning
Activities would likely result in minor reductions in stream bank stability; however these impacts would not be of sufficient size or quantity to result in an overall decrease in bank stability or increase in width-to-depth ratios. Fine sediment from decommissioning activities is unlikely to result in destabilization of stream channels. Therefore, proposed road closure and decommissioning activities would not result in increases in current width-to-depth ratios.

Aspen Restoration
Since proposed aspen restoration treatments do not involve ground-disturbing activities, destabilization of stream channels and resulting increased width-to-depth ratios are not expected to occur.

Bank Stability

Timber Harvest
Proposed road maintenance, road construction, road reconstruction, and haul activities in RHCAs would likely result in minor impacts to stream bank stability, however these impacts would not be of sufficient size or quantity to result in an overall decrease in bank stability. Project design criteria would be implemented during these activities, and are expected to limit impacts to bank stability.

Prescribed Fire
Some stream bank vegetation would burn during underburning; however, herbaceous plants should recover in the second year following the burning activities. Shrubs in burned areas would likely be top killed but fire intensities would be low enough not to result in complete mortality of shrubs. Stream bank stability would be decreased in burned areas until vegetation recovers. However, it is unlikely that burned patches along stream banks would be in sufficient sizes or quantity to result in an overall decrease in bank stability.

Road closures and Decommissioning
Road decommissioning activities in RHCAs directly adjacent to stream channels would likely result in minor reductions in stream bank stability; however these impacts would not be of sufficient size or quantity to result in an overall decrease in bank stability; banks in these areas would be strengthened after about 10 years as planted and naturally generated conifers grow.

Aspen Restoration
Since proposed aspen restoration treatments do not involve ground-disturbing activities, decreased bank stability is not expected to occur.

Existing Condition and Effects by Alternative for Aquatic Species

There are 5 species of fish that are listed by the Endanger Species Act (ESA), Forest Service Region 6 sensitive species, Malheur NF management indicator species, or by the Magnuson-Stevens Act for habitat that occur in the project area. Two species also have critical habitat designated in the project area. There are additionally one frog species, one mussel, and one snail that are listed as sensitive species. Table 24 lists these species, along with the biological determinations by alternative. The rationale for effects to aquatic species described below builds upon the previous discussions on effects to aquatic habitats in the project area. The biological determination displayed in Table 24 is the effect call to the aquatic species based on the impacts to both the species and their habitat from the proposed project activities. Due to similarities in information considered for Threatened, Endangered, Region 6 Sensitive, and Management Indicator Species analyses, this information is consolidated within individual species narratives below.

Table 24. Aquatic species with effect determinations by alternative

Aquatic Species	Status[2]	Alt. 1[2]	Alt. 2[2]	Alt. 3[2]	Alt. 4[2]
Mid-Columbia River Steelhead *Oncorhynchus mykiss*	T, S	NE	LAA- BE	LAA - BE	LAA - BE
Mid-Columbia Steelhead Designated Critical Habitat	D	LAA	LAA - BE	LAA - BE	LAA - BE
Interior Redband Trout *O. mykiss gairdneri*	S	NI	MIIH - BI	MIIH - BI	MIIH - BI
Columbia River Bull Trout *Salvelinus confluentus*	T, S	NE	LAA - BE	LAA- BE	LAA- BE
Columbia River Bull Trout Designated Critical Habitat	D	NE	LAA- BE	LAA- BE	LAA- BE
MCR Spring-run Chinook Salmon EFH[1]	MS	NAE	MAA	MAA	MAA
Columbia spotted frog *Rana luteiventris*	S	NI	MIIH - BI	MIIH - BI	MIIH - BI
Western Ridged Mussel *Gonidea angulata*	S	NI	MIIH - BI	MIIH - BI	MIIH - BI
Shortface Lanx (snail) *Fisherola nuttalli*	S	NI	MIIH - BI	MIIH - BI	MIIH - BI
Westslope Cutthroat Trout *Oncorhynchus clarki lewisi*	S	NI	NI	NI	NI

[1]*Chinook salmon waters are designated Essential Fish Habitat by the Magnuson-Stevens Act.*

[2]*See below for an explanation of the abbreviations:*

T	*Federally Threatened*
S	*Sensitive species from Regional Forester's list*

C	*Candidate species under Endangered Species Act*
MIS	*Management Indicator Species*
D	*Designated Critical Habitat*
P	*Proposed Critical Habitat*
MS	*Magnuson-Stevens Act designated Essential Fish Habitat*
NE	*No Effect*
NLAA	*May Effect, Not Likely to Adversely Affect*
LAA	*May Effect, Likely to Adversely Affect*
BE	*Beneficial Effect*
NI	*No Impact*
MIIH	*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*
WIFV	*Will Impact Individuals or Habitat 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*
BI	*Beneficial Impact*
NE	*No Effect*
LAA	*May Effect, Likely to Adversely Affect*
NLAA	*May Effect, Not Likely to Adversely Affect*
NAE	*No Adverse Effect*
MAA	*May Adversely Affect*

Other aquatic species documented within or downstream of the aquatic analysis area include nongame fish such as northern pikeminnow (Ptychocheilus oregonensis), mountain whitefish (Prosopium williamsoni), sucker species (Catostomus macrocheilus or C. columbianus), speckled dace (Rhinichthys osculus), longnose dace (Rhinichthys cataractae), redside shiner (Richardsonius balteatus), sculpin (Cottus spp.), and pacific lamprey (adults and amocoetes – Lampetra tridentata). Westslope cutthroat trout (Oncorhynchus clarkii lewisi) (R6 Sensitive, MIS), are not present in the project area and do not have habitat in the project area; therefore, this species will not be discussed further in this Biological Evaluation.

Steelhead

Population and Habitat

Middle Columbia River (MCR) steelhead were listed by NMFS as Threatened under the federal ESA on March 25, 1999 (64 FR 15417). MCR steelhead is also a MNF MIS species. Critical habitat for MCR steelhead (present in project area) was re-designated on September 2, 2005 (70 FR 52630).

MCR steelhead are widely distributed in the MFJD River Subbasin. Spawning and rearing takes place in all major tributaries of the MFJD River. Habitat for MCR steelhead in the aquatic analysis area is

currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the aquatic analysis area to support MCR steelhead.

MCR steelhead utilize the MFJD River for migration, (during years when water conditions are favorable), spawning and juvenile rearing habitat. Spawning and juvenile rearing habitat are also present in Windlass Creek, Little Boulder Creek, Caribou Creek, Vincent Creek, Vinegar Creek, Blue Gulch, Placer Gulch, Davis Creek, Deerhorn Creek, Little Butte Creek, eastern tributary to Little Butte Creek, and their tributaries. Steelhead occupy approximately 42.7 miles of habitat within the project area, which represents approximately 10.4% of available habitat on the MNF. The project area is situated in the north-central area of available habitat on the MNF.

Critical Habitat

Critical habitat for MCR steelhead was redesignated on September 2, 2005 (70 FR 52630). Under the 2005 rule, Tincup Creek, Windlass Creek, Little Boulder Creek, Caribou Creek, Vincent Creek, Vinegar Creek, Placer Gulch, Davis Creek, Deerhorn Creek, Little Butte Creek, eastern tributary to Little Butte Creek, and the MFJD River have been designated as critical habitat for MCR steelhead. Of these streams, only Tincup Creek is not known to be currently occupied by steelhead. Designated Critical Habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line (33 CFR 319.11). In areas where ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation.

Alternative 1

Determinations

- Mid-Columbia Summer Steelhead ESA Determination (T): No Effect (NE).
- Mid-Columbia Summer Steelhead Sensitive Species Determination (S): No Impact (NI)
- Steelhead Management Indicator Species Determination (MIS): No Impact to Viability
- Steelhead Designated Critical Habitat ESA Determination (D): No Effect (NE).

Rationale

Habitat for MCR steelhead in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the aquatic analysis area to support MCR steelhead. Alternative 1 proposes no new activities, resulting in no activity-related benefits or impacts to aquatic species and their habitat.

Alternative 2

Determinations

- Mid-Columbia Summer Steelhead ESA Determination (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.
- Mid-Columbia Summer Steelhead Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
- Steelhead Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.

- Steelhead Designated Critical ESA Habitat (D): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Rationale

Habitat for MCR steelhead in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the aquatic analysis area to support MCR steelhead.

Under Alternative 2, use of riparian roads for haul would result in increases in fine sediment during use. Short-term increases in fine sediment from haul and all activities, other than road decommissioning and culvert installation, are unlikely to result in measurable increases in fine sediment to stream channels. Implementation of the project design criteria, along with fairly level, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible. Since all thinning units are outside RHCAs, there would be no effects to fish habitat from activities inside the harvest units.

Under Alternative 2, there is a short-term risk of generating sediment during and shortly after road decommissioning which would likely reach streams, and could affect fish and fish habitat in those streams. This risk is primarily associated with decommissioning of roads immediately adjacent to streams and at stream crossings. The proposed design criteria (including those identified in the ARBO) application of BMPs and implementation of RPMs and T&Cs from ESA section 7 consultation would reduce the probability and magnitude of this short-term risk. The proposed road decommissioning activities would result in a lasting decrease in fine sediment levels in the analysis area, starting about 2 years after decommissioning. Since road decommissioning activities are similar for all action alternatives it is unlikely that there would be measurable differences among action alternatives.

There is a short-term risk of mobilizing and/or delivering sediment to streams during and shortly after culvert installation activities. Design criteria include those identified in the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) Aquatic Restoration Programmatic Biological Opinion (ARBO) as well as design criteria developed by the Blue Mountain Ranger District interdisciplinary team and RPMs/T&Cs from ESA section 7 consultation. These design criteria and RPMs/T&Cs are included in Appendices of the EIS. The RPMs/T&Cs and proposed design criteria would reduce the probability and magnitude of this short-term risk. After about 2 years, effects of culvert installation are beneficial for water quality and fish habitat, including reduced sediment yield from the road prism.

The literature reports that suspended sediment and turbidity influences on fish range from beneficial to detrimental. Elevated total suspended solids (TSS) have been reported to enhance cover conditions, reduce piscivorous fish/bird predation rates, and improve survival, but elevated TSS have also been reported to cause physiological stress, reduce growth, and adversely affect survival. Although fish that remain in turbid waters experience a reduction in predation from piscivorous fish and birds, chronic exposure can cause physiological stress response that can increase maintenance energy and reduce feeding and growth.

As suspended fine sediment settles out downstream from the construction areas, minor increases in stream substrate embeddedness occurs. The literature reports that increases in fine sediments in stream substrates can decrease productivity and habitat quality for juvenile salmonids. Significant increases in fine sediment levels reduce interstitial spaces between substrate particles, leads to shifts in invertebrate community structure, fills pools, and can entomb redds. In such cases, eggs are smothered, prey available for rearing juveniles is reduced, and habitat features are lost.

When heavy equipment is operating in the riparian areas or stream, there is always the potential for fuel or other contaminant spills. Operation of bulldozers, excavators, and other equipment requires the use 01' fuel and lubricants which, if spilled into the channel of a water body or into the adjacent riparian zone,

can injure or kill aquatic organisms. Petroleum-based contaminants (such as fuel, oil, and some hydraulic fluids) contain polycyclic aromatic hydrocarbons, which can be acutely toxic to salmonids at high levels of exposure and can cause acute and chronic sub-lethal effects on aquatic organisms.

Since work area isolation is required, listed fish will be captured and relocated. Direct effects on juvenile salmonids from work area isolation and fish relocation include mechanical injury during capture, holding, or release, and potential horizontal transmission of disease and pathogens and stress-related phenomena. Stress approaching or exceeding the physiological tolerance limits of individual fish can impair reproductive success, growth, resistance to infectious diseases, and survival. If electro-fishing is used to salvage fish, it will particularly increase stress loads. Harmful effects of electro-fishing include internal and external hemorrhage, fractured spines, and death. Although some listed salmonids will die from electro-shocking, fish will only be exposed to stress caused by work area isolation activities once and the fish relocation is only expected to last a few hours. If construction took place without work area isolation, more fish would be injured or killed.

The Forest Service will implement a suite of conservation measures identified in the ARBO that are intended to reduce the short-term effects caused by near in stream construction. Limiting in stream construction to low flow periods and using sediment control measures greatly reduce the amount of fine sediment and turbidity created by the actions. Refueling and servicing equipment outside the riparian area reduces the chances of spilling toxic fuels and lubricants. Development and implementation of a pollution and erosion control plan limit any potential adverse effects of a toxic material spill by ensuring that spill response materials are on site during all construction activities. Ensuring that all heavy equipment that will operate in stream is cleaned and free of leaks will also reduce the induction of contaminants into the aquatic environment. Also, several conservation measures will be implemented to limit stress and mortality during work area isolation and fish relocation. Limiting the activities to in-stream work periods will greatly reduce the chance of affecting adult fish, as these periods are designated to avoid times when adult salmonids are present.

Culvert installation activities require significant in stream construction, isolation of work area from flowing water, and relocation of fish. The construction related effects described above will occur at the project sites. The Forest proposes to construct culverts using the stream simulation method in which natural stream substrates will be placed in the bottom of these structures. This will permit access to areas critical for fulfilling their life history requirements, especially foraging, spawning, and rearing.

In-water equipment use could temporarily affect salmonids and critical habitat, including impacts on redds smothered or crushed eggs and alevins, increased turbidity and deposition, blocked migration, and disrupted or disturbed overwintering behavior. Summer steelhead within the John Day Basin are particularly vulnerable during the spring, when adult salmon are migrating and spawning. Also, they are vulnerable during the summer when eggs and fry are still present in the substrate. The activities could move juveniles out of overwintering habitats such as side channels and deep pools, into inferior habitats or high velocity waters. However, because of the seasonal restrictions imposed by in-stream work windows, these effects will usually be avoided.

The ARBO conservation measures and design criteria will ensure that new culverts do not constrain the stream channel during flows reaching ordinary high water level. Culverts are restricted to 6 percent gradient due to the difficulties of maintaining natural stream substrates in culverts placed at high gradients. Baffled and other non-typical culverts will not be used. The use of riprap is limited to protection of the outlets and inlets of culverts.

Water withdrawals for dust abatement during haul activities would occur. Water is the only agent that would be used for dust abatement for proposed haul activities. Withdrawal would occur at designated water drafting sources including the Rock Pit at Taylor Flat off Highway 7 approximately 4 miles north of Austin Junction, Clear Creek behind the MNF Blue Mountain Work Center, Bridge Creek at the junction of FR2614 and Highway 26, Vinegar Creek approximately ¼ mile upstream of the confluence with the

MFJD River on FR2000663, and on the MFJD River approximately ¼ mile downstream from the confluence with Tincup Creek. Water drafting could potentially decrease stream flow and thus, the amount of water available for fish. Water drafting could also remove fish from the stream or injure them, if they are held against screens. Water drafting can occur only as long as supply is adequate to provide for both fish and withdrawal. Approved screens would be attached to intake hoses to prevent adverse impacts to fish. NMFS developed criteria for pump intake screens would be used on all water pump intakes. Screen mesh openings shall not exceed 3/32 inch for woven wire or perforated plate screens, or 0.0689 inch for profile wire screens, with a minimum 27% open area. Trucks would be maintained to prevent oil leaks. Loading is done in a manner to minimize overflowing and discharge of wash into stream. The maximum withdrawal from one site in an 8 – hour period would be 18,000 gallons of water. Project design criteria include the NMFS criteria and water drafting guidelines from the 2010 Forest Road Maintenance BA, included as appendices A and B of this Aquatics Specialist Report. These guidelines would prevent the potential harm to fish. Since the Taylor Flat drafting source is not directly connected to fishbearing streams, criteria included in appendices A and B of this biological evaluation are not needed at this site.

Proposed activities (logging, road use, road maintenance, road construction and reconstruction, dust abatement, road decommissioning, road re-opening and closure, prescribed fire, precommercial thinning, activity fuels treatment, and aspen restoration) are unlikely to result in measurable changes in water temperatures, pool frequencies, width-to-depth ratios, LWD, or bank stability.

Because this alternative impacts less than 10.4% of suitable habitat across the Forest, the overall direct, indirect, and cumulative effects (discussed below) will result in a small negative trend of habitat in the short term. The loss of habitat will be insignificant at the scale of the Forest. This alternative is consistent with the Forest Plan, and thus continued viability of steelhead is expected on the Malheur National Forest.

Overall, proposed actions would result in an incremental improvement in habitat conditions for MCR steelhead in the aquatic analysis area. However, high water temperatures and altered stream channel conditions will likely persist.

Alternative 3

Determinations

- Mid-Columbia Summer Steelhead ESA Determination (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.
- Mid-Columbia Summer Steelhead Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
- Steelhead Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.
- Steelhead Designated Critical Habitat (D): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Rationale

Same as Alternative 2, with the exception that no culverts would be installed on Davis Creek and Dead Cow Gulch.

Alternative 4

Determinations

- Mid-Columbia Summer Steelhead ESA Determination (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.
- Mid-Columbia Summer Steelhead Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
- Steelhead Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.
- Steelhead Designated Critical Habitat (D): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Rationale

Same as Alternative 2.

Redband Trout

Population and Habitat

Interior redband trout are a Region 6 sensitive species and a MNF MIS species. Redband trout are the resident form of O. mykiss. Redband trout may or may not be reproductively isolated from steelhead. Redband and steelhead trout from the same geographic area may share a common gene pool.

Currently in the John Day Basin, redband trout are present in the North Fork, Middle Fork, mainstem, and South Fork John Day Rivers and their tributaries. Redband trout are present in all fish-bearing streams in the MFJD River Subbasin. Summer distribution of redband trout is generally limited to headwater areas.

Redband trout are present in all fish bearing streams in the aquatic analysis area however their population abundance is unknown. Spawning and rearing habitat is present in all fish-bearing streams in the analysis area, with the MFJD River also serving as a migratory corridor. Their distribution within the analysis area, and habitat needs, are similar to those of steelhead. However, redband spawning may occur in areas with insufficient flow for steelhead spawning. Redband trout occupy approximately 42.7 miles of habitat within the project area, which represents approximately 3.9% of available habitat on the MNF. The project area is situated at the northern edge of available habitat on the MNF.

Alternative 1 – No Action

Determinations

- Interior Redband Trout Sensitive Species Determination (S): No Impact (NI).
- Redband Trout Management Indicator Species Determination (MIS): No Impact to Viability

Rationale

Habitat for redband trout in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the aquatic analysis area to support redband trout. Alternative 1 proposes no new activities, resulting in no activity-related impacts or benefits to aquatic species and their habitat.

Alternative 2

Determinations

- Interior Redband Trout Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
- Redband Trout Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.

Rationale

Except for anadromous migration, the impacts from this project on redband trout and their habitat are considered equivalent to those described for MCR Steelhead. Since the population is well distributed throughout the Malheur National Forest and Galena Project Area, the impacts of all project activities are short-lived, and culvert installations and road decommissioning within or immediately adjacent to fishbearing streams would occur outside of the spawning and egg development period, the overall direct, indirect, and cumulative effects of this alternative will result in only a small short-term negative trend of habitat. This alternative impacts less than 3.9 percent of suitable redband trout habitat in relation to the distribution throughout the Malheur National Forest. The short-term loss of habitat will be insignificant at the scale of the Forest. As such, the implementation of the project may impact individuals or habitat, but would not likely contribute toward federal listing or cause a loss of viability to the population or species at the Forest scale.

Overall, proposed actions would result in an incremental beneficial impact in habitat conditions for redband trout in the aquatic analysis area. However, high water temperatures and altered stream channel conditions will likely persist.

Alternative 3

Determination

- Interior Redband Trout Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
- Redband Trout Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.

Rationale

Same as Alternative 2, with the exception that no culverts would be installed on Davis Creek and Dead Cow Gulch.

Alternative 4

Determinations

- Interior Redband Trout Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
- Redband Trout Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.

Rationale

Same as Alternative 2.

Bull Trout

Population and Habitat

Columbia River Basin bull trout were listed by the FWS as Threatened under the ESA on June 10, 1998 (63 FR 31647). The Galena Project Area is located in the John Day bull trout subpopulation area.

Bull trout are seasonally present in the MFJD River. Bull trout use the MFJD River as a migration corridor and for winter rearing habitat. Bull trout may be present in Vinegar Creek and Davis Creek as these streams are listed as historical bull trout habitat (Buchanan et al 1997) and incidental sightings have occurred within these streams in the past. Bull trout occupy approximately 17.4 miles of habitat within the project area, which represents approximately 8.2% of available habitat on the MNF. The project area is situated at the northern edge of available habitat on the MNF.

Critical Habitat for Bull Trout

The FWS published a proposed rule revising designation of critical habitat for bull trout on January 14, 2010 (75 FR 2270). The final critical habitat rule was published in the federal register October 18, 2010, taking effect November 17, 2010. Streams within the analysis area designated as critical habitat for bull trout include Vinegar Creek and the MFJD River.

Alternative 1

Determination

- Columbia River Basin Bull Trout ESA Determination (T): No Effect (NE).
- Columbia River Basin Bull Trout Sensitive Species Determination (S): No Impact (NI)
- Bull Trout Management Indicator Species Determination (MIS): No Impact to Viability.
- Bull Trout Designated Critical Habitat ESA Determination (D): No Effect (NE)

Rationale

Habitat for bull trout in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the aquatic analysis area to support bull trout. The reduced number of large deep pools in the Middle Fork limits the number of resting pools available for migrating fluvial bull trout. Alternative 1 proposes no new activities, resulting in no activity-related benefits or impacts to aquatic species and their habitat.

Alternatives 2

Determination

- Columbia River Basin Bull Trout ESA Determination (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.
- Columbia River Basin Bull Trout Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

- Bull Trout Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.
- Bull Trout Designated Critical Habitat (D): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Rationale

Habitat for bull trout in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the aquatic analysis area to support bull trout.

The impacts from this project on bull trout and their critical habitat are considered reduced when compared with those described for MCR steelhead and their critical habitat, due largely to minor overlap of the project area with the species and its critical habitat.

Under Alternative 2, use of riparian roads for haul may result in short-term, non-measurable increases in fine sediment during use. Project design criteria, along with fairly level, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible. Since all thinning units are outside RHCAs, there would be no effects to fish habitat from activities inside the harvest units.

Under Alternative 2, there is a short-term risk of generating sediment during and shortly after road decommissioning which would likely reach streams, and could affect bull trout and their habitat in those streams. This risk is primarily associated with decommissioning of roads immediately adjacent to streams and at stream crossings. The proposed design criteria, application of BMPs and implementation of RPMs and T&Cs from ESA section 7 consultation, would reduce the probability and magnitude of this short-term risk. Expected short-term increase in fine sediment from tributaries will not be of a magnitude to result in a loss of deep pool habitat in the MFJD River which is considered bull trout migrating and overwintering habitat. The proposed road decommissioning activities would result in a lasting decrease in fine sediment levels in the analysis area, starting about 2 years after decommissioning. Since road decommissioning activities are similar for all action alternatives it is unlikely that there would be measurable differences among action alternatives. No culvert installation is proposed within or adjacent to bull trout occupied or critical habitat.

Water withdrawals for dust abatement during haul activities would occur. Water is the only agent that would be used for dust abatement for proposed haul activities. Withdrawal would occur at designated water drafting sources including the Rock Pit at Taylor Flat off Highway 7 approximately 4 miles north of Austin Junction, Clear Creek behind the MNF Blue Mountain Work Center, Bridge Creek at the junction of FR2614 and Highway 26, Vinegar Creek approximately ¼ mile upstream of the confluence with the MFJD River on FR2000663, and on the MFJD River approximately ¼ mile downstream from the confluence with Tincup Creek. Water drafting could potentially decrease stream flow and thus, the amount of water available for fish. Water drafting could also remove fish from the stream or injure them, if they are held against screens. Water drafting can occur only as long as supply is adequate to provide for both fish and withdrawal. Approved screens would be attached to intake hoses to prevent adverse impacts to fish. NMFS developed criteria for pump intake screens would be used on all water pump intakes. Screen mesh openings shall not exceed 3/32 inch for woven wire or perforated plate screens, or 0.0689 inch for profile wire screens, with a minimum 27% open area. Trucks would be maintained to prevent oil leaks. Loading is done in a manner to minimize overflowing and discharge of wash into stream. The maximum withdrawal from one site in an 8 – hour period would be 18,000 gallons of water. Project design criteria include the NMFS criteria and water drafting guidelines from the 2010 Forest Road Maintenance BA, included as appendices A and B of this Aquatics Specialist Report. These guidelines would prevent the potential harm to fish. Since the Taylor Flat drafting source is not directly connected to fishbearing streams, criteria included in appendices A and B of this biological evaluation are not needed at this site.

Proposed activities (logging, road use, road maintenance, road construction and reconstruction, dust abatement, road decommissioning, road re-opening and closure, prescribed fire, precommercial thinning, activity fuels treatment, and aspen restoration) are unlikely to result in measurable changes in water temperatures, pool frequencies, width-to-depth ratios, LWD, or bank stability.

Because this alternative impacts less than 8.2% of suitable habitat across the Forest, the overall direct, indirect, and cumulative effects (discussed below) will result in a small negative trend of habitat in the short term. The loss of habitat will be insignificant at the scale of the Forest. This alternative is consistent with the Forest Plan, and thus continued viability of bull trout is expected on the Malheur National Forest.

Overall, proposed actions would result in an incremental improvement in habitat conditions for bull trout in the aquatic analysis area. However, high water temperatures and altered stream channel conditions will likely persist.

Alternative 3

Determinations

- Columbia River Basin Bull Trout ESA Determination (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.
- Columbia River Basin Bull Trout Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
- Bull Trout Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.
- Bull Trout Designated Critical Habitat (D): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Rationale

Same as Alternative 2, with the exception that no culverts would be installed on Davis Creek and Dead Cow Gulch.

Alternative 4

Determinations

- Columbia River Basin Bull Trout ESA Determination (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.
- Columbia River Basin Bull Trout Sensitive Species Determination (S): 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 (MIIH) in the short term. Beneficial Impact (BI) in the long-term.
- Bull Trout Management Indicator Species Determination (MIS): Continued Viability at the Forest Scale.
- Bull Trout Designated Critical Habitat (D): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long-term.

Rationale

Same as Alternative 2.

MCR Spring-Run Chinook Salmon

Population and Habitat

MCR Spring-run Chinook salmon are no longer a Region 6 sensitive species, however Essential Fish Habitat (EFH) for spring Chinook salmon has been designated by NMFS in the aquatic analysis area. Salmon are sensitive to changes in water quality and habitat. Juvenile Chinook salmon are generally associated with pool habitats. An increase in sediment lowers spawning success and reduces the quantity and quality of pool and interstitial habitat. Other important habitat features include healthy riparian vegetation, undercut banks and LWD.

Spawning habitat for spring Chinook in the MFJD River Subbasin is present in the Big Creek, Camp Creek, and Upper MFJD River Watersheds. Main spawning areas are located along the Middle Fork with minor amounts of spawning occurring in Clear Creek. Juvenile rearing primarily occurs in Squaw Creek, Clear Creek, Granite Boulder Creek, Camp Creek, and the MFJD River downstream to the confluence with the North Fork John Day River. Torgerson (1996) reported 2.4 adult Chinook per kilometer (0.6 miles) holding in the MFJD River and 3.0 Chinook per kilometer spawning there. The distribution of the salmon was clustered in reaches where stream temperature was lower than expected.

A die-off during July 2007 and 2013 resulted from the combination of high water temperatures (measured up to 84 degrees) and low stream flows (one-third the average during this period) in the MFJD River. Approximately 118 wild adult spring Chinook salmon were found dead near the mouth of Big Boulder Creek and the mouth of Vinegar Creek (ODFW 2007). Numerous resident rainbow trout and mountain whitefish mortalities were also observed.

MCR spring-run Chinook salmon are found within the analysis area in the MFJD River, Vinegar Creek, Davis Creek, and Deerhorn Creek, including spawning, adult holding, and juvenile rearing habitat.

Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104 – 267), requires the inclusion of EFH descriptions in federal fishery management plans. In addition, the MSA requires federal agencies to consult with NMFS on activities that may adversely affect EFH. EFH determinations and rationale are included in this section by alternative.

All streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California are designated as EFH for Chinook salmon (73 FR 200:60987 October 15, 2008). However, finer resolution of what constitutes waters “currently or historically accessible to salmon” is dependent upon local information.

The MNF searched for information to determine if the Galena Project includes areas currently or historically accessible to Spring Chinook salmon. An ODFW website provides access to maps titled Spring Chinook Habitat: Bates Quad, Spring Chinook Habitat: Boulder Butte Quad and Spring Chinook Habitat: Vinegar Hill Quad that display current Chinook salmon distribution in the vicinity of the Galena Project. The maps display four streams within the Galena Project that have been determined by ODFW to provide Spring Chinook salmon spawning, rearing or migration habitat. They are Vinegar Creek, Davis Creek, Deerhorn Creek, and the Middle Fork John Day River.

Alternative 1

Determination

- Chinook Salmon Essential Fish Habitat Determination (MS): No Adverse Effect (NAE).

Rationale

EFH for Chinook salmon in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the MFJD River in the aquatic analysis area to support Chinook salmon. Reductions in pool habitat in the MFJD River has reduced migration and holding habitat for adult Chinook salmon. Alternative 1 proposes no new activities, resulting in no activity-related benefits or impacts to aquatic species and their habitat.

Despite the degraded habitat conditions in the aquatic analysis area, Chinook population levels in the MFJD River Subbasin appear to be stable though high variability makes it difficult to determine the long-term viability of the population. This uncertainty is evident in the fact that NMFS chose not to list the population as threatened as part of the Mid-Columbia Distinct Population Segment in 1998 (63 FR 11482) while ODFW is concerned that the population would be at risk during future periods of adverse environmental conditions (JDSRDP 2005).

Alternatives 2, 3, 4

Determination

- Chinook Salmon Essential Fish Habitat Determination (MS): May Adversely Affect (MAA)

Rationale

EFH for Chinook salmon in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability streams in the aquatic analysis area to support Chinook salmon.

The impacts from Alternative 2, 3, and 4 on Chinook salmon and designated EFH are considered equivalent to those described for MCR Steelhead as the two species have similar habitat requirements, although the overlap of the project area with the species and its EFH is reduced when compared with MCR Steelhead. Consequently, Alternative 2, 3, and 4 may adversely affect EFH for MSA-managed Chinook salmon for the Galena Project.

Columbia Spotted Frog

Population and Habitat

The Columbia spotted frog is a Region 6 Sensitive species. Spotted frogs are highly aquatic and are rarely found far from permanent water. They are usually found along the grassy margins of low gradient streams, lakes, ponds, springs, and marshes.

The spotted frog is considered present in all subbasins on the MNF. It is assumed this species is widely distributed in the MFJD River subbasin. Limited habitat surveys have been conducted specifically for spotted frogs; however, habitat probably exists along low gradient perennial streams. Fish surveys record incidental sightings of frogs but most do not differentiate species. During 1996 fish surveys, spotted frogs were reported along Davis Creek and Placer Gulch.

Spotted frogs have also been documented in the MFJD River, Crawford Creek, and Squaw Creek. In 2003 and 2004, Forest Service personnel conducted spotted frog surveys and spotted frogs were found near the

mouth of Camp Creek, in the MFJD River near Camp Creek, and Crawford Creek. Egg masses of spotted frogs were also found in a pond adjacent to Bridge Creek and Highway 26 near Austin Junction.

Spotted frogs have been documented in Vinegar Creek and the MFJD River in the aquatic analysis area.

Alternative 1

Determination

- Columbia Spotted Frog Sensitive Species Determination (S): No Impact (NI).

Rationale

Alternative 1 would maintain current habitat conditions for spotted frogs. Riparian habitat appears to be improving for spotted frogs based on the upward trend of riparian areas documented during recent range allotment monitoring.

Alternatives 2, 3, and 4

Determination

- Columbia Spotted Frog Sensitive Species Determination (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Under action alternatives spotted frog habitat in riparian areas would be protected by limiting proposed timber harvest activities to areas outside of RHCAs. Additionally, the MNF requires a 100 foot buffer around springs from disturbance from logging activities in upland areas (Forest Plan Standard 56) as spotted frogs utilize springs for winter habitat.

Proposed burning activities may result in impacts to adult frogs that are dispersed through the project area and frog habitat in riparian areas. Vegetative cover in riparian areas would be decreased in the short-term where shrubs and tall herbaceous vegetation is consumed during burning activities in RHCAs. Decommissioning road segments and installation of fish passage culverts in RHCAs would pose short-term risks to adult frogs yet would result in improved riparian areas in the long-term and should result in improvement of habitat for spotted frogs. The action alternatives may impact individuals or habitat, but would not likely contribute toward federal listing or loss of viability to the population or species at the Forest scale.

Western Ridged Mussel

Population and Habitat

Habitat occupied by the mussel is generally characterized as substrates of lakes, streams, and rivers that range in size from gravel to firm mud with the presence of at least some fine material (e.g. sand, silt or clay). The western ridged mussel may be found within the analysis area. Surveys for Western ridged mussel and two other mussel species were conducted in 2011 between Big Creek and Squaw Creek on the MFJD River as part of a graduate research project. Forty-six randomly selected reaches were surveyed, and the upstream extent of Western ridged mussel distribution was found to end near the confluence with Big Boulder Creek over 4 miles downstream of the analysis area. Surveys were not conducted continuously, and no tributaries to the MFJD River were surveyed, so although it is possible that there are a few scattered individuals upstream of the Big Boulder Creek confluence, presence of the species within the analysis area is unlikely. Habitat for the species probably exists along low gradient perennial streams.

Alternative 1

Determination

- Western Ridged Mussel Sensitive Species Determination (S): No Impact (NI)

Rationale

Habitat for the western ridged mussel in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the aquatic analysis area to support the western ridged mussel. Alternative 1 proposes no new activities, resulting in no activity-related benefits or impacts to aquatic species and their habitat.

Alternatives 2, 3, and 4

Determination

- Western Ridged Mussel Sensitive Species Determination (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Under Alternatives 2, 3, and 4, use of riparian roads for haul would result in increases in fine sediment during use. Short-term increases in fine sediment from haul and all activities, other than road decommissioning and fish passage culvert installation, are unlikely to result in measurable increases in fine sediment to stream channels. Implementation of the project design criteria, along with fairly consistent, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible. Since all thinning units are outside RHCAs, there would be no effects to mussel habitat from activities inside the harvest units.

Under Alternatives 2 and 4, there is a short-term risk of generating sediment during and shortly after road decommissioning and fish passage culvert installations which would likely reach streams and could affect mussel habitat in those streams. This risk is primarily associated with decommissioning of roads immediately adjacent to streams and at stream crossings, and at culvert installations. The proposed design criteria and application of BMPs would reduce the probability and magnitude of this short-term risk. The proposed road decommissioning and culvert activities would result in a lasting decrease in fine sediment levels in the analysis area, starting about 2 years after completion. Proposed activities (logging, road use, road maintenance, road construction and reconstruction, dust abatement, road decommissioning, road re-opening and closure, prescribed fire, pre-commercial thinning, activity fuels treatment, and aspen restoration) are unlikely to result in measurable changes in water temperatures, pool frequencies, width-to-depth ratios, LWD, or bank stability.

Shortface Lanx

Population and Habitat

The shortface lanx is a small pulmonate (lunged) snail which inhabits cold, unpolluted, medium-sized streams to large rivers with fast flowing, well-oxygenated water and cobble-boulder substrate. It is primarily found along the edges of rapids or immediately downstream from rapids.

One of several small populations exists in the John Day River downstream of the aquatic analysis area, and the species may occur within the analysis area although it is unlikely since the habitat preference of this freshwater pulmonate is for streams and rivers at least 30 meters (100 feet) wide. This species is not

found in areas with a high abundance of macrophytes or epiphytic algae, in areas of bedrock substrate, in streams with extreme variation in discharge, in slow flowing streams, in silt or mud substrate, or in areas that are dredged or mined.

Alternative 1

Determination

- Shortface Lanx Sensitive Species Determination (S): No Impact (NI)

Rationale

Habitat for the shortface lanx in the aquatic analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the aquatic analysis area to support the shortface lanx. Alternative 1 proposes no new activities, resulting in no activity-related benefits or impacts to aquatic species and their habitat.

Alternatives 2, 3, and 4

Determination

- Shortface Lanx Sensitive Species Determination (S): May Impact Individuals or Habitat, but would not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long-term.

Rationale

Under Alternatives 2, 3, and 4, use of riparian roads for haul would result in increases in fine sediment during use. Short-term increases in fine sediment from haul and all activities, other than road decommissioning and fish passage culvert installation, are unlikely to result in measurable increases in fine sediment to stream channels. Project design criteria, along with fairly level, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible. Since all thinning units are outside RHCAs, there would be no effects to shortface lanx habitat from activities inside the harvest units.

Under Alternatives 2 and 4, there is a short-term risk of generating sediment during and shortly after road decommissioning and fish passage culvert installations which would likely reach streams, and could affect shortface lanx habitat in those streams. The proposed design criteria and application of BMPs would reduce the probability and magnitude of this short-term risk. The proposed road decommissioning and culvert activities would result in a lasting decrease in fine sediment levels in the analysis area, starting about 2 years after completion.

Cumulative Effects

All past activities, past wildfires, present activities, foreseeable activities, and the current project proposal have been considered for their cumulative effects on aquatic habitat and associated aquatic species. Effects are addressed for all aquatic species considered in this analysis together due to the insignificant differences between species' niches. The following discussion focuses on the past, ongoing and foreseeable future activities that may contribute positive or negative effects.

Alternative 1

Under the no action alternative, there would be no management activities associated with the timber harvest in the project area; therefore, there would be no direct effects to aquatic species. There would continue to be ongoing effects from the past, present and reasonably foreseeable future actions. Roads

would not be treated in this alternative, which would allow several miles of roads to continue acting as potential sediment sources, affecting aquatic species habitat within the project area and downstream reaches.

The hazard of a severe crown fire is higher, as described in the fuels section of Chapter 3. Most of the forested stands in the project area are over stocked and have been identified as moderate to high risk for insect and disease mortality. Without silvicultural treatment and/or the controlled re-introduction of fire into the project area, current stand conditions would worsen and increase the chance of a stand replacing fire. A stand replacing wildfire would result in the loss of shading along stream channels, loss of instream wood structures, and short-term (3 to 5 years) loss of streamside vegetation. Water temperatures would increase, for perhaps one to a few decades, depending on riparian shrub and tree recovery. Sediment from upland sources could increase for 1 to 3 years following a fire. Sediment from channel sources could increase due to higher peak flows and loss of stabilizing trees and shrubs. There would be increased sediment from channel sources for approximately 5 years until bank stabilizing vegetation has recovered. Severe fire would also supply an extended pulse of woody debris to streams, which would gradually decay over decades. In addition, localized extirpation of these fish could occur as the result of severe wildfires (Rinne 1996).

The recovery of aquatic habitat would be slightly slower, and not progress quite as far as under Alternatives 2, 3, and 4, because of the effects of the roads which would not be decommissioned and crossings not improved in RHCAs, and lack of controlled reintroduction of fire to these areas.

Alternative 2, 3, and 4

During the past 100 years livestock grazing, timber harvesting activities, stream dewatering, firewood cutting, fire suppression, road construction, road density, lack of road maintenance, and general road use on public and private lands have contributed to landscape changes that may have affected processes such as overland flows, channel development and riparian and fish habitat within the drainages associated with this project. Legacy effects from past management activities may continue to impact aquatic habitat in the project area and downstream of the project area. The magnitude and timing of these potential impacts are unpredictable, but they would have short-term (1 to 3 years) to long term (50+ years) negative effects on fisheries habitat in this watershed.

There has been a marked shift in the last ten years to more intermediate harvest and greater crown retention. Since the PACFISH amendment (1995) to the Forest Plan, RHCAs are left intact, thus limiting the effects to riparian habitat and stream channels. Recent projects incorporate watershed restoration projects that include increasing the size of culverts and removal of fish passage barriers, restoring streams to their historical channel alignment, installing fish screens to prevent entrainment, implementing BMPs, and decommissioning roads to decrease erosion and sediment delivery to streams.

All alternatives would permit a natural slow, partial recovery from effects of past grazing, past riparian road construction, and past riparian harvest. This recovery would occur as riparian trees grow larger, as large wood falls into the streams, as channel types change to more stable and narrow configurations, as sediment from past actions is washed out, and as riparian shrubs and herbs recover and contribute to more stable stream banks. Recovery would be only partial because some ongoing impacts from some existing roads would not permit full recovery.

Stream reaches on the MFJD River, downstream of the project area have improved dramatically due to riparian fencing on Nature Conservancy, Confederated Tribes of Warm Springs and private lands that have restricted riparian livestock use. Additionally, current grazing management practices, within the project area, have allowed stream reaches to improve and develop an upward trend.

Road decommissioning and culvert installation activities proposed under Alternatives 2, 3, and 4 may result in short-term cumulative effects because the proposed activities would likely result in short-term increases in fine sediment. The short-term increases may add to adverse effects because streams in the

analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids. However, the proposed road decommissioning and culvert installation activities would lead to a long-term reduction in fine sediment levels and therefore would have beneficial impacts to aquatic habitat and fish in the project area and downstream.

Potential effects from the alternatives would be cumulative with effects from non-federal activities within the project area and activities within the aquatic analysis area on federal, state and private lands. Aside from this project, other non-restoration activities that may contribute to cumulative effects include; timber harvest activities, wildfires, livestock grazing, road use, flood irrigation/water diversion, and vegetation alteration.

The effects of other foreseeable activities described above on aquatic species are negligible with the exception of irrigation withdrawals which are potential temperature concerns. The effects of use and maintenance of roads which are not decommissioned would remain the same as at present. The Forest is also proposing to implement the 2005 Travel Management Rule which would restrict motorized travel to designated routes and restrict motorized cross country travel. The pending implementation of this Rule on the Forest would reduce negative impacts to aquatic species and habitat associated with motorized travel within RHCAs.

Currently invasive plants are only treated mechanically, therefore, without herbicides there would likely be cumulative effects on aquatic species due to habitat degradation along stream banks. Treatment of invasive plant infestations is proposed in the upcoming Invasive Plants EIS. Future treatment of these infestations would cumulatively result in fewer invasive plants and thus less impact to riparian areas and aquatic habitats.

Common sources of sediment within the analysis area include both natural processes and past and ongoing actions on both National Forest and private lands, such as channel and floodplain modification from railroad logging, channel erosion, erosion from “scabs” (shallow soil areas where ground cover standards are not met), livestock grazing (especially past grazing), and roads. Under Alternatives 2, 3, and 4, timber harvest, haul, prescribed burning, road maintenance and road construction/reconstruction may result in negligible increases in fine sediment, however it is unlikely that these increases would result in cumulative adverse effects when combined with other past, ongoing, or future actions. Sediment production by road decommissioning and culvert installation in all Galena alternatives would be a small proportion of the total sediment from natural processes and from past and ongoing actions, and would last only about two years. Design criteria for the timber sale would limit sediment delivery to streams. Thus the cumulative effect of the proposed action would be a relatively small increase in total sediment production. After two years sediment would decrease due to road decommissioning and improved crossings.

On-going grazing activities could potentially contribute sediment to streams. Impacts to aquatic habitat from the proposed vegetation management, haul, road maintenance, road construction/reconstruction and prescribed burning would be limited to non-measurable increases of fine sediment. It is unlikely that these increases would result in measurable adverse cumulative effects when considered with range management activities. Road decommissioning and culvert installation activities proposed under Alternatives 2, 3, and 4 may result in short-term increases in fine sediment. However, the level of these cumulative effects with grazing management activities is not likely to reach a point where measurable adverse effects would occur where grazing standards are met.

Because the effects of past, proposed, ongoing, and foreseeable actions are expected to result in insignificant (minimal) cumulative effects to species habitat considered in this BE in combination with the Galena Project, a small short-term decrease in populations of steelhead, bull trout, redband trout, and Chinook salmon may occur. While some additive cumulative effects may be anticipated, projects are consistent with Forest Plan and PACFISH objectives.

Botany

Regulatory Framework

The Endangered Species Act of 1973 as amended lists plant species that are threatened, endangered or proposed for listing. The Regional Forester's Sensitive Species List (USDA 2008) includes sensitive plant species. Forest Service Manual (FSM 2672.41) objectives related to plant species are to: not contribute to loss of viability of any native or desired non-native plant species or trends toward Federal listing of any species, to comply with the requirements of the Endangered Species Act, and to provide a process and standard by which to ensure that threatened, endangered, proposed, and sensitive (TEPS) species receive full consideration in the decision making process.

Analysis Methods

The forest botanist used several methods to determine the existing condition and the potential effects to sensitive plant species and habitat from proposed activities in the project area. A pre-field review was done to determine the probability that TEPS species or habitats are located within or adjacent to the project area. Information from the pre-field review, in conjunction with the project description, is used to determine the need and intensity of field surveys. The following sources of information were used during the pre-field review: Regional Foresters Sensitive Specifies List, Sensitive Pant Species GIS Database, Interagency Sensitive Species Program Website, project maps and aerial photographs, literature, conservation plans and assessments, and species descriptions. Field surveys were conducted for sensitive species occurrences in 1998 and 2000. Sensitive species that have been added since 1999 were not considered in the surveys but were analyzed for presence in the project area with remote techniques.

During the field season between the Draft and Final EIS for this project 1,564 acres were surveyed in 14 different areas within the project boundaries. Surveys focused on the areas with the highest probability of containing sensitive plant habitat, both within and outside of proposed units. A biological evaluation was completed for the sensitive plant species and can be found in the project record.

Existing Condition

The Galena project area has three broad habitat groups: open uplands and vernal meadows, forest and woodland areas, and wetland, moist forest and riparian areas. There are no TEPS species documented or suspected to occur in this area. In the project area, there are 33 Forest Service sensitive species that have suitable habitat and four species that are documented, totaling 37 species considered in this analysis. Documented species were found in springs, seeps, and riparian areas and are not in units proposed for treatment.

In the open uplands in coniferous forests and vernal meadows, there is potential habitat for 9 sensitive plant species. In the forest and woodland areas, there is potential habitat for three sensitive plant species. In the wetland, moist forest and riparian areas there is potential habitat for 25 sensitive plant species.

The results of the additional surveys between the Draft and Final EIS resulted in the detection of one new sensitive plant population: Northern twayblade (Listera borealis) is a small, inconspicuous, rare orchid species that was found in a forested wetland habitat at the headwaters of a Vinegar Creek tributary.

Direct and Indirect Effects by Alternative

For listed plant species that may have potential habitat within the project area, the effects of the proposed activities by alternative were analyzed. Table 25 shows the effects by alternative for each habitat type and listed plant species.

Alternative 1

Open Uplands and Vernal Meadows

Alternative 1 will not directly affect sensitive species in these habitats. However, for three species (Mimulus evanescens, Muhlenbergia minutissima, and Phacelia minutissima), there may be indirect impacts as a result of no action. Historical and continued conifer encroachment into the fringes of some species' habitats could eventually shade-out the areas and/or reduce available ground moisture due to overall increased conifer transpiration. Since these species are dependent upon open sunny conditions, and a suitable source of subsurface water, Alternative 1 may impact individuals or habitat, but will not likely contribute to trends towards federal listing or cause loss of viability to populations or species.

Forest and Woodland Areas

The sensitive species that occupy these habitats are adapted to mid- to late-seral forests or shady forest conditions. Alternative 1 should have no direct impact (NI) on these species. However, Seevers et al. (2005) note that Cypripedium fasciculatum sites where fuel concentrations exceed the historical range of variability should be treated to reduce risk of high intensity fires. Thus, for this species, the indirect effects of Alternative 1 may impact undocumented individuals or habitat, but will not likely contribute to a trend towards federal listing or cause loss of viability to populations or the species.

Wetland, Moist Forest, and Riparian Areas

Alternative 1 will also not directly negatively impact most sensitive species in these habitats. Yet, some may be indirectly affected due to no action. Listera borealis is dependent on shady, densely-populated, or late-successional forests. Thus, leaving high density forests due to no action may provide a direct and indirect beneficial impact. Conversely, for Carex idahoa, there may be indirect impacts as a result of no action. Historical and continued conifer encroachment may eventually outcompete, shade-out, and reduce sources of subsurface water. Since this species is reliant upon these conditions, Alternative 1 may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause loss of viability to populations or the species.

There may also be indirect negative impacts to Botrychium species as a result of no action. As stated above, Botrychium species are often dependent upon historically disturbed habitats. Thus, a lack of substantial disturbance and increased shade of conifers may potentially reduce the overall potential habitat in the area in the long-term. No action, in conjunction with continued fire suppression, may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause loss of viability to populations or the species. Increased fuel loading throughout the project area has also increased the risk for a large scale wildfire, potentially impacting this habitat type, which typically did not have high intensity, non-frequent wildfire activity.

Alternative 2, 3, 4

Open Uplands and Vernal Meadows

Because the habitat types in this group are not forested, logging or thinning activities from Alternatives 2, 3, or 4 are not likely to directly or indirectly affect these species and their habitats. This is contingent upon vehicles and machinery avoiding meadows, scablands, and other seasonally moist open ground. Harvest units have eliminated these areas from entry to ensure that impacts to theses habitats are minimized.

Prescribed burning activities from Alternatives 2, 3, and 4, are unlikely to affect many of the species included in this habitat group. Since fire has been an active natural process in forests of the Blue Mountains prior to Euro-American settlement (Heyerdahl and Agee 1996, Heyerdahl et al. 2001), it may be appropriate to assume that these species are adapted to naturally occurring low to medium intensity

fires. However, since there is insufficient scientific information to evaluate the effects of fire on these species, the prescribed burning activities may impact individuals or habitat, but will not likely contribute to trends towards federal listing or cause loss of viability to populations or species. To mitigate possible negative impacts from prescribed burning activities, direct lighting and ATV travel in these areas will be avoided (Table 3).

Two species (*Encalypta intermedia* and *Tortula mucronifolia*) occur in habitats where fire is unlikely to carry with substantial intensity to negatively affect the species (e.g. rock outcrops). Thus, Alternatives 2, 3, and 4, should have no impact on these species.

Forest and woodland areas

Logging and thinning activities are likely to affect this habitat group. Reductions of understory shade and soil disturbances are the primary threat to these species' habitats (Christy 2007, Seevers et al. 2005, Wilson et al. 2008). The inclusion of project design elements to mitigate all effects is not possible, however, none of the three species were found during surveys and none have been previously documented within the project boundaries. Therefore, logging or thinning activities from Alternatives 2, 3, or 4 may impact undocumented individuals or habitat (MIIH), but will not likely contribute to a trend towards federal listing or cause loss of viability to populations or the species.

Prescribed burning activities from Alternatives 2, 3, and 4, may affect the species included in this group. Fire has been an active natural process in forests of the Blue Mountains prior to Euro-American settlement (Heyerdahl and Agee 1996, Heyerdahl et al. 2001). Thus, it may be appropriate to assume that these species are adapted to naturally occurring low to medium intensity fires. However, since there is insufficient scientific information to evaluate the effects of fire on these species, prescribed burning may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause loss of viability to populations or the species. Additionally, a reduction in fuels is recommended as a conservation action and may provide a long-term beneficial impact to *Cypripedium fasciculatum* (Seevers et al. 2005).

Wetland, Moist Forest, and Riparian Areas

For the most part, the habitats in this group have been eliminated from harvest units. Thus, logging or thinning activities from Alternatives 2, 3, or 4 are not likely to directly or indirectly affect most of the sensitive species and their habitats. Buffers around riparian areas, springs, and wetlands should protect most of these species from logging and thinning. This is also contingent upon vehicles and off-road equipment avoiding seeps, springs, wet meadows, permanent wetlands, riparian areas, and waterways. Harvest units have eliminated these areas from entry to ensure that impacts to theses habitats are minimized. However, *Listera borealis* sometimes occurs in moist areas in heavily shaded forests. Thus, a reduction in shade due to logging and thinning may impact individuals or habitat of this species, but will not likely contribute to a trend towards federal listing or cause loss of viability to populations or the species.

Additionally, there may also be indirect, long-term beneficial impacts to *Botrychium* species as a result of action from Alternatives 2, 3, or 4. *Botrychium* species are often dependent upon historically disturbed habitats where some mineral soil has been exposed. Thus, disturbance due to logging and thinning may facilitate long-term habitat enhancement in the area.

The prescribed burning of Alternatives 2, 3, or 4 will likely not carry low to moderate fires though wetlands and riparian areas. Thus, there should be no substantial impacts to species in saturated wetlands (Table 25). However, some species, such as those that sometimes occur on the margins of wetlands (*Carex idahoa*, *Listera borealis*, and *Botrychium* species), may be impacted by prescribed burning. These species occur in or adjacent to wetland areas where the soil and vegetation becomes dry late in the season. Since there is insufficient scientific information to evaluate the effects of fire on these species, and since

fire intensity may be relatively substantial in these habitats, prescribed burning may impact individuals or habitat, but will not likely contribute to trends towards federal listing or cause loss of viability to populations or species.

Cumulative Effects

Open and Vernal Meadow Species

Anticipated cumulative effects on the species in this habitat group (except the moss *Encalypta intermedia*) are primarily due to past, present, and future grazing use and historical logging practices. Historical heavy livestock grazing and overuse of forest openings have likely reduced the extent and abundance of these species throughout their range, and may have degraded potential habitat as well (Kaye et al. 1997, Wilcove et al. 1998, Wilson et al. 2008). Prescribed burning and wildfires may contribute to cumulative effects to these species through the loss of individuals, yet any potential additional impacts should be inconsequential when added to past, present, and future grazing use of the area.

Forest and Woodland Areas

Anticipated cumulative effects on the species in this group vary depending on the species, but all three are thought to be threatened by logging and fire. *Schistidium cinclidodonteum* threats are difficult to identify because so little is known about its distribution and abundance. It may be threatened by logging, road and trail construction, or fire, (Christy 2007). Since all of these activities have historically occurred in the area, these all add to potential cumulative impacts to these species. Each action alternative along with historical thinning and logging contribute to cumulative negative effects on all three species.

Furthermore, cumulative effects to *Carex cordillerana* may include impacts due to grazing use (Kaye et al. 1997, Wilcove et al. 1998). The leaves of this species are highly palatable and attractive to grazers, which can easily pull up shallow-rooted plants (Wilson et al. 2008). It is likely that this species was once more widespread in upland forests and it presently persists mainly on rocky forested slopes where it receives some protection from livestock (Wilson et al. 2008). While there may have been historical impacts to this species, any potential impacts from the proposed actions will not add substantially to cumulative impacts and will not contribute to a trend towards federal listing.

Wetland, Moist Forest, and Riparian Associated Species

Anticipated cumulative effects on the species in this group vary depending on the species. Previous fires, historical logging, and trampling by livestock may add to negative cumulative effects to *Lister borealis*. Cumulative effects to *Botrychium* species include impacts from livestock grazing and historical timber harvest. Since moonworts require historical disturbance to maintain their habitat, a history of light to moderate grazing can potentially maintain optimal habitat conditions; yet, continued heavy grazing will have negative impacts to *Botrychium* habitat (Ahlenslager and Potash 2007). Similarly, historical timber harvests have potential long-term beneficial impacts on their habitat (moonwort populations decline with succession to dense, closed canopy conditions). However, the combined effect of disturbance form continued livestock grazing, logging, and prescribed burning may be beyond the appropriate levels of disturbance for these species and thus will likely have a long-term negative cumulative effect to these species (Kaye et al. 1997, Wilcove et al. 1998).

Cumulative effects to *Carex idahoa* are primarily from livestock grazing. This species is highly palatable to cattle and grazing is the primary threat to this species (Wilson et al. 2008). It may be able to tolerate light grazing, but populations will decline under moderate to heavy grazing (Lesica 1998). Since the project area has had a substantial grazing program presently and in the past century, grazing may add to any potential negative effects from prescribed burning.

Summary of Effects

This analysis has shown that the Galena Forest Restoration Project may impact individuals or habitat of some sensitive plant species, but would not result in the loss of population or species viability nor cause a trend toward federal listing under the Endangered Species Act. For these reasons, the Galena Forest Restoration Project should not result in an irretrievable and irreversible commitment of resources. Sensitive plants that do occur or are suspected to occur within or adjacent to the project area and the effects determinations are presented in Table 25.

Table 25. Sensitive plant species and potential habitat within the project area with effects by alternative

Habitat	Species	Alternative 1		Alternatives 2, 3, 4	
		Direct Effects	Indirect Effects	Direct Effects	Indirect Effects
Species of Open Uplands and Upland Vernal Meadows					
Scablands	*Achnatherum hendersonii* Henderson ricegrass	NI	NI	**MIIH**	NI
	Achnatherum wallowaensis Wallowa ricegrass	NI	NI	**MIIH**	NI
Seasonally wet scablands and meadows	*Eleocharis bolanderi* Bolander's spikerush	NI	NI	**MIIH**	NI
Rock outcrops and overhangs	*Encalypta intermedia* Candle snuffer moss	NI	NI	NI	NI
Sandy drainages, rocky slopes, vernal flats, in drier open areas	*Mimulus evanescens* disappearing monkeyflower	NI	**MIIH**	**MIIH**	NI
	Muhlenbergia minutissima annual dropseed	NI	**MIIH**	**MIIH**	NI
Seasonally wet meadows, scablands, and aspen stands	*Phacelia minutissima* least phacelia	NI	**MIIH**	**MIIH**	NI
Dry slopes in shrublands and forest edge	*Thelypodium eucosmum* arrow-leaf thelypody	NI	NI	**MIIH**	NI
Rock outcrops and riparian hardwood forest	*Tortula mucronifolia* mucronleaf tortula moss	NI	NI	NI	NI
Species of Forest and Woodland Areas					
Shade and duff of conifers and hardwoods in drier areas	*Carex cordillerana* Cordilleran sedge	NI	NI	**MIIH**	**MIIH**

Habitat	Species	Alternative 1		Alternatives 2, 3, 4	
		Direct Effects	Indirect Effects	Direct Effects	Indirect Effects
Moist to dry, mid to late seral coniferous forests	*Cypripedium fasciculatum* clustered lady's slipper	NI	MIIH	MIIH	MIIH/BI
Rocks in coniferous forests and intermittent streams	*Schistidium cinclidodonteum* schistidium moss	NI	NI	MIIH	MIIH
Species Of Wetlands, Moist Forest And Riparian Areas					
Seeps, springs, wet meadows, dry meadows, wetlands	*Botrychium ascendens* upward-lobed moonwort	NI	MIIH	MIIH	BI
	Botrychium crenulatum crenulate grape-fern	NI	MIIH	MIIH	BI
	Botrychium lunaria common moonwort	NI	MIIH	MIIH	BI
	Botrychium minganense Mingan moonwort	NI	MIIH	MIIH	BI
	Botrychium montanum mountain moonwort	NI	MIIH	MIIH	BI
	Botrychium paradoxum peculiar moonwort	NI	MIIH	MIIH	BI
	Botrychium pedunculosum stalked moonwort	NI	MIIH	MIIH	BI
Seeps, springs, and riparian in cool/cold forests	*Listera borealis* northern twayblade	**BI**	BI	MIIH	MIIH
Ecotones between shrublands and wetlands	*Carex idahoa* Idaho sedge	NI	MIIH	MIIH	NI
Forested floodplains, wetlands, and riparian areas	*Carex retrorsa* retrorse sedge	NI	NI	NI	NI
Wetlands, peatlands, fens, bogs, floating mats	*Carex diandra* lesser panicled sedge	NI	NI	NI	NI
	Carex lasiocarpa var. *americana* American woolly-fruit sedge	NI	NI	NI	NI

Habitat	Species	Alternative 1		Alternatives 2, 3, 4	
		Direct Effects	Indirect Effects	Direct Effects	Indirect Effects
	Helodium blandowii Blandow's helodium moss	NI	NI	NI	NI
	Meesia uliginosa meesia moss	NI	NI	NI	NI
	Tomentypnum nitens tomentypnum moss	NI	NI	NI	NI
Rocks in streams and lake margins	*Dermatocarpon meiophyllizum* leafless skin-fruit lichen	NI	NI	NI	NI
Vernal pools, shallow ponds, and muddy streamsides	*Elatine brachysperma* short-seed waterwort	NI	NI	NI	NI
Damp ledges and rock crevices in wetlands	*Jungermannia polaris* arctic flapwort	NI	NI	NI	NI
Bark of riparian hardwood and mossy rocks	*Leptogium burnetiae* Burnet's skin lichen	NI	NI	NI	NI
Wetlands, pond margins, and riparian areas	*Rotala ramosior* lowland toothcup	NI	NI	NI	NI
Montane wetlands and riparian areas	*Salix farriae* Farr's willow	NI	NI	NI	NI
	Salix wolfii Wolf's willow	NI	NI	NI	NI
Old dung in wetlands	*Splachnum ampullaceum* small capsule dung moss	NI	NI	NI	NI
Aquatic bed habitat	*Potamogeton diversifolius* waterthread pondweed	NI	NI	NI	NI
	Utricularia minor lesser bladderwort	NI	NI	NI	NI

BI – Beneficial Impact, MIIH – May Impact Individuals or Habitat but will not lead to a trend toward federal listing, NI – No Impact

Wildlife

All alternatives would be consistent with Forest Plan standards and goals because they would meet design criteria set for the project, meet standards and goals for affected land management allocations, and provide for viable populations of wildlife species. All alternatives would provide for diversity of plant and animal communities in the project area, based on the suitability and capability of the project area.

A biological evaluation (BE) was completed for federally listed and proposed threatened and endangered wildlife species, and species listed on the January 31, 2008, Regional Forester' sensitive species list. Determinations conclude that the proposed project activities would not have an effect on threatened or endangered species and would not contribute to a trend toward federal listing of sensitive species, nor cause a loss of viability to the listed animal populations or species.

Federally Listed Species

The U.S. Department of Interior (USDI) Fish and Wildlife Service (FWS) provide a list of threatened and endangered species that have the potential to occur in Grant County for consideration in analysis (USFWS 2010). No wildlife species on the list are present within the project area. There is no designated or proposed critical habitat for threatened or endangered species in the affected subwatersheds. Fish species on the list are found in the aquatics section of this chapter.

Forest Service Sensitive Species

On January 31, 2008, Regional Forester Linda Goodman released an updated Sensitive Species List which includes federally listed, federally proposed and sensitive species lists. Per Regional Forester direction the Threatened, Endangered, and Sensitive species in this list were considered in this analysis.

Regulatory Framework

There are 14 species on the 2008 Regional Forester's Sensitive Species list that occur on the Malheur National Forest, only nine species have potential habitat in the proposed project area and warrant further analysis. The Columbia Spotted Frog is addressed in the Aquatics BE and therefore will not be discussed further in this section.

Table 26. Threatened, Endangered, and Sensitive species considered for analysis

Common Name	Scientific Name	Status	Occurrence in Project Area
Forest			
Gray Wolf	*Canis lupus*	S	HD/N
California Wolverine	*Gulo gulo luteus*	S	HD/N
White-headed Woodpecker	*Picoides alborarvatus*	S	HD/D
Riparian			
Bald Eagle	*Hailaeetus leucocephalus*	S, DL	HD/S
American Peregrine Falcon	*Falco perigrinus anatum*	S, DL	HD/S
Lewis' Woodpecker	*Melanerpes lewis*	S	HD/D
Bufflehead	*Bucephala albeola*	S	HD/D
Bobolink	*Dolichonyx oryzivorus*	S	HD/N

Common Name	Scientific Name	Status	Occurrence in Project Area
Meadow			
Silver-bordered Fritillary	*Boloria selene*	S	HD/N
Outside Project Area			
Pygmy Rabbit	*Brachylagus idahoensis*	S	HN/N
Western Sage Grouse	*Centrocercus urophasianus phaios*	S, C	HN/N
Upland Sandpiper	*Bartramia longicauda*	S	HN/N
Tricolored Blackbird	*Agelaius tricolor*	S	HN/N
Canada Lynx*	*Lynx canadensis*	T	HN/N

***** *There is no designated or proposed critical habitat for Threatened or Endangered species in the affected subwatersheds. Based on the National Lynx Survey, the Malheur National Forest falls under designation of "unoccupied mapped lynx habitat" (USFWS Memo, 2006).*

Status

T	*Federally Threatened*
DL	*Federally Delisted*
E	*Endangered*
S	*Sensitive species from 2008 Regional Forester's list*
C	*Candidate species under Endangered Species Act*

Occurrence

HD	***Habitat Documented*** *or suspected within the project area or near enough to be impacted by project activities*
HN	***Habitat Not*** *within the project area or affected by its activities*
D	*Species* ***Documented*** *in general vicinity of project activities*
S	*Species* ***Suspected*** *in general vicinity of project activities*
N	*Species* ***Not documented*** *and not suspected in general vicinity of project activities*

Analysis Methods

To determine the effects to Proposed, Endangered, Threatened, and Sensitive (PETS) species, potential habitat was identified for each species. Habitat was defined using the best available science obtained from literature reviews. Within the project area, stand information that correlated with species requirements were identified by Most Similar Neighbor analysis, using Geographic Information System electronic layer files, aerial photographs, ground reconnaissance and stand exams. For each species, potential habitat was mapped and effects were determined by comparing the number of acres affected by proposed treatment. Proposed activities for each alternative are similar, with the exception of their location and intensity, and were compared to the no action alternative.

Existing Condition

Gray Wolf

Life History and Habitat

Gray wolves are highly adaptable and use a variety of habitats, with a preference for remote areas. Remote, forested areas provide refuge from humans and support ungulate prey. Gray wolves feed extensively upon large ungulates, including Rocky Mountain elk, and mule deer. In unexploited populations, survival of young and population growth are dependent upon availability of food during the rearing season (Jordan et al., 1967, Verts and Carraway 1998). Currently, the major limiting factor to gray wolf populations is human caused mortality and disturbance.

Distribution

In July of 2008, a biologist confirmed the presence of Oregon's first reproducing pack of wolves on the Umatilla National Forest. Oregon Department of Fish and Wildlife (ODFW) confirm two wolf packs in Oregon with individuals dispersed throughout the state. In 1999, a collared wolf from the experimental, non-essential Idaho population was confirmed near the Middle Fork John Day River, but captured and returned to Idaho. Over time, dispersing wolves could return to the Forest and establish packs.

Existing Condition

The Northern Rocky Mountain gray wolf was listed as endangered on June 4, 1973. On April 2, 2009, the U.S. Fish and Wildlife Service published a final rule that established a distinct population segment of the gray wolf in the Northern Rocky Mountains and revised the List of Endangered and Threatened Wildlife by removing gray wolves within the Northern Rocky Mountains distinct population segment boundaries, except in Wyoming. The Northern Rocky Mountains distinct population segment includes a portion of eastern Oregon east of the centerline of Highway 395 and Highway 78 north of Burns Junction and that portion of Oregon east of the centerline of Highway 95 south of Burns Junction (USFWS 2009). A final rule published by the U.S. Fish and Wildlife Service on October 26, 2010 reinstated federal protections that were in place prior to the 2009 delisting and wolves were listed as endangered throughout the former Northern Rocky Mountains DPS (USFWS 2010). Another final rule published on May 5, 2011 once again delisted wolves in the Northern Rocky Mountain distinct population segment (USFWS 2011). Region 6 USFS status has returned to "sensitive."

There are 707,585 acres of available habitat for the gray wolf on the Blue Mountain Ranger District. Within the project area 35,615 acres of suitable habitat exists. High road densities and human presence may be a factor that limits wolf viability within the Galena project area. Within the project area 2,385 acres of remote habitat exists within the Vinegar Hill-Indian Rock Scenic area and the Dixie Butte Wildlife Emphasis Area.

California Wolverine

Life History and Habitat

Wolverines are strongly associated with remote mountainous wilderness habitats (Beauvias et. al 2004). Open areas are avoided and the most critical habitat component is the absence of human activity or development. Wolverines prefer higher elevation alpine and mature coniferous forest. The presence of avalanche chutes, boulder fields, and/or large piles of down logs are also important habitat features. In Oregon the wolverine diet consists mainly of elk and deer carrion. Wolverines are extremely mobile travelling great distances within large home ranges. The major limiting factor to California wolverine populations is human caused mortality and disturbance.

Distribution

The California wolverine is found in higher elevations of Oregon, including the northern Blue Mountains and the Cascade Mountains. Confirmed sightings have occurred in Oregon, in the Wallowa and Cascade mountains. Presence of wolverine has been confirmed with a partial skeleton and tufts of fur found near Canyon Mountain in 1992. Tracks and a probable denning site were found in the Strawberry Mountain Wilderness in 1997, about 15 miles southwest of the Galena project area. Numerous other reliable sightings have occurred, which indicates portions of the forest are suitable habitat for wolverine. Suitable habitat consists of areas with low human impacts, low human disturbance, and high deer and elk concentrations such as: Strawberry and Monument Rock Wilderness Areas, Vinegar Hill-Indian Rock Scenic Area, Dixie Butte and Dry Cabin Wildlife Emphasis Areas, as well as Shaketable, McClellan Mountain, and Aldrich Mountain Roadless Areas.

Existing Condition

There is over 102,000 acres of potential wolverine habitat on the district. Within the project area 2,385 acres of habitat exists within the Vinegar Hill-Indian Rock Scenic area and the Dixie Butte Wildlife Emphasis Area.

White-headed Woodpecker

White-headed woodpecker is a Management Indicator Species (MIS) of dead and defective wood habitat and MIS of old growth habitat.

Life History and Habitat

White-headed woodpeckers are associated with old forest single stratum (OFSS) stands, i.e., open canopy stands of large mature and over mature ponderosa pine, and less frequently mixed ponderosa and Douglas-fir stands (Ligon 1973, Cannings 1995, Buchanan et al. 2003). The white-headed woodpecker differs from many of the other primary cavity excavators in its near exclusive selection of mature single stratum ponderosa pine dominated habitats. In the project area this species relies almost exclusively upon seeds from large ponderosa pine cones for foraging and eats insects gleaned off ponderosa pine trees. White-headed woodpeckers prefer large ponderosa pine snags for nesting; however, other species are used including grand fir, Douglas-fir and aspen. Because of its more limited need and use of snags for foraging, the species snag requirements are less than those required by other primary cavity excavators such as the pileated, downy, and hairy woodpeckers.

Distribution

White headed woodpeckers are found in the Blue, Ochoco, and Wallowa mountains as well as the east side of the Cascades. Loss of mature ponderosa pine habitat has resulted in a severe decline of this species in the Blue Mountains of Oregon (Csuti et. al. 1997). As with the rest of Oregon habitat abundance and distribution for white-headed woodpeckers has been reduced or eliminated in the warm-dry and hot-dry forest types. Past harvest activities have concentrated on removing the large overstory ponderosa pine, western larch and Douglas-fir trees and snags, setting many stands back to younger structural stages. Significant reduction in numbers of large, mature ponderosa pine reduces trees available for nesting and cones for winter food supplies. Fire suppression has increased stocking of understory trees shifting stand structure from old forest single structure to old forest multi structure. White-headed Woodpecker was chosen by the Blue Mountain Land Management Plan Revision Team (the team, Wales et al. 2011 draft) as a focal species to represent the Medium-large trees/Dry forest group. The team determined the current condition viability outcome call for the white-headed woodpecker on the Malheur National Forest and the Blue Mountain Land Management Plan revision planning area is low likelihood of viability. During the summer of 2010 and 2011, white-headed woodpecker monitoring conducted on the Malheur National Forest verified localized breeding in ponderosa pine-dominated habitats on the Blue Mountain Ranger

District. However, survey information and population data for the white-headed woodpecker are incomplete.

Existing Condition

On the district preferred habitat currently occurs on less than 1% of the landscape. Potential habitat for white-headed woodpeckers is most often associated with the warm-dry and hot-dry forest types. Within the project area, 20,558 acres of potential habitat exists. Today, 126 acres or <1%, of these forest types are classified as OFSS. Historically, 15-55% of warm-dry forest types and 20-70% of the hot-dry forest types were in stands of OFSS. Old forest multi-strata (OFMS) stands provide habitat for OFSS associated species to a degree, as long as canopy cover is not too great, and appropriate tree species composition exists, i.e., predominantly ponderosa pine, Douglas-fir and western larch. However, habitat suitability may be low.

Bald Eagle

Life History and Habitat

The bald eagle is heavily associated with aquatic habitats and a majority of their diet is fish and waterfowl. During winter, bald eagles are known to feed heavily upon carrion. Nests are typically located in large trees or snags in close proximity to water.

Distribution

Bald eagles are most common around large lakes, marshes, along the coast and along the Columbia River (Csuti et. al. 1997). The bald eagle has been documented on the Forest and adjacent private lands. Most observations of bald eagles are seasonal occurring in the late fall, winter, and early spring. In the winter bald eagles roost and feed in Bear Valley, along the South Fork of the John Day River, Middle Fork of the John Day River, the mainstem John Day River, Harney Basin, and the Silvies Valley.

Existing Condition

There are two known bald eagle nests on the Forest, but no known bald eagle nests on the District, however, numerous winter roost sites exist and are monitored annually. Within the project area, winter roost sites could exist but are unknown. Habitat within the project area occurs along 4.7 miles of the Middle Fork of the John Day River.

American Peregrine Falcon

Life History and Habitat

Peregrine Falcons nest on cliffs greater than 75 ft. tall and are typically found no farther than one mile away from water (Pagel 2003). Nest locations and prey species vary considerably and are difficult to characterize. However, nest sites usually overlook open habitat where water birds are plentiful as peregrines are not well suited for interior forests (Csuti et. al. 1997).

Distribution

Peregrine falcons were once found throughout Oregon. Peregrines were extirpated from much of their range due to the use of the pesticide DDT, which was banned in 1972 and are slowly increasing in numbers. During migration, peregrine falcons can be seen throughout Oregon (Csuti et. al. 1997). No known peregrine falcon nesting occurs on the forest. However, numerous individuals have been seen near Ragged Rocks and Coyote Bluffs along the Middle Fork John Day River.

Existing Condition

On the district potential nesting sites include Ragged Rocks and Coyote Bluffs. Ragged Rocks is located approximately 3 miles west of the project area and has been identified as having good potential for falcon nesting. Coyote Bluffs is located within the project area on cliffs adjacent to the Middle Fork of the John Day River. However, cliff characteristics and close proximity to County Road 20 probably make this site a low potential for nesting. Potential nesting habitat also occurs about north of the project area on the Umatilla National forest where peregrine falcons have been reported, but nesting has not been documented.

Lewis' Woodpecker

Lewis' woodpeckers are a Management Indicator Species (MIS) of dead and defective wood habitat.

Life History and Habitat

Unlike most other woodpecker species in Oregon, Lewis' woodpecker inhabits primarily open forests and woodlands since its primary foraging strategy is fly catching. Nesting habitat consists of two distinct types in eastern Oregon: riparian areas with large cottonwoods, and fire maintained or burned old-growth ponderosa pine forests (NatureServe 2009). This species seldom excavates its own nest cavity, instead it uses cavities created by other woodpeckers (Bock 1970). In burned areas, ponderosa pine snags greater than 16 inches dbh are chosen for nesting. Similar diameter cottonwood snags in riparian areas are selected (Galen 1989).

Distribution

Currently the Lewis' woodpecker is common year round only in the white oak-ponderosa pine belt east of Mt. Hood. However, it breeds in eastern Oregon river and stream valleys such as the John Day River, Grande Ronde River, Lower Deschutes River, Wallowa River, Imnaha River, Burnt River, Klamath River, Squaw Creek, Murderers Creek, and Pike Creek (Marshall et. al. 2003).

There has been an approximate 70-75% decline in source habitat for this woodpecker compared to historical estimates in the Blue Mountains (Wisdom et al. 2000). This decline is possibly due to loss of habitat including nest and food storage trees, and from increased competition for nest trees by introduced European starlings. Murderers Creek, Pike Creek, and the John Day rivers have been identified as suitable nesting habitat. Numerous large stand-replacing fires have occurred on the Malheur National Forest since the late 1990's that provide foraging habitat for Lewis' woodpeckers.

Existing Condition

The Blue Mountain Ranger District has had numerous stand replacing fires that provide suitable foraging habitat for Lewis' woodpecker, although no post fire habitat exists in the project area. Due to fire suppression, fire maintained old growth only occurs in those areas where prescribed fire is implemented. Acreages for this habitat type are currently not available, however open old growth habitat is providing nesting and foraging habitat to some degree. On the District over 72,000 acres of riparian habitat exists, and within the project area there are 6,231 acres. Although, riparian habitats are abundant on the district and within the project area, cottonwoods are scarce.

Bufflehead

Life History and Habitat

The bufflehead nests near high mountain lakes surrounded by open woodlands. Buffleheads are the smallest diving ducks allowing them to nest in small cavities excavated by northern flickers. After breeding season, buffleheads can be seen on major rivers, lakes, and along estuaries. Buffleheads eat

crustaceans and aquatic insects during the nesting season and seeds of pondweeds and bulrushes (Csuti et. al 1997). The bufflehead is a game species in Oregon.

Distribution

Nesting primarily occurs in the central and southern Cascade Mountains. The bufflehead is widely distributed throughout the state frequenting open waters on major rivers and lakes. As of 1997, Csuti et. al documented only several hundred breeding pairs in the state. There are few mountain lakes or reservoirs suitable for nesting on the forest. Numerous rivers including the North Fork, Middle Fork, South Fork and mainstem of the John Day River and the Silvies River have suitable post breeding habitat that is slow flowing and remains free of ice throughout the winter.

Existing Condition

There are 113 ponds and lakes totaling 90 acres on the Blue Mountain Ranger District that could potentially be bufflehead nesting habitat. Whether or not the lakes and ponds are surrounded by woodlands with numerous snags is unknown. Two ponds in the project area totaling less than one acre could be nesting habitat. Suitable post-breeding habitat on the district that provide slow flowing, sheltered habitat, that remains ice free, are portions of the North Fork, Middle Fork, South Fork and mainstem of the John Day Rivers and the Silvies River. Post breeding habitat within the project area occurs along 4.7 miles of the Middle Fork of the John Day River.

Bobolink

Life History and Habitat

Bobolinks are found in native and tame grasslands, haylands, lightly to moderately grazed pastures, no-till cropland, small-grain fields, wet meadows, and planted cover. Bobolinks prefer habitat with, tall, dense vegetation, moderately deep litter, and the absence of woody vegetation (Dechant et. al. 2001). Bobolinks prefer large grasslands and nest far from woody edges.

Distribution

The species commonly breeds at Malheur National Wildlife Refuge and grasslands throughout southern and eastern Oregon. In Oregon, breeding occurs in the following counties: Baker, Malheur, Union, Grant, Harney, and Klamath. Potential habitat is associated with tributary streams and at low reaches where streams enter major rivers. Along tributary streams, habitat is considered marginal. Many of these acres are grazed and may not be providing tall enough grass for bobolinks. Meadows exist in the uplands, but they tend to be too small or habitat is naturally dry and low in productivity.

Existing Condition

On the district potential habitat could be described similarly to that on the Forest. Within the project area, habitat is limited to 115 acres of meadows and grasslands along the Middle Fork of the John Day River.

Silver-bordered Fritillary

Life History and Habitat

Habitat for silver-bordered fritillaries consists of open, boggy, wet meadows that contain marsh and bog violets, the host species for caterpillars. Adults feed on plants including black-eyed Susan and goldenrod. Loss of open meadows or bogs due to encroaching woody-stemmed plants, de-watering of marsh habitat, and livestock grazing practices have degraded habitat.

Distribution

Only two primary colonies are found in Oregon. One colony is found at Big Summit Prairie in the Ochoco Mountains and one in the Strawberry Mountains on the Malheur National Forest.

Existing Condition

Although this species is only found in the Strawberry Mountains, 6 acres of wet meadow occur in the Galena project area and could be potential habitat. However, there have been no assessments to determine if the meadows contain black-eyed Susan, goldenrod, or marsh and bog violets.

Direct and Indirect Effects by Alternative

Alternative 1 – No Action

No thinning, prescribed fire, road building, or aspen treatment would occur. With no activities proposed, habitat would remain in its current condition. Use of habitats would not change from the way they are currently being utilized and may not be self-sustaining over time. Under Alternative 1, sensitive species habitat would remain the same therefore there would be No Impact from proposed activities to individuals, populations, or prey species associated with gray wolf, California wolverine, White-headed woodpecker, bald eagle, American peregrine falcon, Lewis' woodpecker, bufflehead, bobolink or silver-bordered fritillary.

Alternative 2, 3, 4

Thinning and Prescribed Fire

Thinning and prescribed fire in overstocked stands would enable remaining trees to respond by increasing their crowns and roots, increasing their ability to utilize nutrients, sunlight, and water. Thinning also enhances understory forage for some species by opening up tree canopies. Treatments are designed to enhance growth of young stands into old forest structural stages and increase old forest single stratum (OFSS) development where appropriate which will increase the amount of habitat for white headed woodpecker and potentially Lewis's woodpecker in the project area in the short and long term. Both species use mature open ponderosa pine forest.

Implementation of thinning and prescribed burning is likely to result in some loss of existing snags, and down wood that are important stand attributes of healthy forests and critical components of wildlife and invertebrate habitat (Pilliod et. al. 2006). Wildlife and invertebrate species that depend on down wood, snags, dwarf mistletoe brooms, dense forests with abundant saplings and small poles, and closed canopy-forests for survival and reproduction. At the project area scale, the loss of large snags from commercial and noncommercial thinning operations would be expected to be minor. The Canyon Creek Wildland Urban Interface project, estimated that snags felled for safety reasons would impact 2%-10% of the existing snags in treatment units, and less than 1% at the landscape level (Schuetz, 2006). Project designs such as retention of untreated patches of trees within units would continue to provide avenues for snag recruitment.

Prescribed fire would have the most effect on snags. Snags would be both lost and recruited by burning. Burning prescriptions would strive to minimize the effects to snags. If the quantity of fire-created snags exceeds the loss, the amount of habitat to woodpeckers would increase

Thinning (commercial and pre-commercial) and prescribed fire would be used to help restore historical stand structure and fire regimes on dry forest types. Action alternatives incorporate these strategies at varying levels. Within RHCA's thinning would only occur to restore aspen stands. Thinning will not occur in RHCA's outside of aspen stands. In late and old structure (LOS) stands, action alternatives would thin to meet the objectives of the project. Treatments are prescribed where current vegetation

conditions do not meet historical conditions and stands are considered at risk. All proposed management actions are consistent with Forest Plan and amendment #2 standards for maintaining LOS and RHCA's.

Roads

Road construction increases human access, reduces snag density and habitat as a result of the conversion of forest to roadway, and increases firewood cutting of snags. However, additional roads will be closed or decommissioned, reducing potential snag density and habitat loss. Although no thinning is proposed in roadless areas or wildlife emphasis areas, species requiring remote areas and refuge from humans could be detrimentally affected in other undeveloped lands. Ponderosa pine, western larch, and lodgepole pine are used for firewood and provide some of the most suitable nest and roost sites for cavity dependent wildlife.

Closing or decommissioning roads would secure potential habitat from human access. Disturbances to wildlife would be expected to decrease. Closing or decommissioning roads would secure habitat from the risks of firewood cutting and danger tree removal.

Road densities after implementation of each action alternative would be at or below standards set by the Forest Plan and be closer to the desired open road densities based on the LRMP Record of Decision. Road densities after implementation of action alternatives are shown by management area and subwatershed in the MIS – Elk section.

Aspen Treatment and Protection

Aspen stands would be released from overstory shading and conifer competition, protected from browsing, and allowed to expand. Prescribed fire would enhance natural regeneration. Saplings would grow into larger size classes, becoming resistant to ungulate browsing. Understory grass and forb cover would increase, as would deciduous riparian shade, root structure, and soil-holding capacity within the stands. Diversity of habitat would increase, especially foraging and nesting opportunities for neo-tropical migrants and cavity excavators. Genetic diversity of the treated aspen stands would be maintained and preserved.

In the long term aspen stands would be protected and result in increased browse for elk and deer, the primary food source for wolf and wolverine. Diversity of habitat would increase, especially foraging and nesting opportunities for neo-tropical migrants and cavity excavators. Genetic diversity of the treated aspen stands would be maintained and preserved.

Table 27. Effects to Threatened, Endangered and Sensitive species with habitat documented within the project area

Common Name	Status	Effects Determination			
		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Gray Wolf	S	NI	NI	NI	NI
California Wolverine	S	NI	MIIH	MIIH	MIIH
White-headed Woodpecker	S	NI	MIIH (BI)	MIIH (BI)	MIIH (BI)
Bald Eagle	S, DL	NI	NI	NI	NI
American Peregrine Falcon	S, DL	NI	NI	NI	NI
Lewis' Woodpecker	S	NI	NI	NI	NI
Bufflehead	S	NI	NI	NI	NI

Common Name	Status	Effects Determination			
		Alt. 1	Alt. 2	Alt. 3	Alt. 4
Bobolink	S	NI	NI	NI	NI
Silver-bordered Fritillary	S	NI	NI	NI	NI

NI	*No Impact*
MIIH	*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*
WIFV	*Would Impact Individuals or Habitat 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*
BI	*Beneficial Impact*

Gray Wolf

Wolves feed on big-game animals and occasionally on other species. Therefore, actions that affect big game populations could affect wolf survival or productivity. Thinning and prescribed fire, road activities and aspen treatment in alternatives 2, 3, and 4 improve big game habitat by 1) improving cover/forage ratios, 2) enhancing forage by opening up canopies and treating aspen stands, and 3) reducing open road densities.

Any wolf inclined to travel in the project area may be temporarily displaced by activities associated with thinning and prescribed fire. However, because there are currently no wolves within the project area and due to the wide-ranging nature of wolves it is assumed that the potential for chance encounters are remote.

Determination for Wolves is No Impact (NI) for the following reasons:

- No populations currently occupy the Forest.
- No denning or rendezvous sites have been identified.
- There is an abundance of prey; that is not a limiting factor
- Most Forest Service management activities for non-breeding populations are compatible with wolf protection and recovery.

If wolves become established while project implementation is occurring, measures will be taken to protect them.

California Wolverine

The Galena project area could be used seasonally by wolverines when human access is impeded by snow or more likely used as dispersal habitat for animals traveling between source habitat areas in the unroaded areas listed in the existing condition. The only potential impacts on wolverines would be habitat fragmentation and increased human presence associated with thinning and prescribed fire, road activities and aspen treatments from each action alternative during implementation occurring between the potential wolverine habitats. However, within Vinegar Hill-Indian Rock Scenic area and the Dixie Butte Wildlife Emphasis Areas there is no proposed road construction or thinning activities, so impacts to habitat will be negligible.

Wolverines do not tolerate land-use activities that permanently alter their preferred habitat. However, travel corridors are expected to continue to facilitate wolverine travel and dispersal. Elk and deer

distribution, an important food source, could be altered. Treatment is expected to benefit big game populations. Implementation of Alternatives 2, 3, and 4 may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species (MIIH).

White-headed Woodpecker

The majority of the timber harvest and prescribed fire activities are being conducted in the dry forest types where much of the vegetation is outside of historic range of variability (HRV). Treatments would reduce canopy closures and stand densities. Treatments would convert old forest multi-strata (OFMS) to old forest single stratum (OFSS) structure stands, where appropriate. Younger stands would be managed to develop OFSS over the next 25 to 50 years. Development of large blocks of OFSS structure stands would increase the density and distribution of the white-headed woodpecker. Also, road closures would secure potential snag habitat important to white-headed woodpeckers. For a more detailed analysis on the effects to white-headed woodpecker see MIS – Old Growth.

In the short term the thinning and prescribed fire, road activities and aspen treatments from each action alternatives may impact individuals or habitat, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH). In the long-term, converting OFMS stands back to OFSS, and securing snag habitat as a result of closing roads would have a Beneficial Impact (BI) on white-headed woodpecker.

Bald Eagle

Bald eagle presence in the area would be post breeding season along the 4.7 miles of the Middle Fork of the John Day River. Prescribed burning is the only activity occurring within close proximity to bald eagle habitat. Burning could occur on approximately 100 acres along the river. However, burning would not change the potential for bald eagles to utilize the river outside of the prescribed burning window. Individuals may utilize other river habitat while prescribed burning is occurring. Design criteria, including snag retention, would ensure there would be No Impact (NI) to bald eagles by implementing any of the alternatives.

American Peregrine Falcon

Peregrine falcon presence in the area is transitory in nature and falcons would not likely be affected during implementation of any of the proposed activities. Thinning and prescribed burning reduces stand density may provide a benefit to peregrine falcon. These potential benefits are not measureable and are too minimal to be considered. Design criteria would ensure there would be No Impact (NI) to peregrine falcon from thinning, prescribed burning or aspen treatment by implementing any of the alternatives.

Lewis' Woodpecker

Thinning in RHCA's associated with aspen stands would increase habitat diversity, especially foraging and nesting opportunities for neo-tropical migrants and cavity excavators including Lewis' woodpecker. Prescribed burning, road construction and decommissioning would also occur in RHCAs on different scales within each action alternative. Road construction associated with the action alternatives would allow access to potential snag habitat which could reduce snags impacting Lewis' woodpeckers. However, overall reduced open road densities would secure potential snag habitat important to Lewis' woodpeckers.

Insect abundance is likely the key factor in determining if the project area is suitable habitat for the Lewis' woodpecker. Most habitats are only temporarily suitable and project activities may initially deplete the prey density, although underburning and the natural regeneration of shrubs would replenish the prey base making it suitable for a longer period of time. Protection measures for snags would be implemented to mitigate potential losses from project activities. Thinning old growth would convert

OFMS stands back to OFSS, benefitting the Lewis' woodpecker. For a more detailed analysis on the effects to Lewis' woodpecker see MIS- Primary Cavity Excavators.

The project area is marginal habitat at best and the nearest occupied habitat is likely within the area of the summit fire which burned in 1996. The summit fire is <1 mile west of the project area and is likely to have the snag density and prey base that the Lewis' woodpecker requires. The summit fire area is likely the closest foraging habitat for the Lewis' woodpecker. The proposed activities will not decrease nest cavities or foraging activities, and therefore there would be No Impact (NI) to Lewis' woodpecker populations under any alternatives.

Bufflehead

Bufflehead presence in the area would likely be post breeding season, along the 4.7 miles of the Middle Fork of the John Day River. Prescribed burning is the only activity occurring within close proximity to bufflehead habitat. Burning could occur on approximately 100 acres along the river. However, burning would not change the bufflehead's likeliness to utilize the river outside of the prescribed burning window or adjacent habitats while prescribed burning is occurring. Burning activities in potential habitat are expected to be very short duration, generally a few days. There would be No Impact (NI) to bufflehead by implementing any of the alternatives.

Bobolink

In the project area there is 115 acres of potential bobolink habitat present along the Middle Fork of the John Day River. Prescribed burning is proposed primarily in forested areas, no ignitions of prescribed fire will occur within 100' of perennial or intermittent streams, wetlands, or wet meadows with the exception of aspen treatments. If fire does enter potential bobolink habitat present along the Middle Fork of the John Day River, burning should stimulate grasses, which should improve the potential bobolink habitat and the effect should last for about 5 years post burn. Subsequent burns should have the same effect. Riparian openings probably would not burn during a spring burn, but would during the fall. Under all action alternatives 2, 3, and 4 there would be No Impact (NI) to bobolinks.

Silver-bordered Fritillary

Prescribed burning could occur on the 6 acres of potential habitat. To minimize the effects to the silver-bordered fritillary no lighting will take place in wet meadows. Fire will be allowed to back into wet meadows to reduce the need for firelines. The wet meadows are not expected to burn with high severity, preserving the majority of the wet meadow habitat, therefore the impacts to the silver-bordered fritillary are expected to be insignificant. Under all action alternatives 2, 3, and 4 there would be No Impact (NI) to the silver-bordered fritillary.

Conclusion

The impacts to wolverine and short term impact to the white-headed woodpecker may impact individuals however there are no expected impacts to populations that would lead any sensitive species toward threatened or endangered status. The effects to white-headed woodpecker are expected to be beneficial as new habitat is created and develops in the future.

Cumulative Effects

Alternative 1

Under the no action alternative no project activities would occur, so there would be no contribution to cumulative losses of old growth or habitat fragmentation. Forgoing treatments under the no action alternative could contribute to the loss of OFSS and the white-headed woodpecker in the long-term.

Additionally, the wildfire hazard will continue to increase with this alternative. If a large scale wildfire were to occur, large sections of habitat would be removed from the project area.

Alternative 2,3, 4

There are no direct or indirect impacts to gray wolf, bald eagle, American peregrine falcon, Lewis's woodpecker, bufflehead, bobolink, and silver-bordered fritillary or their associated habitat in the project area. There are not anticipated cumulative effects as a result of the action alternatives. Current and future actions are not expected to impact the above listed species.

All of the activities in Table 6 have been considered for their cumulative effects on California wolverine and white-headed woodpecker. Past activities such as timber harvest, road construction associated with timber harvest, wildfire, fire suppression, mining, and firewood cutting have impacted the quantity, quality, and distribution of habitat. The bounds of analysis for cumulative effects on white-headed woodpecker and wolverine are the project area subwatersheds and adjacent subwatersheds. The bounds of the cumulative effects analysis on California wolverine is the project area.

There is not likely to be a cumulative or additive effect from proposed activities with noxious weed treatments, livestock grazing, or watershed improvements on white headed woodpecker or California wolverine. These activities have not changed, nor will they change vegetation or snag habitat for the white-headed woodpecker. These activities are not fragmenting source habitat, dispersal habitat, or decreasing food supply for the California wolverine.

Past timber harvest projects were generally very intensive; focusing upon the removal of the larger, more valuable ponderosa pine, Douglas-fir, and western larch trees. Past activities were done with disregard to habitat fragmentation and no consideration was given to impacts of increasing accessibility into expansive tracts of land. Past timber harvest activities and roads were considered in the existing condition or the baseline conditions for the project area. The majority of the proposed timber harvest and prescribed fire activities in the Galena project would occur in the dry forest types where much of the vegetation is outside the historical range. Proposed activities of thinning and prescribed burning would move stands towards OFMS and OFSS structural stages where appropriate and will not harvest trees over 20.9 inches benefitting white-headed woodpecker in the long term. Individual wolverine could be disturbed and dispersal habitat may be fragmented with thinning, prescribed fire, road activities and aspen treatments. There are however no similar ongoing or foreseeable future activities that would have a cumulative impact on wolverine or wolverine habitat. At the project scale, the short-term loss of snags s associated with commercial and precommercial thinning operations would expected to be minor. This initial reduction of snags in the project area could be offset by the large number of snags provided in the Reed, Summit, and Easy fires located in nearby subwatersheds. In the mid to long term, snags would be lost and recruited during propose prescribed burning. No ongoing or foreseeable prescribed burning projects would occur in the project areas that would have a cumulative impact to white headed woodpecker habitat.

Vehicle traffic, hunting, camping, snowmobiling, and firewood cutting are expected to continue in the project area. All action alternatives propose to reduce road densities and designate 6,751 acres of connectivity corridors within and outside the project area, reconnecting habitat types important for wolverine dispersal; and reducing firewood cutting access to snag habitat important to white headed woodpecker. Currently off road vehicle travel is allowed in most of the project area. OHV use has the potential to disturb dispersing wolverine and reduce security for big game (prey species or carrion sources for wolverine). The Malheur National Forest is in the process of analyzing changes in its travel management plan. It is foreseeable that cross country travel would be prohibited on the Malheur National Forest (where it is not already prohibited), with the exception of accessing dispersed camp sites from open roads. The distance from roadway to dispersed site varies by alternatives being considered. Proposed road closures and decommissioning in the Galena project, combined with the foreseeable changes in

travel management would have a beneficial cumulative impact to wildlife, including wolverine and white headed woodpecker in the long term. Potential benefits to wolverine include providing increased security and reduced disturbance. Benefits to white headed woodpecker include reduced access in the future for firewood cutting and improved retention of large diameter snags.

Management Indicator Species (MIS) for Big Game

Regulatory Framework

The Forest Plan identifies 15 wildlife species as MIS to monitor the conditions of the Forest's ecosystems. The Forest Plan provides direction on managing habitat quality for MIS by management area. These MIS are considered to be representative for a variety of other species with similar life requirements and were determined to reflect the habitat needs for the majority of the forest's species. MIS were selected because population changes are believed to indicate the effects of management activities that occur on the forest.

All 15 MIS were considered in the analysis of the alternatives. However, 12 species were found to have the potential of being affected by this project and were evaluated in detail. These species have been grouped into three categories:

- Big game
- Old growth dependent species
- Primary cavity excavators

The MIS that are not evaluated in detail are found in the wildlife specialist report located in the project record with reasons of why there are no effects and not analyzed in greater detail.

Rocky Mountain Elk (Cervus elaphus) were selected as a Management Indicator Species (MIS) for Big Game on the Malheur National Forest due to their economic and social value, and their response to changes in forest cover, forage quality, and road densities.

Analysis Methods

The Blue Mountain Land Management Plan Revision Team (the team, Wales et al. 2011 draft) determined the current condition viability outcome call for focal species representing different habitat types for the Blue Mountain Land Management Plan Revision. The team's analysis included 5 species currently listed as MIS for the current Forest Plan. Therefore, the analysis of the proposed activities on those 5 species habitat as well as the 10 others occurring in the Management Indicator Species - MIS section may vary slightly due to availability of data.

Thomas et al. (1988) developed the Habitat Effectiveness Index (HEI) model for estimating elk habitat effectiveness on the landscape. The existing condition and the effects analysis by alternative for elk habitat effectiveness were evaluated using the HEI model, marginal and satisfactory cover percentages, and open road densities. Existing big game cover was designated using stand exams, Most Similar Neighbor analysis using Geographic Information System electronic layer files, aerial photographs and ground reconnaissance. Open road densities were calculated using the District access travel management database. Values were estimated by subwatershed, winter/summer range, and by wildlife emphasis area classification.

The Malheur Forest Plan establishes minimum standards for HEI for both summer range (LRMP, pp. IV-27 to IV-29) and winter range (LRMP, pp. IV-69 to IV-73). In addition, the Forest Plan identifies minimum standards for retention of satisfactory cover, marginal cover, and total cover. The Forest Plan also establishes standards for open road density.

Hiding cover in the project area is plentiful, although difficult to quantify. Many stands classified as satisfactory or marginal cover provide hiding cover. Even small thickets of saplings can offer hiding cover. These categories generally reflect gradation from early to late succession structural stages. Past management activities have altered cover, forage and road densities. A mosaic of forage and cover areas, and adequate water is preferred.

Existing Condition

The project area is divided into winter range, summer range, and the Dixie Butte Wildlife Emphasis Area. Winter range is primarily at lower elevations, less than 5,200 feet, where forested areas are interwoven with non-forested grasslands and shrublands. In the Little Boulder Creek-Deerhorn subwatershed there are 3,800 acres of big game winter range. Winter range extends out of the Little Boulder Creek-Deerhorn subwatershed and that portion within the Galena project area comprises <5% of the total winter range within the Middle Fork John Day Sub-basin. Summer range, consisting of 32,188 acres, is predominantly in mixed conifer stands above 4,600 feet in elevation. Approximately 1,098 acres of the project area is classified as the Dixie Butte Wildlife Emphasis Area and no activities will occur within this area so there are no impacts that will be analyzed. Forest Plan standards are different for summer range, winter range. Table 28 below displays the existing Habitat Effectiveness Index (HEI) values in the Galena Project area.

Table 28. Existing HEI values, cover percentages, and open road densities

Subwatershed	HEc	HEs	HEf	HEr	HEcsfr	%S	%M	% Total Cover	Open Road Density miles/mile^2
Project Area									
Vinegar Creek	0.59	0.57	0.5	0.49	0.55	8	38	47	2.0
L. Boulder/Deerhorn	0.64	0.48	0.5	0.54	0.54	17	44	62	1.6
Summer Range									
Forest Plan Standard	*0.3*	*0.3*	*N/A*	*0.4*	*0.4*	*12*	*5*	*20*	*3.2 (1.5*)*
Vinegar Creek	0.59	0.57	N/A	0.49	0.55	8	38	46	2.0
L. Boulder/Deerhorn	0.65	0.43	N/A	0.58	0.54	21	48	69	1.6
Winter Range (MA-4a)									
Forest Plan Standard	*0.4*	*0.3*	*0.4*	*0.5*	*0.5*	*10*	*10*	*25*	*2.2(1.0*)*
Vinegar Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
L. Boulder/Deerhorn	0.57	0.69	0.50	0.39	0.53	5	30	35	3.0
Wildlife Emphasis Area (MA-21)									
Forest Plan Standard	*0.5*	*0.6*	*0.5*	*0.6*	*0.7*	*20*	*20*	*40*	*1.5*
Vinegar Creek	0.53	0.55	0.50	0.94	0.61	2	24	26	0.1
L. Boulder/Deerhorn	0.88	0.39	0.50	1.00	0.64	64	19	83	0

HEc = habitat effectiveness derived from the quality of cover

HEs = habitat effectiveness derived from the size and spacing of cover

HEf = habitat effectiveness derived from the quantity and quality of forage; HEf is not used in summer range.

HEr = habitat effectiveness derived from the density or roads open to vehicular traffic

%S = Satisfactory Cover, %M = Marginal Cover, % Total Cover = %S + %M

N/A – Not Applicable. HEf is not used for summer range.

**Desired open road density based on LRMP Record of Decision*

The Malheur National Forest defines elk and deer habitat by four broad categories based on vegetative conditions: satisfactory cover, marginal cover, hiding cover, and forage. These categories generally reflect the gradation of forest vegetation from late structural stages to early structural stages. A mosaic of cover and forage areas with adequate water is preferred. Definitions follow:

- Satisfactory cover is a stand of coniferous trees 40 or more feet tall with an average canopy closure equal to or more than 50% for ponderosa pine and 60% for mixed conifer. Satisfactory cover is considered superior to marginal cover.
- Marginal cover is a stand of coniferous trees 10 or more feet tall with an average canopy closure equal to or more than 40%. As with satisfactory cover, marginal cover must be at least 10 acres in size and 600 feet wide. Marginal cover and satisfactory cover are also sometimes referred to as thermal cover. Deer and elk use this thermal cover to moderate harsh weather conditions. Under thermal cover, animals need to expend less energy for thermal regulation, i.e., to keep cooler on hot days and to keep warmer on cold days. Recent studies by Cook (1998) indicate this benefit may be less important for elk than once thought). Often, but not always, thermal cover also provides hiding cover.
- Hiding cover, also referred to as security cover, is vegetative cover that hides at least 90 percent of an adult elk at 200 feet. Hiding cover provides a visual barrier between big game animals and potential predators or sources of disturbance, and is especially important during hunting season when big game alter their travel patterns to avoid humans.

Forage consists of all woody and non-woody plants that are available to livestock or wildlife as a food source. Browsing refers to foraging on woody plants, typically hardwood shrubs or trees. In general, deer prefer browse forage such as shrubs and forbs while elk prefer forage dominated by grasses.

In summer range, all values exceed Forest Plan standards except satisfactory cover in the Vinegar Creek subwatershed which is 8% rather than the requisite 12%. Both subwatersheds meet the standard for open road density (<3.2 miles of open road per square mile), but the Vinegar Creek subwatershed does not meet the objective level recommended in the Forest Plan Record of Decision (ROD) (<1.5 miles of open road per square mile).

Cover requirements are not always compatible with historical range of HRV. This conflict is apparent in hot-dry and warm-dry forests dominated by ponderosa pine. Historical conditions and fire return intervals favored large blocks of trees with canopy closure too low to support satisfactory or marginal cover. Today, cover requirements are being met on many ponderosa pine sites; however, stands are overstocked and at high risk to bark beetle and severe wildfires. Cover levels may not be sustainable. Unfortunately, tree thinning, the treatment that most effectively reduces beetle and fire risk, also reduces the effectiveness of a stand as cover.

Winter range only occurs in the Little Boulder Creek-Deerhorn subwatershed. In winter range, the HEI value is above Forest Plan standards, however the road density is too high resulting in a poor HEr value.

In winter range total cover (satisfactory and marginal cover together) exceeds Forest Plan Standards, as does marginal cover. Satisfactory cover within winter range is currently at 5% rather than the requisite 10%. Cover requirements in winter range, as discussed for summer range, are also likely incompatible with HRV. The low satisfactory cover values may better reflect historical conditions. In fact, this inherent conflict may be even more relevant in winter range, which is often located in low elevation, hot-dry and warm-dry forests dominated by ponderosa pine.

Big game management on the Malheur National Forest is a cooperative effort between the Forest Service and the Oregon Department of Fish and Wildlife (ODFW) where the Forest Service manages habitat while ODFW manages populations, managing big game according to pre-established management

objectives for each big game management unit. The project area is in the Desolation and Northside big game management units.

Wintering elk populations have not met population management objectives in the Desolation unit in 4 out of the last 8 years. Wintering elk populations have met or exceeded population management objectives in the Northside unit since 2001. Elk population estimates have remained stable for the Northside unit, and fluctuate near the management objectives for the Desolation unit. According to ODFW population estimates for the Desolation unit have not reached the management objectives because elk from the Desolation unit winter in the neighboring Heppner unit, causing population estimates from winter game counts to be below actual summer population levels (ODFW 2009).

Bull to cow ratios are influenced by a number of factors including numbers of hunters, length of hunting seasons, including the rutting period in the hunting season, lack of restrictions of antler class in harvest, lack of hiding cover, and high open road densities (Schommer and Johnson 2003). Bull to cow ratios have been below the management objectives for the last 8 years within the Desolation unit, while in the Northside unit ratios have exceeded the management objectives in all but two of the last 8 years. Calf recruitment is the number of sub-adult animals added to the population each year. Recruitment levels are expressed as the number of calves per 100 cows. The average number of calves needed to sustain an elk population ranges between 20 to 40 calves per 100 cows, depending on the annual adult mortality.

Table 29. Management objectives for Desolation and Northside big game management units

Year	Population	Bulls per 100 cows	Calves /100 cows
Desolation			
Management Objectives	*1,300*	*15*	*N/A*
2008	1,124	11	16
2007	1,239	9	21
2006	1,400	6	21
2005	1,400	8	34
2004	1,196	6	48
2003	1,235	7	17
2002	1,365	6	18
2001	1,625	8	25
Northside			
Management Objectives	*2,000*	*10*	*N/A*
2008	2,500	12	22
2007	2,400	12	31
2006	2,000	12	25
2005	2,000	10	33
2004	2,000	8	37
2003	2,000	12	25

Year	Population	Bulls per 100 cows	Calves /100 cows
2002	2,300	12	20
2001	2,940	12	22

Direct and Indirect Effects by Alternative

In general, elk could be impacted by the proposed activities in this project, which are timber harvest, prescribed burning, enhancement of aspen stands and various road actions. These activities could potentially change the condition of the inputs to the HEI model, forage, cover, and road density thus changing the effectiveness of elk habitat within the project area. A decrease in habitat effectiveness could result in population trend declines. An increase in habitat effectiveness could result in more forage and cover for elk and a potential for an increase in the population trend.

Timber harvest, while reducing cover, at the same time has the potential to increase forage. Where canopy cover is reduced, understory vegetation is likely to increase due to less competition for light, water, and nutrients. In Galena, summer and winter range have total cover in excess of minimum standards, therefore forage and browse is likely to be the more limiting habitat component.

Results from long-term big game studies at the Starkey Project indicates that elk avoided the short-term disturbance of logging activity itself, but elk did not avoid the harvests units or the log-hauling roads during and after timber harvest. In general, the elk populations become more dispersed during and after timber harvest which suggests that elk were moving farther over larger areas to meet their needs. Elk productivity was not negatively affected by timber harvest; however, the vulnerability of elk to hunting did increase. Open landscapes and relatively flat topography make elk more visible to hunters. This would increase hunter success, but would have little effect on elk performance (USDA 2006).

Alternative 1

No commercial thinning or pre-commercial thinning would occur. With no activities proposed, cover percentages, quantity and quality of forage, and open road densities, which are all used to evaluate habitat effectiveness of elk, would remain in their current condition in the short term, however there would be continued growth of late-seral species. Total percent cover and marginal cover would remain in excess of Forest Plan standards for each subwatershed. Those areas where satisfactory cover is deficient would remain deficient. In the mid to long term, development of multi-strata stands would create additional satisfactory and marginal cover stands, increasing both thermal and hiding cover.

Open road densities would be maintained at current levels. This alternative would not result in direct effects to big game security. Implementation of this alternative would construct no new roads, but at the same time, it would do nothing to modify existing open road densities or road management. Relationships between the spatial distribution and disturbance associated with open roads and hiding cover habitat would also not change, as existing road densities and levels of use are expected to remain the same in the short, mid, and long term.

Aspen stands would remain in their current condition. Grazing and browsing of aspen stands would continue. Conifer encroachment into groves would remain and continue to increase. The overstories of each stand would remain even aged and be approaching the end of their life cycle. Aspen would continue to decline and stands would slowly disappear.

Alternatives 2, 3, & 4 – Common Effects

In the Vinegar Creek subwatershed existing satisfactory cover in the summer range, currently below forest plan standards, is proposed to be further reduced as a result of all action alternatives. Furthermore, all action alternatives reduce satisfactory cover within that portion of big game winter range (MA-4A)

occurring in the Little Boulder-Deerhorn Creek subwatershed, which is currently below standards, requiring a non-significant forest plan amendment. This amendment would apply only for the duration of and to those actions proposed for this site-specific project.

Marginal cover, total cover, and open road density would meet or exceed forest plan standards as a result of all action alternatives.

Table 30. HEI values, cover percentages and open road densities by alternative for winter/summer range classification in each subwatershed

Subwatershed	HEc	HEs	Hef	HEr	HEcsfr (HEI)	%S	%M	% Total Cover	Open Road Density (miles/mile^2)
Summer Range									
Forest Plan Standard	*0.3*	*0.3*	*N/A*	*0.4*	*0.4*	*12*	*5*	*20*	*3.2 (1.5*)*
Vinegar Creek									
Alternative 1	0.59	0.57	N/A	0.49	0.55	8	38	47	2.0
Alternative 2	0.61	0.57	N/A	0.52	0.56	7	27	34	1.6
Alternative 3	0.60	0.59	N/A	0.51	0.57	8	29	37	1.7
Alternative 4	0.61	0.56	N/A	0.52	0.56	7	25	32	1.6
L. Boulder/Deerhorn									
Alternative 1	0.65	0.43	N/A	0.58	0.54	21	48	69	1.6
Alternative 2	0.67	0.47	N/A	0.60	0.58	20	40	60	1.3
Alternative 3	0.66	0.47	N/A	0.60	0.57	20	44	64	1.2
Alternative 4	0.67	0.52	N/A	0.60	0.59	19	36	55	1.3
Winter Range									
Forest Plan Standard	*0.4*	*0.3*	*0.3*	*0.5*	*0.5*	*10*	*10*	*25*	*2.2 (1.0*)*
L. Boulder/Deerhorn									
Alternative 1	0.57	0.69	0.50	0.39	0.53	5	30	35	3.0
Alternatives 2, 3, & 4	0.58	0.68	0.50	0.52	0.57	5	25	30	1.6

HEI = Habitat Effectiveness Index

HEc = habitat effectiveness derived from the quality of cover

HEs = habitat effectiveness derived from the size and spacing of cover

HEf = habitat effectiveness derived from the quantity and quality of forage

HEr = habitat effectiveness derived from the density or roads open to vehicular traffic

%S = Satisfactory Cover, %M = Marginal Cover, % Total Cover = %S + %M

N/A – Not Applicable. HEf is not used for summer range

**Desired open road density based on LRMP Record of Decision*

Alternative 2

Thinning

Under Alternative 2, commercial timber harvest would reduce satisfactory and marginal cover as shown in Table 31. Analysis assumed that all proposed harvest treatments in cover – regeneration favoring seral species (HRS), understory removal (HUR), commercial thin (HTH) and pre-commercial thin (SPC) – would essentially eliminate cover, i.e., cover will be reduced below the 40% canopy cover needed to classify as marginal cover.

Pre-commercial thinning of small trees would have the greatest impact on hiding cover. Road closures would result in increased security mitigating these losses. The potential negative effects of removing understory trees would be reduced by the design requirement to retain unthinned patches of dense trees throughout the project area. Untreated patches would remain at high risk to bark beetle attack and if tree mortality is high cover would be lost. These patches would be gradually lost over the next 25 years. Those areas where thinning would occur, both HTH or SPC, would be expected to transition back into marginal cover in approximately 25-50 years depending on the stand density following harvest.

At any one time, management activities would be localized in portions of the watersheds and elk may or may not shift use areas as a result. Disturbance to big game is a concern in winter range. In big game winter range (MA-4A), timber management activities would be restricted from December 1 to April 1 to minimize disturbance to wintering deer and elk.

Table 31. Acres of satisfactory and marginal cover removed in summer and winter range. Percentage reduction in cover is also shown. Values are displayed for all action alternatives

Subwatershed	Summer Range				Winter Range			
	Satisfactory Cover		Marginal Cover		Satisfactory Cover		Marginal Cover	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Vinegar Creek								
Alternative 2	158	0.9%	2088	12%	--	--	--	--
Alternative 3	130	0.7%	1632	9%	*No winter range exists in vinegar creek*			
Alternative 4	202	1.1%	2437	13%	--	--	--	--
L. Boulder/Deerhorn								
Alternative 2	37	0.3%	1221	9%	3	0.1%	190	5%
Alternative 3	37	0.3%	633	5%	3	0.1%	190	5%
Alternative 4	178	1.3%	1705	12%	3	0.1%	190	5%

Roads

Road densities after implementation of Alternative 2 would be at or below standards set by the Forest Plan and be closer to the desired open road densities in both summer and winter ranges (Table 30). When timber sales are active, log haul activities would temporarily increase local traffic levels and disturbances to big game would be expected to increase. Elk are likely to shift use areas as activities progress across the watershed (USDA 2006). As road closures are completed, disturbances to deer and elk from vehicular traffic would decrease. Closures would in part mitigate losses in hiding cover that occur due to timber harvest and prescribed fire. However, the decrease in disturbances to deer and elk would only occur if road closures are effective. Seasonal restrictions in winter range would minimize effects during the most

sensitive season. Disturbance is less of a concern to summer range where more of the land base is available for use.

Prescribed Fire

Large, highly mobile animals like deer and elk tend to move calmly in response to fire, tending towards the periphery of the fire (Smith et al. 2000). If ATV's with drip torches are used to traverse the area deer and elk may move further out from the fire perimeter and if a helicopter is used deer and elk are expected to move an even greater distance from the fire perimeter. Disturbance would be short term, unlikely lasting more than 2 or 3 days on the larger burning operations. Elk and deer could return to burn areas as soon as the ground cools.

Direct fire caused mortality would be unlikely; mortality typically occurs only in uncontrolled wildfire where fire fronts are wide and fast moving, fires are actively crowning, and thick smoke occurs. Additionally, within the project area there are no identified calving or fawning areas.

The negative impact of understory removal is compounded near roads where sight distance is increased, thereby raising the potential for poaching and harvest vulnerability of elk and deer. Burning might increase the possibility of insect activity particularly bark beetle activity. If beetle activity intensifies, there would be some risk of additional losses of hiding cover. Because prescribed fire would be expected to burn in a mosaic, ground vegetation would be reduced but not entirely eliminated. Temporarily, forage opportunities still may be better elsewhere until ground vegetation is reestablished.

Burning would improve forage conditions by opening canopies and allowing more light to the forest floor. Fire would also increase nutrient content and palatability of forage, although the increased quantity of forage after a fire would be more significant than the increased quality of that forage (Smith 2000).

Aspen Restoration

Encroaching conifers would be removed from aspen stands and they would be fenced to protect from browsing. In the first 10 years many of these trees would be essentially off limits to elk, but as new regeneration becomes established and protective fences deteriorate or are removed, available browse should increase. Aspen groves would be larger and healthier and more likely to remain a viable component of the landscape.

Habitat Effectiveness - HEI

The most direct effect from the proposed action is the reduction in satisfactory and marginal cover and the change in cover/forage distribution. In understory removal and commercial thin units canopy cover would drop below 40% and be classified as forage. Following treatment, satisfactory and marginal cover would comprise 13.5% and 24.6% of the analysis area, respectively. Total cover is provided on approximately 38% of the analysis area. While cover is reduced, HEI values increase due to road density reduction, increase in forage, and better distribution of cover and forage. The HEI model runs are located in the Galena Project Record.

The proposed action increases the habitat effectiveness derived from the quality of cover within summer range in both subwatersheds. However, percent satisfactory cover, currently below standards in the Vinegar Creek subwatershed, is further reduced by 158 acres.

In winter range satisfactory cover is reduced by 3 acres. This decrease in acres results in a decrease in the habitat effectiveness derived from the size and spacing of cover, however, standards are still being exceeded. Due to the incidental amount reduced, the percent of satisfactory cover in winter range did not change from the existing condition. Total cover in winter range would still be above standards at 35%, well above the minimum standard of 25%.

The proposed action increases the overall habitat effectiveness for each subwatershed in summer and winter range, exceeding Forest Plan standards. To compare the proposed action to the existing condition, any stand receiving treatment is predicted to move from its current structural stage to forage habitat. The HEI model runs are found in the project record.

The results of the HEI analysis for Alternative 2 show that the interaction between the four variables (HEs, HEr, HEf, HEc) increases the HEI value resulting from the proposed activities; commercial thinning, pre-commercial thinning, and prescribed fire (Table 30). This increase would benefit elk and therefore benefit elk populations within the project area and forest wide.

Alternative 3

Thinning

Under Alternative 3 commercial timber harvest would reduce satisfactory and marginal cover as shown in Table 31. Similar to Alternative 2 it is assumed that all proposed treatments would eliminate cover. Commercial timber harvest and pre-commercial thinning would have the same effects as Alternative 2; the difference is the acres treated and the units treated. All design criteria for Alternative 3 are the same as Alternative 2.

Satisfactory cover in summer range within the Vinegar Creek subwatershed, which is currently below standards, would be further reduced by 130 acres as a result of commercial timber harvest and pre-commercial thinning. Satisfactory cover in winter range within the Little Boulder-Deerhorn subwatershed, which is currently below standards, would be further reduced by 3 acres as a result of commercial timber harvest and pre-commercial thinning. Although timber harvest and pre-commercial thinning would reduce marginal and total cover, those percentages would remain above Forest Plan standards in both subwatersheds for both summer and winter range.

Roads

For each analysis area the HEr value exceeds Forest Plan standards and is higher than the HEr value for the existing condition. Road densities after implementation of Alternative 3 would be at or below the standards set by the Forest Plan and be closer to the desired open road densities. Disturbances to elk from the timing and duration of activities would be expected to be the same as Alternative 2.

Prescribed Fire

The acreage, area, and proposed implementation for prescribed burning is the same as Alternative 2 and therefore the effects to elk from prescribed fire are the same as Alternative 2.

Aspen Restoration

The proposed aspen stand treatments are the same as Alternative 2 and therefore the effects to elk from aspen treatment and protection are the same as Alternative 2.

Habitat Effectiveness – HEI

The descriptions of HEI under Alternative 2 also apply to Alternative 3. All variables and values not only exceed Forest Plan Standards but also increase as a result of implementing Alternative 3.

The results of the HEI analysis for Alternative 3 show that the interaction between the four variables (HEs, HEr, HEf, HEc) increases the HEI value resulting from the proposed activities; commercial thinning, pre-commercial thinning, and prescribed fire (Table 30). This increase would benefit elk and therefore benefit elk populations within the project area and forest wide.

Alternative 4

Thinning

Under Alternative 4 commercial timber harvest would reduce satisfactory and marginal cover as shown in Table 31. Similar to Alternative 2 it is assumed that all proposed treatments would eliminate cover. Commercial timber harvest and pre-commercial thinning would have the same effects as Alternative 2; the difference is the acres treated and the units treated. All design criteria and mitigation measures for Alternative 3 are the same as Alternative 2.

Satisfactory cover in summer range within the Vinegar Creek subwatershed, which is currently below standards, would be further reduced by 202 acres as a result of commercial timber harvest and pre-commercial thinning. Satisfactory cover in winter range within the Little Boulder-Deerhorn subwatershed, which is currently below standards, would be further reduced by 3 acres as a result of commercial timber harvest and pre-commercial thinning. Although timber harvest and pre-commercial thinning would reduce marginal and total cover, those percentages would remain above Forest Plan standards in both subwatersheds for both summer and winter range.

Roads

For each analysis area the HEr value exceeds Forest Plan standards and is higher than the HEr value for the existing condition. Road densities after implementation of Alternative 4 would be at or below the standards set by the Forest Plan and be closer to the desired open road densities. Disturbances to elk from the timing and duration of activities would be expected to be the same as Alternative 2.

Prescribed Fire

The acreage, area, and proposed implementation for prescribed burning is the same as Alternative 2 and therefore the effects to elk from prescribed fire are the same as Alternative 2.

Aspen Restoration

The proposed aspen stand treatments are the same as Alternative 2 and therefore the effects to elk from aspen treatment and protection are the same as Alternative 2.

Habitat Effectiveness – HEI

The descriptions of HEI under Alternative 2 also apply to Alternative 3. As a result of implementing Alternative 4 HEs is decreased from .57 to .56. However, HEs is still well above the Forest Plan standard of .3. All other variables and values not only exceed Forest Plan Standards but also increase as a result of implementing Alternative 4.

The results of the HEI analysis for Alternative 4 show that the interaction between the four variables (HEs, HEr, HEf, HEc) increases the HEI value resulting from the proposed activities; commercial thinning, pre-commercial thinning, and prescribed fire (Table 30). This increase would benefit elk and therefore benefit elk populations within the project area and forest wide.

Cumulative Effects

All of the activities in Table 6 and in the SOPA in the project record have been considered for their cumulative effects on big game habitat and associated species in the Galena project area and within the range of big game across the district. The following discussion focuses on those past, ongoing and foreseeable future activities that may contribute positive or negative effects.

Alternative 1 would not directly contribute to significant adverse cumulative effects to big game populations, however, continued declines in forest health would continue under the no action alternative.

Livestock grazing may reduce available forage for big game species. Recent studies from the Starkey Project suggest that elk, deer, and cattle have different forage preferences, each species having a distinctive dietary niche that varies by season (USDA, 2006). However, the diets of the three ungulates are similar in late summer when forage biomass and quality declines with summer drought, suggesting increased potential for competition. Galena will reduce cover, potentially improving forage by reducing competition for light, water, and nutrients for understory vegetation.

Mining activities within the Galena project area are localized, of short duration, and can be avoided by big game. Therefore, there are no cumulative effects to big game as a result of active mining claims.

Invasive plants lead to habitat degradation by reducing quantity and quality of forage. Galena project design mitigates the spread of noxious and invasive plants. In addition, the Malheur National Forest is in the process of completing an environmental impact statement and decision controlling invasive plants on National Forest system lands. Future treatment of this infestation would cumulatively result in fewer invasive plants and thus improve big game forage.

Past timber harvest activities and associated road construction in the analysis area has affected the quantity, quality, and distribution of cover habitat. However, recent timber harvest activities, such as, Crawford and Balance, would have effects similar to those described for the Galena project. Combined effects from timber projects would improve forage quality and quantity for big game, while reducing cover habitat and increasing big game vulnerability. Projects would likely be designed to retain un-thinned patches to reduce cover losses. Combined effects from timber projects would be expected to maintain overall HEI at or above Forest Plan standards. Restoration of HRV in the dry forest types is expected to reduce the risk of uncharacteristic disturbances such as uncharacteristically severe wildfire and insect epidemics that could result in an undesirable ratio of open and closed canopy habitats.

Road construction associated with past timber harvest has increased road-related disturbance on big game. Disturbance of elk by hunting along open roads and off-road vehicle use has impacted big game populations. The Galena project reduces open road densities, meeting and exceeding Forest Plan standards. In addition the Malheur National Forest Travel Management Plan will prohibit motorized travel off of existing designated routes where it is not currently prohibited, further increasing big game security.

Private lands within the Galena project boundary have been intensively managed. In the past, these lands do not appear to have been managed to improve big game habitat conditions. However, 98% of non-Forest Service land within the Galena project area is now owned by the Confederated Tribes of Warm Springs. The current management objectives for this land are to restore and maintain native habitat, with the ultimate goal of sustaining native fish and wildlife populations, reducing the potential for cumulative effects to elk.

In the long term, each action alternative would contribute positively to cumulative effects by reducing road densities, increasing big game security, and improving the overall habitat effectiveness on the landscape. The combined effects of the Galena action alternatives with past, present, and reasonably foreseeable future activities would not be expected to adversely affect populations or viability of big game species within the cumulative effects analysis area.

Management Indicator Species (MIS) for Old Growth Dependent Species

Regulatory Framework

There are 3 MIS species that represent old growth habitat on the forest: pine marten, pileated woodpecker, three-toed woodpecker. In addition the white-headed woodpecker is a good indicator of the health of OFSS. Table 32 shows these species, the old growth habitat type they represent, their habitat requirements and if the habitat is currently present within the project area.

Table 32. Old Growth Management Indicator Species

MIS Species	Representing	Habitat Requirements	Habitat Present in Project Area
Pine Marten *Martes Americana*	Old growth	Mature, mesic coniferous forests, with high structural diversity in the under story	Yes
Pileated woodpecker *Dryocopus pileatus*	Old growth, primary cavity excavator, snags and down wood	Extensive areas of dense coniferous forests with tall closed canopy, high basal area and large diameter snags	Yes
Three-toed woodpecker *Picoides tridactylus*	Old growth, primary cavity excavator, snags and down wood	Higher elevation (above 4,500 ft.) lodgepole pine and mixed conifer forests with a lodgepole component	Yes
White-headed woodpecker *Picoides albolarvatus*	Old growth, primary cavity excavator, snags and down wood	Open ponderosa pine forests with large trees and snags in large patches	Limited, due to lack of OFSS habitat

Analysis Methods

Within the project area, stand information that correlated with species requirements were identified by Most Similar Neighbor analysis, using GIS layer files, aerial photographs, ground reconnaissance and stand exams. Once habitat was identified within the project area the existing MA-13 network boundaries were changed to ensure standards and habitat needs are met for pileated woodpecker and pine marten. For each species potential habitat was mapped and effects were determined by comparing the number of acres affected by proposed treatment. Treatments for each alternative are similar, with the exception of their location and intensity, and were compared by alternative.

Existing Condition

Dedicated Old Growth (DOG) & Replacement Old Growth (ROG)

To provide for pileated woodpecker and pine marten population viability Forest Plan, Management Area 13 (MA-13), provides for the management of old growth habitat through a system of Dedicated Old Growth (DOG) units and Replacement Old Growth (ROG) units.

The Forest Plan directs that pileated woodpecker areas are to be 600 acres, composed of a 300-acre DOG and a 300-acre Pileated Woodpecker Feeding Area (PWFA). ROGs are intended to be ½ the size of DOGs. ROGs may overlap with the feeding areas. Pine marten units are to be 240 acres, composed of a 160-acre DOG and an 80-acre ROG. Management requirements are derived from the US Forest Service 1986 Minimum Management Requirements.

Ten DOG units (Appendix C, Maps 15 & 16) in the Galena project area have been delineated for pileated woodpecker, pine marten, or a combination of both species, totaling 2,614 acres. Existing DOGs do not always meet minimum size requirements, and they are not always tied to logical stand or topographical boundaries. ROGs have been established for 2 out of 10 DOGs. PWFAs have been established for 1 of the 4 pileated woodpecker DOGs. However, due to the fact that acres designated for a ROG can also be the same acres designated for a PWFA, Table 33 displays those "overlapping" acres only for the ROG to eliminate the appearance of excess designated acres.

925 acres, or 35% of the 2,614 acres located within the DOGs/ROGs currently classify as OFMS. Most of the remaining acres classify as young forest multiple strata. These latter acres typically provide adequate canopy complexity and canopy closure, but the number of large diameter trees present fall short of quantities required for OFMS classification.

Other Old Growth

Regional forester's eastside Forest Plans amendment #2 (USDA 1995) amended the Forest Plan to manage late and old structure (LOS) stands within HRV. Amendment #2 direction applies to LOS stands both inside and outside of the MA-13 network. Forests located outside designated DOGs, ROGs, and feeding areas can provide additional habitat for pileated woodpeckers and pine martens. The project area currently contains 4,955 acres of OFMS and 126 acres of OFSS.

Within the project area, OFSS habitat in both the warm-dry and hot-dry biophysical environments is well below the historical range of variability due to past timber harvest and fire suppression activities. Stands that were historically OFSS are now over stocked with smaller diameter trees. Many of these stands now classify as OFMS. Risk of uncharacteristically severe wildfire is elevated. Insect and disease risk is elevated. Old growth conditions may not be sustainable.

Current old growth conditions are more supportive of species that require high canopy cover such as the pileated woodpecker, pine marten, and northern goshawk, and are barely supportive of species that use open stand conditions such as the white-headed woodpecker and flammulated owl.

Connectivity

Amendment #2 gives direction for maintaining connectivity between LOS habitats to allow the free movement of old growth wildlife species. LOS stands need to be connected with each other inside the watershed and to like stands in adjacent watersheds in a contiguous network pattern by at least 2 different directions.

Currently there are no designated connectivity corridors connecting LOS stands within the analysis area.

Pileated Woodpecker

Pileated woodpeckers prefer late successional stages of coniferous or deciduous forest, but also use younger forests that have scattered, large, dead trees (Bull et al. 2007). In northeastern Oregon, pileated woodpeckers selected unlogged stands of old-growth grand fir (Abies grandis) 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). Their association with late seral stages stems from their use of large-diameter snags or living trees with decay for nest and roost sites, large-diameter trees and logs for foraging on ants and other arthropods, and a dense canopy to provide cover from predators (Marshall et al. 2006).

Under historical conditions, pileated woodpeckers were likely well-distributed throughout the Blue Mountains, however they are likely not as well distributed currently, and source habitat is less abundant.

The forest fish and wildlife database includes about 400 recorded sightings of pileated woodpeckers, 20 of which occur within the project boundary. Surveys focusing in DOG/ROG stands during the 2011 field season detected 9 individuals not accounted for in the forest fish and wildlife database total. Currently there are 186,027 acres of source habitat for pileated woodpecker on the Malheur National Forest. Within the project area 4,955 acres of preferred habitat exists in the form of OFMS habitat.

Pine Marten

American marten are typically associated with late-seral coniferous forests with closed canopies, large trees, and abundant snags and down woody debris (Zielinski et al. 2001).

Marten habitat historically was not abundant on this forest which led to a poorer viability projected historically as compared to the other forests within the Blue Mountain Forest Plan Revision planning area. Loss of historical habitat is the primary cause of poorer viability on this forest currently. The loss of habitat has led to poorer abundance and distribution overall.

The forest fish and wildlife database includes about 20 recorded sightings of pine marten, 3 of which occur within the project boundary. Marten tracks were found within the project area during the winter of 2008-2009 and a subsequent motion detection camera survey confirmed marten presence at that location. Currently there are 25,664 acres of source habitat for pine marten on the Malheur National Forest. Within the project area 3,097 acres of preferred habitat exists in the form of OFMS within the cool-moist and cold-dry forest types.

Three-Toed Woodpecker

To ensure species viability for three-toed woodpeckers, an MIS species, Forest Plan standard 59 gives direction to identify potential or existing old growth lodgepole pine forests. Minimum management requirements suggest establishing habitat areas of 75 acres for every 2,000 to 2,500 acres (USDA 1986). Cold dry forest types, consisting mostly of lodgepole pine, and moist forest types represent the highest quality habitat for three-toed woodpeckers. Post fire habitat does not occur within the project area, although 117,599 acres of recent (post 2005) post fire habitat occurs on the Malheur National Forest. For the purpose of the Galena project, analysis focused on habitat within the cold-dry and moist forest types. 11,843 acres of cold-dry and moist forest types exist within the project area. Of that 3,097 acres or 26% are in the old structure habitat conditions preferred for nesting and foraging. Potential habitat by forest type within the project area is as follows:

- 1,826 acres of cold dry habitat exists with 52 acres or 3%, in the OFMS structural stage.
- In the moist forest type 10,017 acres of potential habitat exists with 3,045 acres or 30% in the OFMS structural stage.

The district database includes about 7 recorded sightings of three-toed woodpeckers, 1 of which occurs within the project boundary.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 70% of the watersheds in the Blue Mountains showed an increasing trend in three-toed woodpecker habitat and 30% showed a decreasing trend. Breeding Bird Survey data is insufficient to determine population trends in the Interior Columbia Basin, but data summarized across the West indicates a 0.7% annual decline in populations from 1966 through 1994 (Wisdom et al. 2000). Breeding Bird Survey data for 1980-1998 indicates a significant annual decrease in three-toed woodpecker populations of 15.0% (n = 12 survey routes) and 13.4% (n = 18) in the U.S. and across the species' range in North America, respectively (Sauer et al. 1997). However, this data should be viewed with caution

given the low number of routes and low abundance of three-toed woodpeckers per route (Leonard, D.L. Jr., 2001).

White-Headed Woodpecker

Currently the white-headed woodpecker is not listed specifically as a MIS for primary cavity excavator and dead and defective habitat species in the Forest Plan. However, the white-headed woodpecker is an excellent indicator of the health of OFSS habitats. White-headed woodpeckers are associated with OFSS stands, i.e., open canopy stands of large mature and over mature ponderosa pine, and less frequently mixed ponderosa and Douglas-fir stands (Burleigh 1972, Ligon 1973, Webber and Cannings, 1976).

The white-headed woodpecker differs from many of the other primary cavity excavators in its near exclusive selection of mature single stratum ponderosa pine dominated habitats. This species relies almost exclusively upon the seeds from large ponderosa pine cones for foraging and eats insects gleaned off ponderosa pine trees. Large ponderosa pine snags are used for nesting. Because of its more limited need and use of snags for foraging, the species snag requirements are less than those required by other primary cavity excavators such as the pileated, downy, and hairy woodpeckers.

Habitat abundance and distribution for white-headed woodpeckers has been reduced or eliminated in the warm-dry and hot-dry forest types. Past harvest activities have concentrated on removing the large overstory ponderosa pine, western larch and Douglas-fir trees and snags, setting many stands back to younger structural stages. Significant reduction in numbers of large, mature ponderosa pine reduces trees for nesting and cones for winter food supplies. In other areas fire suppression has increased stocking of understory trees shifting stand structure from OFSS to OFMS.

Under historical conditions, white-headed woodpeckers were likely well-distributed throughout the planning area; currently they are likely not well-distributed and at risk of extirpation.

The project area contains 1,897 acres of source habitat in the form of OFMS or OFSS in the warm-dry and hot-dry forest types. Warm-dry and hot-dry forest types lacking large diameter trees are potential habitat. Currently there are 66,562 acres of source habitat on the Malheur National Forest.

In the project area 20,558 acres of potential habitat exists. Today, 126 acres or <1%, of these forest types are classified as OFSS. Historically, 15-55% of warm dry forest types and 20-70% of the hot-dry forest types were in stands of OFSS. OFMS stands are providing habitat for OFSS associated species to a degree, as long as canopy cover is not too great, and appropriate tree species composition exists, i.e., predominantly ponderosa pine, Douglas-fir and western larch. However, habitat suitability may be low.

The district database includes over 80 recorded sightings of white-headed woodpeckers, none of which occur within the project boundary.

Direct and Indirect Effects by Alternative

Alternative 1 – No Action

No MA-13 boundary change, connectivity corridor designation, thinning, prescribed fire, road building, or aspen treatment and protection would occur. With no activities proposed habitat would remain in its current condition. Use of habitats would not change from the way they are currently being utilized and may not be self-sustaining over time. Under Alternative 1 old growth habitat would remain the same therefore there would be no impact to forest wide habitat or populations trends for pine marten, pileated woodpecker, three-toed woodpecker, and white-headed woodpecker.

Alternative 2, 3, 4 – Common Effects

The following effects are the same for each action alternative.

Dedicated Old Growth & Replacement Old Growth

Alternative 2, 3, and 4 would result in changes and additions to DOGs, ROGs, and PWFAs to meet MA-13 standards. Designation of suitable MA-13 old growth areas across the project area would improve the agency's ability to manage for pileated woodpecker and pine marten. Population viability for pileated woodpeckers and pine martens would be maintained via the proposed MA-13 network and via old growth in the cold and moist forest types.

Table 33. Old growth Management Area 13 minimum requirements, existing acres, and proposed acres after adjusting boundaries for all action alternatives

Old Growth Management Area (MA 13) Classification and Species	Minimum MA-13 Acre Requirements[a]	Existing Acres	Additional Proposed Acres	Total Acres
DOG 129 Pileated Woodpecker	300	397	46	443[b]
Feeding Area	300	0	137	137[c]
Replacement Area	150	0	193	193[c]
DOG 242 Pine Marten	160	252	16	268
Replacement Area	80	47	95	142
DOG 243 Pine Marten	160	204	4	208
Replacement Area	80	0	109	109
DOG 248 Pine Marten	160	149	12	161
Replacement Area	80	0	124	124
DOG 249 Pine Marten	160	168	23	191
Replacement Area	80	0	87	87
DOG 250 Pine Marten	160	169	1	170
Replacement Area	80	0	97	97
DOG 330 Woodpecker and Marten	300	340	-2	338
Feeding Area	300	0	173	173[c]
Replacement Area	150	0	160	160[c]
DOG 333 Woodpecker and Marten	300	366	-34	332
Feeding Area	300	134[d]	137	137[c]
Replacement Area	150	134[d]	59	193[c]
DOG 433 Pileated Woodpecker	300	171	34	205[b]
Feeding Area (PWFA)	300	0	160	160[c]
Replacement Area	150	0	146	146[c]
DOG 533 Pine Marten	160	217	34	251
Replacement Area	80	0	130	130

Old Growth Management Area (MA 13) Classification and Species	Minimum MA-13 Acre Requirements[a]	Existing Acres	Additional Proposed Acres	Total Acres
	DOGs	2433	*134*	*2567*
Totals:	*ROGs*	*181*	*1200*	*1381*
	PWFAs	0	607	607
		2,614	**1,941**	**4,555**

[a] *The 4555 acre total for all DOGs, ROGs, and PWFAs is above the 3840 acre minimum requirement, and when coupled with treatments would improve suitable habitat available for old growth dependent species .*

[b] *DOG #129 and DOG #433 are contiguous, combined acreage is over the 600 acre combined minimum.*

[c] *ROGs and PWFAs associated with DOGs 129, 330, 333, and 433 can be combined to meet the 300 acre standard.*

[d] *Acres designated for a ROG can also be the same designated for a PWFA, the table displays those "overlapping" acres only for the ROG to eliminate the appearance of excess designated acres.*

Thinning and Prescribed Fire

Thinning (commercial and pre-commercial) would be used to help restore historical stand structure and fire regimes in particular, on dry forest types. Action alternatives incorporate these strategies at varying levels. In the DOGs, thinning would not occur in any alternatives. In ROGs and PWFAs action alternatives would thin to meet the objectives of the project. Treatments are prescribed where current vegetation conditions do not meet historical conditions and stands are considered at risk. All proposed management actions are consistent with Forest Plan and amendment #2 standards for maintaining the MA-13 network.

Connectivity

All action alternatives designate 6,751 acres of connectivity corridors connecting all LOS habitats. Long-term connectivity between LOS would be maintained according to amendment #2 standards. These corridors would continue to provide for the free movement of LOS associated species.

Thinning would treat 100 acres within amendment #2 connectivity corridors. Treatment units are 25, 26, and 271. In these units pre-commercial thinning would reduce understory stocking levels and reduce the proportion of late seral species such as fir trees. Clumps of small trees would be retained to provide connectivity and horizontal diversity. Canopy closures will remain in the top one-third of site potential. In all units slash would be handpiled and burned.

Outside of harvest units, prescribed fire would be implemented on 4,315 acres within amendment #2 corridors. Design criteria would ensure that minimum canopy closure and tree stocking requirements would be met. Prescribed fire effects are described in the Prescribed Fire section of this report. Prescribed fire has the potential to clear away some of the hiding cover but has very little effect on larger trees or overstory. As a result of prescribed fire connectivity will be largely unchanged from the existing condition.

Roads bisecting connectivity could impede the movement, interaction, and the dispersal of wildlife species associated with late and old structural conditions. Table 34 shows the miles of road by operational

maintenance level within connectivity corridors potentially impeding wildlife movement for each alternative.

Table 34. Miles of road by operational maintenance level within connectivity corridors potentially impeding wildlife movement

Operational Maintenance Level	-1-	-2-	-3-	-4-	-5-
	Basic Custodial Care (Closed)	High Clearance Vehicles	Suitable for Passenger Cars	Moderate Degree of User Comfort	High Degree of User Comfort
Alternative 1	13.04	13.06	0	4.1	0
Alternative 2	10.94	11.36	0	4.1	0
Alternative 3	10.94	11.66	0	4.1	0
Alternative 4	10.94	11.36	0	4.1	0

Aspen Restoration

Diversity of habitat would increase, especially foraging and nesting opportunities for neo-tropical migrants and cavity excavators including pileated woodpecker. Genetic diversity of the treated aspen stands would be maintained and preserved. Pine marten, three-toed woodpeckers and white-headed woodpeckers would show little, if any, affect from the proposed aspen treatments as aspen provide a minor component of these species habitat.

Alternative 2

Thinning and Prescribed Fire

Within the DOG/ROG/PWFA system treatment would only be conducted within the ROGs and PWFAs as directed by the Forest Plan. Core habitat for nesting and denning would be maintained in the DOGs. The following discussion describes effects only on those acres prescribed for treatment.

Pre-commercial thinning would occur in unit 235, which classifies as stand initiation (SI), and would treat 25 acres within the proposed PWFA associated with DOG 333. Pre-commercial thinning would reduce tree stocking, increase growth rates on the residual trees, and accelerate the development of old forest structure. Slash would be hand piled and burned.

In the short to mid-term (1-25 years) treatments may have effects to old-growth species dependent on high canopy cover and structure, such as the pileated woodpecker and pine marten. For pileated woodpeckers, habitat changes would make treatment areas less suitable for nesting, but still suitable for foraging. For pine martens, denning and foraging habitat may be lost in the short to mid-term, but only on the acres treated. Thinning would occur in three-toed woodpecker habitat on 537 acres within the cold-dry forest type and on 611 acres of cool-moist habitat, although no thinning will occur in old growth habitat for this species. Treatments are considered beneficial to old growth dependent species in the long term (25+ years). OFMS would be converted back to OFSS stands, benefitting white-headed woodpeckers. Tree species and stand structure would better mimic historical more sustainable conditions. Younger structural stage stands (YFMS, SECC, SEOC, SI, and UR) would be thinned to accelerate development of large diameter trees and restoration of old forest structure.

In the project area 23,137 acres will be prescribed burned. Burning in DOG’s will not occur however, a total of 545 acres of ROGs and 409 acres of PWFA’s will be burned.

Other Old Growth

Alternative 2 would commercially thin 49 acres of OFMS located outside existing and proposed MA-13 network. Treatment units are 178, 180 and 346. Understory removal (HUR) would thin smaller understory trees from beneath larger overstory trees in units 178 and 180, while in unit 346 regeneration favoring seral species (HRS) would remove late seral species and retain early seral species. Stand structure would be converted from OFMS to OFSS. Yarding trees with the top attached as well as handpiling would remove fuels from each site. Thinning would not occur in preferred habitat for three-toed woodpecker or marten source habitat, although 241 acres (<1% of the forest) would be underburned for both species. Prescribed fire would underburn 910 acres of source habitat for pileated woodpecker (<1% of the forest) and 694 acres of source habitat for white-headed woodpecker (1% of the forest). This alternative will underburn a total of 1,188 acres of old growth outside the DOG/ROG network.

Roads

Implementation of Alternative 2 would construct 12.6 miles of new roads allowing access to approximately 472 acres of potential habitat for firewood cutting, and hazard tree removal. At the same time roads that will be closed or decommissioned will secure 1,673 acres of potential habitat from the risks of firewood cutting and danger tree removal. Road construction would not dissect any existing old growth or dedicated old growth. The road density for all operational maintenance level roads within connectivity corridors would remain the same or decrease as a result of implementing Alternative 2 (see Table 34).

Conclusion

Amendment 2 connectivity corridors would provide for the free movement of old growth dependent species. In the project area <1% of existing old growth (OFMS and OFSS) would be thinned. Of the remaining 4,829 acres 1,188 acres would be underburned further altering horizontal and vertical stand structure including snags and logs.

Thinning old growth would convert OFMS stands back to OFSS, benefitting white-headed woodpeckers. All other thinning would accelerate younger structural stage stands to develop large diameter trees and restore old forest structure. In the short to mid-term (1-25 years) thinning and prescribed fire would have negative effects to pileated woodpecker and pine marten by reducing stand density and cover, thus reducing nesting and denning habitat. Repetitive underburn entries into an area would reduce foraging habitat for woodpeckers and pine marten. However in the long term (25+ years) stand structure will better mimic historical sustainable conditions and are considered beneficial to old growth dependent species. Under Alternative 2 there would be no change to forest-wide habitat or population trends for pine marten, pileated woodpecker, three-toed woodpecker, or white-headed woodpecker.

Alternative 3

Thinning and Prescribed Fire

Alternative 3 would not treat any proposed DOG or ROG. However, 14 acres of existing DOG and ROG would be treated. Existing units proposed for treatment are 235 and 301. These units classify as stand initiation (SI), and young forest multiple strata (YFMS) respectively. Slash associated with each unit would be hand piled and burned.

Pre-commercial thinning would occur in unit 235, which classifies as SI, and would treat 25 acres within the proposed PWFA associated with DOG 333. Pre-commercial thinning would reduce tree stocking, increase growth rates on the residual trees, and accelerate the development of old forest structure. Thinning would occur in three-toed woodpecker habitat on 337 acres within the cold-dry forest type and on 466 acres of cool-moist habitat, although no thinning will occur in old growth in either forest type.

Alternative 3 would emphasize the short-term habitat needs for pileated woodpecker and pine marten over long-term needs.

Harvest would be avoided within 300-acre additions to pileated woodpecker management areas on all but 9 acres. Commercial thinning would occur on 9 acres located in unit 464. Existing canopy cover and structural complexity would be maintained. Prescribed fire would occur on 1,261 acres within the DOG/ROG/PWFA system and on 307 acres in the 1,202 acre home range additions. Underburning would further alter horizontal and vertical stand structure including snags and logs.

Other Old Growth

Alternative 3 would commercially thin 49 acres of OFMS located outside existing and proposed MA-13 network. Treatment units are 178, 180 and 346. Understory removal (HUR) would thin smaller understory trees from beneath larger overstory trees in units 178 and 180, while in unit 346 regeneration favoring seral species (HRS) would remove late seral species and retain early seral species. Stand structure would be converted from OFMS to OFSS. Yarding trees with the top attached as well as handpiling would remove fuels from each site. Underburning would further alter horizontal and vertical stand structure including snags and logs.

Roads

Implementation of this alternative would construct an inconsequential amount of new roads (1.1 miles). However, because of the miles of road that will be closed or decommissioned, 1,309 acres of potential habitat will be secured from the risks of firewood cutting and danger tree removal. Road construction would not dissect any existing old growth or dedicated old growth. The road density for all operational maintenance level roads within connectivity corridors would remain the same or decrease as a result of implementing Alternative 3 (Table 34).

Conclusion

The proposed MA-13 network would designate 4,555 acres managed for OFMS development with an additional 1,202 acres of set aside as pileated woodpecker feeding areas. Amendment 2 connectivity corridors would continue to provide for the free movement of LOS associated species. Thinning would not occur in preferred habitat for three-toed woodpecker or within marten source habitat, although 241 acres (<1% of the forest) of habitat would be underburned for each species. Thinning would occur in 49 acres of source habitat for both the white-headed and pileated woodpecker, which is currently <1% of the respective habitats available on the forest.

Prescribed fire would underburn 910 acres of source habitat for pileated woodpecker (<1% of the forest) and 694 acres of source habitat for white-headed woodpecker (1% of the forest). In the project area <1% of existing old growth would be thinned, the remaining 4,829 acres of OFMS would continue to benefit pileated woodpeckers and pine marten. Of the remaining 4,829 acres 1,188 acres would be underburned further altering horizontal and vertical stand structure including snags and logs. Thinning old growth would convert OFMS stands back to OFSS, benefitting white-headed woodpeckers. All other thinning would accelerate younger structural stage stands to develop large diameter trees and restore old forest structure.

In the short to mid-term (1-25 years) thinning and prescribed fire would have negative effects to pileated woodpecker and pine marten by reducing stand density and cover, thus reducing nesting and denning habitat. Repetitive underburn entries into an area would reduce foraging habitat for woodpeckers and pine marten. However in the long term (25+ years) stand structure will better mimic historical sustainable conditions and are considered beneficial to old growth dependent species. Under Alternative 3 there would be no change to forest-wide habitat or population trends for pine marten, pileated woodpecker, three-toed woodpecker, and white-headed woodpecker in the short term. However, in the long term it is

expected that designating additional habitat would increase pileated woodpecker and pine marten numbers.

Alternative 4

Thinning and Prescribed Fire

Alternative 4 would thin 18 acres currently managed as DOG and ROG. Existing DOG and ROG units proposed for treatment are 134, 235, and 301. These units classify as understory re-initiation (UR), stand initiation (SI), and young forest multiple strata (YFMS) respectively. 140 acres of proposed ROG would be thinned. Units proposed for treatment are: 140, 704, 406, 708, and 710. Unit 708 is classified as stem exclusion-open canopy (SEOC), while all others are classified as OFMS. Commercial thinning (HTH) would be used in unit 708 to reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure. Within all other units understory removal (HUR) would thin smaller understory trees from beneath larger overstory trees. Stand structure would be converted from OFMS to OFSS. Thinning would occur in three-toed woodpecker habitat on 581 acres within the cold-dry forest type and on 923 acres of cool-moist habitat, although no thinning will occur in old growth in either forest type.

Other Old Growth

Alternative 4 would harvest timber on 103 acres of OFMS located outside existing and proposed DOG and ROG. Treatment units include: 152, 154, 178, 180, 346, and 348. Understory removal (HUR) would thin smaller, understory trees from beneath larger overstory trees in all but unit 346. Treatment in unit 346 would favor seral species (HRS) removing late seral species and retaining early seral species. Stand structure would be converted from OFMS to OFSS. Yarding trees with the top attached as well as handpiling would remove fuels from each site.

Roads

Implementation of this alternative and the construction of new roads would open approximately 509 acres of potential habitat could be degraded as a result of building the road, firewood cutting, and danger tree removal. At the same time roads that will be closed or decommissioned will secure approximately 1,673 acres of potential habitat from the risks of firewood cutting and hazard tree removal. At the same time, under Alternative 4 new road construction would fragment 1/5 miles of old growth habitat. Designated connectivity corridors help to mitigate the effects of this habitat fragmentation. The road density for all operational maintenance level roads within connectivity corridors would remain the same or decrease as a result of implementing Alternative 4 (see Table 34).

Conclusion

The proposed MA-13 network would designate 4,555 acres managed for OFMS development. Amendment 2 connectivity corridors would provide for the free movement of LOS associated species. In the project area <1% of existing old growth would be thinned. Of the remaining 4,829 acres 1,188 acres would be underburned further altering horizontal and vertical stand structure including snags and logs. Thinning would convert OFMS stands back to OFSS, benefitting white-headed woodpeckers. All other thinning would accelerate younger structural stage stands to develop large diameter trees and restore old forest structure.

In the short to mid-term (1-25 years) thinning and prescribed fire would have negative effects to pileated woodpecker and pine marten by reducing stand density and cover, thus reducing nesting, foraging and denning habitat. However in the long term (25+ years) stand structure will better mimic historical sustainable conditions and are considered beneficial to old growth dependent species. Under alternative 4

there would be no change to forest-wide habitat or population trends for pine marten, pileated woodpecker, three-toed woodpecker, and white-headed woodpecker.

The majority of the timber harvest and prescribed fire activities are being conducted in the dry forest types where much of the vegetation is outside of HRV. Treatments would convert OFMS to OFSS structure stands, where appropriate. Younger stands will be managed to develop OFSS over the next 25 to 50 years. Development of large blocks of OFSS structure stands will increase the density and distribution of the white-headed woodpecker. Treatments will reduce canopy closures and stand densities. Species such as pileated woodpecker, pine marten and three-toed woodpeckers could be affected by these activities. However, dry forests, even in the YFMS condition, are not particularly productive habitats for these species. Large diameter trees and dead wood habitats are notably lacking. Canopy closures are generally lower. Stands are dominated by ponderosa pine and Douglas-fir with a smaller component of grand fir. While structural stages will change from ones that are more suitable for these species to ones that are less suitable, the overall impact will be much less because of the poor quality of habitat as it currently exists. Impacts will be primarily to habitats used more for foraging rather than nesting or denning purposes. Population viability for pileated woodpecker and pine marten would be maintained via old growth in the moist and cold forest types as well as the DOG, ROG, PWFA system, and Amendment # 2 corridors.

In the long-term, restoration of dry forests, i.e., restoring natural conditions and fire regimes, will make these habitats far more self-sustaining for old growth associated wildlife species. Treatments will increase, not reduce, old growth dependent wildlife species diversity.

Cumulative Effects

All of the activities in Table 6 of the Galena FEIS have been considered for their cumulative effects on old growth dependent species. The following discussion focuses on those past, ongoing and foreseeable future activities that may contribute positive or negative effects. Past activities such as timber harvest, road construction, fire suppression and wildfire have combined to create the current condition in the analysis area.

Continued livestock grazing and active mining will not reduce old growth habitat, important snag habitat, down wood, or decrease connectivity for old growth dependent species. As a result there is not likely to be a cumulative effect under any alternative on old growth dependent species from continued livestock grazing and active mining.

Non-native invasive plants can have detrimental impacts on wildlife species. Invasive plants may not affect old growth habitat, however they can affect habitat for prey of old growth dependent species. Galena project design criteria mitigate the spread of noxious and invasive plants. In addition, the Malheur National Forest is in the process of beginning an environmental impact statement and decision controlling invasive plants on National Forest system lands. The treatment of this infestation would cumulatively result in fewer invasive plants, benefitting prey species important to old growth dependent species.

Past timber harvest projects were generally very intensive; focusing upon the removal of the larger, more valuable ponderosa pine, Douglas-fir, and western larch trees. Past activities were done without consideration to habitat fragmentation, leaving a sufficient amount of old growth habitat for wildlife, or maintaining connectivity between LOS habitats. The majority of Galena's timber harvest and prescribed fire activities are being conducted in the dry forest types where much of the vegetation is outside HRV. Galena will move stands towards OFMS and OFSS structural stages and the harvest of trees over 20.9 inches will not occur. There will not be a loss of old growth habitat as a result of any of the action alternatives. All action alternatives retain old growth habitat and in addition manage a system of DOG's, ROG's, and PWFA's. Furthermore, old growth habitats will be connected by connectivity corridors ensuring the landscape will not be fragmented as a result of management activities.

Proposed projects may require new and temporary road construction, road decommissioning, and road closures. During harvest operations it is expected that habitat would be lost through the felling of snags that pose a hazard to workers and equipment, not only within units but also along haul routes. New road construction will allow access to snags which could be removed as firewood, reducing habitat for pileated woodpeckers, martens, white-headed woodpeckers, three toed woodpeckers, and other species that use deadwood habitats. Effects resulting from the proposed activities would be mitigated by the reduced road density after implementation of the action alternatives, design criteria for snag retention, and availability of dead and down wood as a result of the nearby Summit, Reed, and Easy fires. Changes in dead wood habitats as a result of the Galena project area are considered incidental. Fragmentation of old growth habitat as a result of road construction will be reduced by road decommissioning and the designation of connectivity corridors within the project area.

Private lands within the Galena project boundary have been intensively managed in the past. However, 98% of non-Forest Service land within the Galena project area is now owned by the Confederated Tribes of Warm Springs. The current management objectives for this land are to restore and maintain native habitat, with the ultimate goal of sustaining native fish and wildlife populations.

In the short term the Alternative 1 would not contribute to cumulative losses of old growth or connectivity habitat because stands would not be treated. In the long-term, forgoing action could contribute to the continued decline of OFSS and associated species.

In the short-term, the action alternatives would not contribute to cumulative losses of old growth habitat because stands would not be treated except to enhance old-growth attributes. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of OFSS and maintaining connectivity habitat between LOS. Therefore, proposed activities would contribute positively toward the viability of species that use these habitats. There are no significant adverse cumulative effects to pileated woodpeckers, pine martens, or their habitat from either alternative; there are positive effects to white-headed woodpeckers from the development of OFSS.

Management Indicator Species (MIS) for Primary Cavity Excavators

Regulatory Framework

Eleven bird species were selected as MIS of dead and defective wood habitat because they excavate cavities in dead or defective trees to nest or roost. The Forest Plan establishes management direction for primary cavity excavators with forest wide standards (pages IV-29 to IV-30). By providing habitat for these birds, habitat is provided for many other cavity dependent species. MIS associated with dead and defective wood habitat include: black-backed woodpecker, downy woodpecker, hairy woodpecker, Lewis' woodpecker, northern flicker, pileated woodpecker, red breasted sapsucker, three-toed woodpecker, white-headed woodpecker, Williamson's sapsucker, and the yellow-bellied sapsucker (USFS 1990, IV-32).

The red-breasted and yellow-bellied sapsuckers were formerly classified with the red-naped sapsucker. Because sapsucker species have been re-classified, the red-naped sapsucker will be used as a surrogate for the red-breasted and yellow-bellied sapsuckers. Three species serve as MIS for old growth and primary cavity excavators, pileated woodpecker, three-toed woodpecker, and white-headed woodpecker. Effects to these species are described in the MIS – Old Growth section and therefore will not be discussed here. Table 35 includes habitat requirements and the amount of habitat present in the project area.

Table 35. Dead and defective wood habitat MIS

MIS Species	Habitat Requirements	Habitat Present in Project Area	Acres of Preferred Habitat Within Project Area
Black-backed woodpecker *Picoides arctus*	Forests with dead, insect-infested trees associated with large-scale disturbances such as fire or wind throw	Limited, due to lack of large-scale disturbances.	924 acres of insect infested trees
			0 acres of recent wildfire mortality
Downy woodpecker *Picoides pubescens*	Associated with riparian habitats consisting of a mixture of grasses shrubs and hard woods	Yes, but likely limited by lack of hardwoods within riparian areas.	6,231 acres of RHCA's (However, limited hardwoods are present)
			16.6 acres of aspen stands
Hairy woodpecker *Picoides villosus*	Habitat generalists that prefer large trees in open park like stands along ridges	Limited, due to lack of open park like stands within the project area.	126 acres of OFSS (However, only 30 acres near ridge tops)
Lewis' woodpecker *Melanerpes lewis*	Open forests and nests in large snags in cavities created by other cavity excavators or in very soft snags	Limited, due to lack of open forests within the project area.	6,231 acres of RHCA's (However, limited hardwoods are present)
			126 acres of OFSS
Northern flicker *Colaptes auratus*	Habitat generalists that prefer large trees in open park like stands near meadows	Limited, due to lack of open forests within the project area.	126 acres of OFSS (However, only 82 acres near meadows)

MIS Species	Habitat Requirements	Habitat Present in Project Area	Acres of Preferred Habitat Within Project Area
Red-naped sapsucker *Sphyrapicus nuchalis*	Associated with riparian habitats consisting of a mixture of grasses shrubs and hard woods	Yes, but likely limited by lack of hardwoods within the riparian area.	6,231 acres of RHCA's (However, limited hardwoods are present)
			16.6 acres of aspen stands
Williamson's sapsucker *Sphyrapicus thyroideus*	Mature higher-elevation coniferous forests for nesting and feeding	Yes, but likely limited by number of snags within the project area.	126 acres of OFSS
			4,955 acres of OFMS

Analysis Methods

To determine the effects to MIS of dead and defective wood habitat, potential habitat was identified for each species. Within the project area, stand information that correlated with these species requirements were identified by Most Similar Neighbor analysis, GIS, aerial photographs, ground reconnaissance and stand exams. For each species, potential habitat was mapped and effects were determined by comparing the number of acres affected by proposed treatment. Treatments for each alternative are similar, with the exception of their location and intensity, and were compared to the no action alternative.

Snag estimates were derived using photo interpretation, satellite imagery, stand exam data and Most-Similar-Neighbor Imputation within the INFORMS program. DecAID, a web-based advisory tool, was used to help evaluate effects of forest conditions and existing or proposed management activities on MIS associated with dead and defective wood. DecAID is a summary, synthesis, and integration of published scientific literature, research data, forest inventory databases, wildlife databases, and expert judgment and experience. However, it does not provide snag retention guidelines. DecAID contains two major data sets: vegetation inventory data or snags and down wood data and wildlife use data. Vegetation data collected across the region is used to characterize natural forest conditions, and wildlife data is used to characterize habitat use by species. Wildlife use data from DecAID was used in conjunction with the snag estimates to determine acres of potential habitat in the project area. Effects on species will be determined by assessing how alternatives affect snag densities relative to the existing condition.

Existing Condition

Black-backed Woodpecker

Black-backed woodpeckers are associated with lodgepole pine, ponderosa pine, or mixed forests containing lodgepole pine and ponderosa pine, or other conifers such as larch, true fir, and Engelmann spruce (Marshall, 2003). Concentrations of birds occur in stands where wind, fire, or insect-killed timber supports bark beetles above normal levels (Marshall, 2003). It prefers to nest in smaller trees (<20" dbh, averaging about 12" dbh), recently dead and harder snags (Bull 1980, Marshall 1992, Saab and Dudley 1997). Suitable habitat is diseased and decaying trees for nesting and roosting, and decaying substrate to provide a prey base for insects (Goggans et al. 1987). Black-backed woodpeckers usually forage by drilling and scaling, or flaking the bark of trees to reach insects (Bull 1980, Raphael and White 1984). In the moist and cold forest types, black-backed woodpeckers are more strongly associated with the OFMS structural stage. In the lodgepole forest types, black-backed woodpeckers will use OFMS, YFMS, and UR structural stages.

Black-backed woodpeckers were chosen by the Blue Mountain Land Management Plan Revision Team (the team, Wales et al. 2011 draft) as focal species for the post-fire Group. They represent post-fire habitat with a relatively high density of trees and snags, as compared to other species in the group. Black-backed

woodpecker's have been reported to exist at higher densities and are more productive in post-fire habitats than in other forest conditions in which they occur. The current condition viability outcome scores for the black-backed woodpecker on the Malheur National Forest primarily falls within two categories of viability calls developed by the team:

- Distribution issues and/or low abundance lead to uncertainty of likelihood of viability and the need to address with plan components (40%)
- Low likelihood of viability (approximately 44%)

According to Wales et al. (2011 draft), the main factor leading to a lower sustainability outcome from historical levels was the decreased percentage of watersheds with recent wildfire activity. Fire suppression efforts; have likely reduced the amount and distribution primary habitat for this species, and likely other species in the Post-fire Group, leading to reduced sustainability.

There are 40 recorded observations for the black-backed woodpecker in the forest fish and wildlife database, none of which occur in the project area.

Downy Woodpecker

Preferred habitat includes riparian areas, cottonwood, and aspen stands but they will use coniferous-deciduous and sometimes coniferous forests. Territories are 5-9 acres. Nesting occurs in trees and snags greater than 8 inches dbh at heights over 15 feet (Marshall et al. 2003). They forage by pecking and flaking bark for insects, gleaning leaves, and fly catching (Csuti et al. 1997). In the project area habitat for this species is primarily in aspen stands due to lack of hardwoods within the riparian areas. Although, riparian habitats do occur in the project area, cottonwoods are scarce.

There are approximately 30 recorded observations for the downy woodpecker in the forest fish and wildlife database, none of which occur in the project area. During surveys conducted in 2011 one downy woodpecker was detected.

Hairy Woodpecker

Suitable habitat for this species includes open stands with low basal areas along ridges, low slopes, and southerly aspects in the ponderosa pine forest types. Hairy woodpeckers are more common in older forests, but readily use burned areas and forest edges for foraging (Csuti et al. 1997). In northeastern Oregon, nesting and foraging occurs primarily in ponderosa pine 10-20 inches dbh, however other species may be used (Bull et al. 1986). Hairy woodpeckers are considered habitat generalists, i.e., they are less restricted by habitat conditions than other woodpecker species. Although the hairy woodpecker has preferences for certain tree species for nesting and foraging, it has been observed in almost all forest types in the project area as long as an adequate amount of dead wood habitat is available. Habitat for this species is well distributed throughout the planning area. However, low snag densities in the dry forest may inhibit occupation in these areas.

There are approximately 94 recorded observations for the hairy woodpecker in the forest fish and wildlife database, none of which occur in the project area.

Lewis' Woodpecker

Unlike most other woodpecker species in Oregon, Lewis' woodpecker inhabits primarily open forest and woodlands since its primary foraging strategy is fly catching. Nesting habitat consists of two distinct types in eastern Oregon: riparian areas with large cottonwoods, and fire maintained or burned old-growth ponderosa pine forests (NatureServe 2009). This species seldom excavates its own nest cavity, instead it uses cavities created by other woodpeckers (Saab et al. 2004). In burned areas, ponderosa pine snags greater than 16 inches dbh are chosen for nesting. Similar diameter cottonwood snags in riparian areas are

selected (Galen 1989). Although, riparian habitats are abundant in the project area, cottonwoods are scarce and recently burned areas don't exist.

There are approximately 50 recorded observations for the Lewis's woodpecker in the forest fish and wildlife database, none of which occur in the project area. However, adjacent to the project area numerous individuals have been documented in the Summit and Reed post fire habitat.

Northern Flicker

This species uses a wide variety of plant communities and succession stages. It prefers open habitats, and is commonly found foraging on the ground in open woodlands, meadows, fields and regeneration harvest areas (DeGraaf et al. 1991 and Csuti et al. 1997). Thomas et al. (1979) reports this species using all forest succession stages for foraging, and young (40-79 years) to old-growth (160+ years) for reproduction. Limited reproductive use of earlier stages is due to the absence of snags that this species requires for nesting. Nesting occurs in open areas in snags with some decay. In Douglas County Oregon, Bull et. al. (1986) noted 71% of nest trees had broken tops, average nest tree diameter was 22" dbh, and average cavity height was 26 feet. Northern flickers are considered habitat generalists. Although the flicker has preferences for certain tree species for nesting and foraging, it has been observed in almost all forest types. Habitat for this species is well distributed throughout the project area.

There are only 20 recorded observations for the northern flicker in the forest fish and wildlife database, none of which occur in the project area.

Red-naped Sapsucker

This species, formerly a subspecies of the yellow-bellied sapsucker, is described as inhabiting riparian habitats, especially aspen. It will also inhabit pine forests (Marshall et al. 2003). Nest trees are most commonly aspen with heart rot, but ponderosa pine is also selected (DeGraaf et al. 1991). Approximately thirty aspen stands occur in the project area. In most cases the aspen stands are old and decadent, exhibit poor vigor, and lack regeneration. Due to fire suppression, conifers are encroaching, competing for water and light. Heavy grazing by domestic livestock and browsing by deer and elk are inhibiting regeneration. In the project area and the Malheur National Forest, aspen is declining. Although riparian habitats do occur in the project area aspen is scarce.

There are 13 observations for the red-naped sapsucker in the forest fish and wildlife database, none of which occur in the project area.

Williamson's Sapsucker

In northeastern Oregon Bull et al. (1986) described this species as occurring in mature and old-growth mixed conifer forests at 3,500 - 6,500 feet elevations. Nesting occurs in both live and dead tree species comprised mainly of western larch, but also ponderosa pine, Douglas-fir, and grand fir, in trees and snags averaging 27 inches diameter at breast height with 53% of nesting occurring in grand fir forest types. A majority of foraging consisted of feeding at sapwells of western larch and Douglas-fir with diameters averaging 8.5 inches. There is little mature and old growth habitat in the project area and large diameter snags are scarce.

There are 72 observations for the Williamson's sapsucker in the forest fish and wildlife database, none of which occur in the project area.

Direct and Indirect Effects by Alternative

Alternative 1 – No Action

Thinning and Prescribed Fire

Alternative 1 would not conduct any additional timber harvest or prescribed burning activities. For those species preferring large trees in open habitats; such as the hairy woodpecker, Lewis' woodpecker, and northern flicker, habitat would continue to be reduced as a result of fire suppression, stand structure, and high stand densities. In the long term this habitat would be more at risk for insect, disease, and wildfire damage. The black-backed woodpecker which prefers dead, insect infested trees susceptible to fire would benefit as a result of the no action alternative. The no action alternative would increase snag densities in the long term benefitting downy woodpecker, red-naped sapsucker and Williamson's sapsucker.

Roads

Implementation of this alternative would not construct new roads but at the same time it would do nothing to close or decommission existing roads. Areas would remain accessible for firewood removal. Therefore snags creating important habitat for primary cavity excavators could be at risk of being removed.

Aspen Restoration

No aspen stand treatments would occur. Mature aspen stands would continue to decline and regeneration would be low or nonexistent. Several of the smaller, older, and more decadent aspen stands could disappear from the watershed within 25 years. All aspen may be gone within 100 years. This decline in aspen would not likely impact black-backed woodpeckers however, habitat would continue to decline for other primary cavity excavators including: downy woodpeckers, red-naped sapsuckers, and Williamson's sapsucker.

Conclusion

No thinning, prescribed fire, road building, or aspen treatment and protection would occur. With no activities proposed, habitat would remain in its current condition. Use of habitats would not change from the way they are currently being utilized and may not be self-sustaining over time. Under Alternative 1 habitat would remain the same therefore there would be no impact to forest wide habitat or populations trends for black-backed woodpecker, downy woodpecker, hairy woodpecker, Lewis' woodpecker, northern flicker, red-naped sapsucker, or Williamson's sapsucker.

Alternative 2, 3, 4

Currently, retention of snags and down logs is based on the Forest Plan as amended by Regional Forester Eastside Forest Plans amendment #2. This amendment directs forests to manage snags at the 100% population potential and to use the best available science to determine actual numbers. Additional snag and downed wood retention measures can be found in Chapter 2, Table 3.

Thinning and Prescribed Fire

Thinning (commercial and pre-commercial) and prescribed fire will be used to help restore historical stand structure and fire regimes. Action alternatives incorporate these strategies at varying levels. Within RHCA's thinning would only occur to promote aspen suckering. Thinning will not occur in RHCA's outside of aspen stands. In LOS, action alternatives would thin to meet the objectives of the project. Treatments are prescribed where current vegetation conditions do not meet historical conditions and stands are considered at risk. All proposed management actions are consistent with Forest Plan and amendment #2 standards for maintaining LOS and RHCA's.

On those acres prescribed for treatment, thinning would reduce tree stocking, increase growth rates on the residual trees, and accelerate the development of old forest structure. These changes could potentially affect species that rely on dense, multi-stratum conditions for nesting habitat. However, the DOG/ROG/PWFA system discussed in the previous MIS-Old Growth section would retain 2,567 acres of dense multi-stratum stands. Where only thinning occurs, chainsaws and harvesters can provide more control over which trees are actually killed, assuring snag retention.

Prescribed burning can alter or remove vertical and horizontal stand structure including snags and down wood. Studies by Hardy and Reinhardt (1998) document both losses of existing snags during prescribed burning and recruitment of new snags through fire caused mortality. The level of loss and the replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load. In prescribed burn only areas it is assumed there would be the largest number of snags recruited. This impulse of snags would provide foraging for numerous woodpecker species, however, snags likely would be too small to provide suitable nesting habitat.

In areas where both thinning and prescribed burning occur stands are at risk of becoming homogenized. Although thinning and prescribed fire will help restore historical stand structure, it is assumed in these areas that snag loss will be the highest and stand structure will be most similar. To maintain habitat diversity and create a mosaic of fire conditions, thinning using variable density spacing will be implemented and prescribed burn boundaries larger than 1,000 acres will require a wildlife biologist input to mitigate impacts to various wildlife species including primary cavity excavators. To further maintain habitat diversity, ignition will be avoided within 100’ of intermittent and perennial streams unless authorized by the district wildlife biologist.

In the short to mid-term (1-25 years) treatments may affect old-growth species dependent on high canopy cover and structure, such as the Williamson’s sapsucker. Species preferring large trees in open habitat types i.e. hairy woodpecker, Lewis’ woodpecker, and the northern flicker, would benefit immediately as a result of treatments. Species preferring riparian habitats and hardwoods would be affected as a result of the old and decadent aspen being reduced as a result of prescribed fire. In prescribed burn only areas (15,662 acres) it is anticipated a large pulse of small diameter snags will benefit black-backed woodpeckers. However, this benefit will diminish with each additional prescribed burn entry. Design criteria would minimize effects to the black-backed woodpecker.

Treatments are considered beneficial to old growth dependent species in the long term (25+ years). OFMS would be converted back to OFSS stands, benefitting the hairy woodpecker, Lewis’ woodpecker, and northern flicker. Tree species and stand structure would better mimic historical more sustainable conditions. Younger structural stage stands (YFMS, SECC, SEOC, SI and UR) would be thinned to accelerate development of large diameter trees and restoration of old forest structure.

Roads

Closing or decommissioning roads will secure potential habitat from the risks of firewood cutting and hazard tree removal. However, road construction will affect potential dead and defective wood habitat. As a result snags could be removed from building the road, firewood cutting and hazard tree removal.

Table 36. Affected acres of snag habitat as a result of closing, decommissioning and constructing roads

Alternative	Additional Acres of Snag Habitat Accessible to Firewood Cutting	Additional Acres of Snag Habitat Inaccessible to Firewood Cutting
Alternative 1	0	0
Alternative 2	472	1,673
Alternative 3	0	1,309
Alternative 4	509	1,673

Aspen Restoration

Twenty-eight existing aspen stands would be released from overstory shading and conifer competition, protected from browsing, and allowed to expand. In the short term, prescribed fire would enhance natural regeneration as soil heating stimulates root suckering. Existing suckers and saplings that are protected would become more vigorous.

In the long term, saplings would grow into larger size classes, becoming resistant to ungulate browsing as fences start to deteriorate. Overstory composition would change. Understory grass and forb cover would increase, as would deciduous riparian shade, root structure, and soil-holding capacity within the stands. Diversity of habitat would increase, especially foraging and nesting opportunities for neo-tropical migrants and cavity excavators including downy woodpecker and red-naped sapsucker. Genetic diversity of the treated aspen stands would be maintained and preserved. Black-backed woodpecker, Lewis' woodpecker, and Williamson's sapsucker would show little if any affect from the proposed aspen treatments as aspen provide a minor component of these species habitat. Habitat generalists such as hairy woodpecker and northern flicker would benefit slightly from the proposed aspen treatments.

Conclusion

Thinning old growth would convert OFMS stands back to OFSS, benefitting the hairy woodpecker, Lewis' woodpecker and northern flicker. Aspen stand treatments will benefit the downy woodpecker and red-naped sapsucker. Williamson's sapsucker will benefit as all other thinning would accelerate younger structural stage stands to develop large diameter trees and restore old forest structure. Thinning and burning would have negative effects to black-backed woodpecker by reducing stand density and cover, thus reducing nesting and foraging habitat. However, in the long term stand structure will better mimic historical sustainable conditions and are considered beneficial to old growth dependent species. Under Alternatives 2, 3, and 4 there would be no change to forest-wide habitat or population trends for primary cavity excavators habit as a result of implementing any of the action alternatives. There would be no impact to primary cavity excavators forest-wide as a result of all action alternatives.

Cumulative Effects

All of the activities in Table 6 have been considered for their cumulative effects on species that use dead and defective wood. The following discussion focuses on those past, ongoing, and foreseeable future activities that may contribute positive or negative effects. Past activities such as timber harvest, road construction associated with timber harvest, wildfire, fire suppression, mining, and firewood cutting have impacted the quantity, quality, and distribution of dead wood habitats and primary cavity excavator populations dependent on these habitat features across the analysis area. These activities have created the existing condition of dead wood habitats described in the existing condition section. Large snags are

currently below Forest Plan standards, but densities are similar to historical snag data reported by Matz (1927).

Activities associated with the Bates saw mill, noxious weed treatment, livestock grazing, watershed improvements, and the Malheur National Forest Access and Travel Management Plan will not reduce dead and defective wood habitat.

Past timber harvest generally focused on the removal of the larger, more valuable ponderosa pine, Douglas-fir, and western larch trees. Likewise, merchantable snags and down wood were also removed, burned, or otherwise disposed of.

The extensive road network in the analysis area has impacted snag densities by decreasing habitat from road construction and increasing accessibility of the area to firewood cutting. However, this project also closes and decommissions more miles of road than are constructed. It is likely that firewood removal will be the highest during implementation of the project then subside once project implementation is over and roads are closed. Any short term losses of dead and defective wood habitat would be mitigated by the large number of snags and down wood created from recent wildfires adjacent to the project area.

Recent fires within close proximity to the Galena project area include the 30,000 acre Summit fire and the 2,000 acre Reed fire. These fires created an immediate pulse of snags that are providing additional snag habitat. Portions of this post-fire habitat were salvaged, while some portions continue to provide high levels of snags and down wood. Snags and down wood from these fires will continue to provide habitat for primary cavity excavators, further mitigating effects during the implementation of Galena.

Fire suppression has resulted in dense, multi-strata stands and snag and down log densities are generally higher in these stands than less dense ponderosa pine stands. Fire suppression has led to the buildup of ground fuels and overstocked stands. These overstocked stands are at risk of competition pressure which increases the potential of insects, disease, and wildfires. These characteristics provide habitat for primary cavity excavators. However, these stands are at risk of a large scale fire. Design criteria were established to retain and recruit a sufficient amount of dead and defective wood; therefore the Galena project will decrease the future risk of large scale fire, while providing habitat for primary cavity excavators.

Private lands within the Galena project boundary have been intensively managed. In the past, these lands have not been managed to retain snags and down wood. However, 98% of non-Forest Service land within the Galena project area is now owned by the Confederated Tribes of Warm Springs. The current management objectives for this land are to restore and maintain native habitat, with the ultimate goal of sustaining native fish and wildlife populations.

In the short term the no action alternative would not contribute to cumulative losses of dead and down wood habitat, however open roads would allow access for the continued removal of snags for firewood. In the long-term, the no action alternative, by forgoing action, would allow for stands to be more at risk for insect, disease, and wildfire damage. Species which prefer dead, insect infested trees susceptible to fire may benefit as a result of the no action alternative.

Under the action alternatives, changes in dead wood habitats would be considered minor. In the short-term, the action alternatives would contribute to cumulative losses of snag and down wood habitat. Design criteria and nearby dead and defective wood from adjacent fires would help to mitigate the initial loss of snags in the project area. In the long term snag levels will likely decrease as a result of increased forest health and multiple entry underburning. As trees respond to proposed activities, increased vigor and health will have cumulative effects on those species which prefer dead, insect infested trees susceptible to fire. However, in the long term stand structure will better mimic historical sustainable conditions, and snag levels will be similar to those reported by Matz (1927).

Migratory Birds and Associated Habitat Types

Regulatory Framework

In 2000, the Oregon-Washington Partners in Flight published the Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington (Altman 2000). This plan is used to address the requirements contain in Executive Order 13186 (2001), responsibilities of federal agencies to protect migratory birds. Many of the birds identified in this plan are also addressed in the U.S. FWS Birds of Conservation Concern (USFWS 2008). All action alternatives are consistent with the 1918 Migratory Bird Treaty Act. Design features, such as, retention of adequate snags and downed logs, retention of some live trees, and avoidance of thinning in riparian areas proposed in this project would minimize any take of migratory birds and meet the intent of current management direction.

Analysis Methods

Regional direction for analysis of effects on landbirds was followed including the use of the Partners in Flight Conservation Strategy and documentation of adherence to related executive orders and acts. Stand information that correlated with these priority habitat types were identified by Most Similar Neighbor analysis, GIS, aerial photographs, ground reconnaissance and stand exams. For each priority habitat, effects were determined by comparing the results from habitat modification to key habitat components by species.

Existing Condition

Neo tropical migratory birds breed in the U.S. and winter south of the boarder in central and South America. Continental and local declines in the population trends for migratory and resident land birds have developed into an international concern. Many of these birds are associated with old forest, riparian areas, or unique areas, such as, aspen and meadows.

The project area falls within the Blue Mountains Landbird Conservation Planning Region and contains the following priority habitat types:

Dry Forest

The project area contains 20,558 acres of dry forest habitat type. The hot-dry and warm-dry biophysical environments refer to the dry ponderosa pine dominated habitats and the dry mixed conifer habitats. The Conservation Strategy (Altman 2000) identifies four habitat components of the dry forest types that are important to landbirds: OFSS, OFSS with patches of regenerating pines, OFSS with grassy openings and dense thickets of small trees, and burned habitats. Around 126 acres (<1%), are classified as OFFS. There are no post burn habitats within the project area.

Late Successional Mesic Mixed Conifer

The project area contains 3,127 acres of late successional mesic mixed conifer habitat type. The mesic mixed conifer habitats refer to the cooler, moister mixed conifer habitats that occur at higher elevations, wetter sites, northerly aspects, and in areas where soils are mesic and well developed. These forests are generally dominated by the true fir species, with Douglas fir, western larch, and occasional ponderosa pine scattered within these stands. Stand structure is generally a multi-strata habitat condition. Suppression of fire and timber harvest has resulted in the expansion of this habitat condition into much of the dry forest types.

Riparian Woodland and Shrub

The project area contains 6,231 acres of RHCAs. A common element of hardwood communities is they are exhibiting a downward trend in size, continuity, and health (Galena watershed analysis 1999).

Existing riparian habitats are degraded from long-term livestock grazing. Most of the area has little to no shrub or overstory structure, therefore, currentlyprovides minimal habitat for riparian associated bird species.

Sub Alpine Forests

The project area contains 4,000 acres of sub alpine forest habitat type. This habitat type is the coolest and wettest forest zone, dominated by subalpine fir, Engelmann spruce, lodgepole pine, and huckleberry. Important features of the subalpine forest are a multi-layered structure and dense understory of shrubs (Altman, 2000).

Montane Meadows

The project area contains 786 acres of montane meadow habitat type, 430 of which are located along the Middle Fork of the John Day River. This habitat type includes wet and dry meadows dominated by herbaceous vegetation and grass at moderate and high elevations. These meadows are generally associated with streams and springs. Suppression of fire has increased conifer encroachment, reducing meadow habitats within the project area.

Aspen

The project area contains about 35 acres of aspen habitat type. Aspen stands have been characterized as being heavily over-browsed and encroached upon by conifers, leading to declines in health and vigor. There have been 28 aspen stands identified for restoration within the project area, which would improve conditions for landbird species.

Direct and Indirect Effects by Alternative

Alternative 1 – No Action

No thinning, prescribed fire, road building, or aspen treatment would occur. With no activities proposed, habitat would remain in its current condition. Use of habitats would not change from the way they are currently being utilized and may not be self-sustaining over time. Under alternative 1, neo-tropical migratory bird and resident landbird habitat would remain the same therefore there would be no effect to habitat, individuals, or bird populations.

Alternative 2, 3, 4

Thinning and Prescribed Fire

Thinning (commercial and pre-commercial) and prescribed fire will be used to help restore historical stand structure and fire regimes in particular, on dry forest types. Within RHCA's thinning would only occur to promote aspen suckering. Thinning will not occur in RHCA's outside of aspen stands. Treatments are prescribed where current vegetation conditions do not meet historical conditions and stands are considered at risk.

Thinning would reduce tree stocking, increase growth rates on the residual trees, and accelerate the development of old forest structure. Treatments are considered beneficial to dry forest old growth dependent species in the long term (25+) years. OFMS would be converted back to OFSS, benefitting white-headed woodpecker, Flammulated owl, chipping sparrow, Lewis' woodpecker, and other dry forest associated species (see Table 37). Treatments occurring in late successional mesic mixed conifer habitats would reduce stand structure and may affect Vaux's swift, Townsends warbler, varied thrush, olive-sided flycatcher, and other associated species dependent on dense overstory. The MacGillivary's warbler may benefit as a result of increasing shrubs from opening the forest canopy. No thinning will occur in subalpine forest or montane meadows.

In the project area 23,137 acres will have the potential to be prescribed burned. Of the 23,137 acres, less than 19,913 acres would be actively lit. Prescribed burning can alter or remove vertical and horizontal stand structure including snags and down wood. Studies by Hardy and Reinhardt (1998) document both loss of existing snags during prescribed burning and recruitment of new snags through fire caused mortality. The level of loss and the replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load. In prescribed burn only areas it is assumed there would be the largest number of snags recruited. This impulse of snags would provide foraging for numerous bird species including the Lewis's woodpecker and white-headed woodpecker, however, snags likely would be too small to provide suitable nesting habitat.

Early-season burns may cause some direct mortality of young, particularly for species nesting on the ground. However, when nests are lost, many species will re-nest (Reinking, 2005, Knapp et al., 2009). Many bird species will benefit from habitat modifications resulting from prescribed burning.

In areas where both thinning and prescribed burning occur stands are at risk of becoming homogenized. Although thinning and prescribed fire will help restore historical stand structure, it is assumed in these areas that snag loss will be the highest and stand structure will be most similar. To maintain habitat diversity and create a mosaic of fire conditions, thinning using variable density spacing will be implemented and prescribed burn boundaries larger than 1,000 acres will require a wildlife biologists input to ensure neotropical migratory bird objectives are being met.

Table 37. Species, key habitat components, and effects by Habitat Type for alternatives for Focal Species found in the Galena project area using criteria described by Altman 2000

Species	Key habitat components	Effects by alternative
Dry Forest Habitats		
White-headed woodpecker *Picoides albolarvatus*	• Large patches of old forest with large trees and snags • Large high-cut stumps • Ponderosa pine	See MIS old growth dependent species section
Flammulated owl *Otus flammeolus*	• Old forest with grassy openings and dense thickets • Thick patches for roosting and grassy opening for foraging • Ponderosa pine and Douglas-fir	No action alternative *Continued decline of habitat. No impact to populations.*
		All action alternatives *Possible increase in individuals as a result of converting OFMS to OFSS. No impact to the population.*
Chipping sparrow *Spizella passerine*	• Open understory with regenerating pines • Non-agriculture landscape due to cowbird parasitism • Ponderosa pine, Douglas-fir, and grand fir	No action alternative *Continued decline of habitat. No impact to populations.*
		All action alternatives *Possible increase in individuals as a result of converting OFMS to OFSS. No impact to the population.*

Species	Key habitat components	Effects by alternative
Lewis's woodpecker *Melanerpes lewis*	• Patches of burned old forest • Soft snags for excavation • Ponderosa pine	See MIS primary cavity nesting species section
Other associated species: Pygmy nuthatch *Sitta pygmaea*		No action alternative *Continued decline of habitat. No impact to populations.* All action alternatives *Possible increase in individuals as a result of converting OFMS to OFSS. No impact to the population.*
Mesic Mixed Conifer Habitats		
Vaux's swift *Chaetura vauxi*	• Large snags • Recruitment snags (live trees) with signs of defects, and proximity to riparian areas.	No action alternative *Benefit individuals as forest health continues to decline. No impact to populations.* All action alternatives *Possible decrease in individuals as a result of reducing mixed conifer stands. Possible increase to individuals as a result of decommissioning roads in riparian area, securing riparian snag habitat. No impact to the population.*
Townsend's warbler *Dendroica townsendi*	• Overstory canopy closure • Grand fir and Douglas-fir	No action alternative *Benefit individuals as a result of increased canopy closure. No impact to populations.* All action alternatives *Possible decrease in individuals as a result of reducing mixed conifer stands. No impact to the population.*
Varied thrush *Ixoreus naevius*	• Structurally diverse and multi-layered canopies • Area sensitive, avoids edges, needs dense leaf litter for foraging • Douglas-fir and grand fir	No action alternative *Benefit individuals as a result of increased canopy closure. No impact to populations.* All action alternatives *Possible decrease in individuals as a result of increasing edge habitat. No*

Species	Key habitat components	Effects by alternative
		impact to the population.
MacGillivary's warbler *Oporornis tolmiei*	• Dense shrub layer with understory or with openings • Cowbird host, extensive gazing is detrimental • Douglas-fir	No action alternative *Continued decline of shrub habitat. No impact to populations.*
		All action alternatives *Possible increase to individuals as a result of increasing shrubs from opening the forest canopy. No impact to the population.*
Olive-sided flycatcher *Contopus cooperi*	• Edges and opening created by fire • Patches of mixed live and dead trees • Grand-fir and ponderosa pine	No action alternative *Long term benefit to individuals as risk of fire increases. No impact to populations.*
		All action alternatives *Possible decrease in individuals as a result of increasing edge habitat without the necessary snag component. No impact to the population.*
Other associated species: Pileated woodpecker, *Dryocopus pileatus* Northern goshawk, *Accipiter gentilis* Brown creeper, *Certhia americana* Northern three-toed woodpecker, *Picoides tridactylus* Hammond's flycatcher, and *Empidonax hammondii* Hermit thrush *Catharus guttatus*		Pileated woodpecker and the Northern three-toed see MIS old growth dependent species Northern goshawk see *forest featured species*
		No action alternative *No impact to populations.*
		All action alternatives *Possible decrease in individuals as a result of increasing edge habitat, fragmenting the landscape and removing dense overstory. Hammond's flycatcher will benefit from aspen treatments. No impact to these populations.*
Riparian Woodland and Shrub Habitats		
Lewis' woodpecker *Melanerpes lewis*	• Woodlands with large snags • Dependent on insect food supply, competition with	See MIS primary cavity nesting species section

Species	Key habitat components	Effects by alternative
	starlings is detrimental • Cottonwood	
Red-eyed vireo *Vireo olivaceus*	• Woodlands with canopy foliage • Frequent cowbird host • Cottonwood and aspen	No action alternative *Continued decline of aspen habitat. No impact to populations.* All action alternatives *Will benefit as a result of aspen treatments. No impact to the population.*
Veery *Catharus fuscescens*	• Woodlands with an understory shrub layer • Common cowbird host, negatively impacted by grazing • Cottonwood and aspen	No action alternative *Continued decline of aspen habitat. No impact to populations.* All action alternatives *Individuals will benefit as a result of aspen treatments. No impact to the population.*
Willow flycatcher *Empidonax traillii*	• Shrubs with willow and alder patches • Frequent cowbird host and more than 3 miles from high use cowbird areas • Willow and alder	No action alternative *No impact to populations.* All action alternatives *No change to willow or alder habitat. No impact to the population.*
Other associated species:	Common yellow throat, *Geothlypis trichas* Yellow warbler, *Dendroica petechia* Warbling vireo, *Vireo gilvrus* Swainson's thrush, and *Catharus ustulatus* Green-tailed towhee *Pipilo chlorurus*	No action alternative *No impact to populations.* All action alternatives *No actions changing cottonwood or willow, marsh, or mountain mahogany habitats. Aspen treatment will benefit warbling vireo. Swainson's thrush will benefit in the long term from moderate levels of thinning.*
Sub Alpine Forest Habitat		

Species	Key habitat components	Effects by alternative
Hermit thrush *Catharus guttatus*		No action alternative *No impact to populations.*
		All action alternatives *No actions in sub alpine forest. No impacts to populations.*
Montane Meadows Habitat		
Upland sandpiper *Bartramia longicauda*		No action alternative *No impact to populations.*
		All action alternatives. *Upland sandpipers do not occur in the project area. No impact to the population.*
Aspen Habitat		
Red-naped sapsucker *Sphyrapicus nuchalis*		No action alternative *Continued decline of aspen. No impact to populations.*
		All action alternatives *Individuals will benefit as a result of aspen treatments. No impact to the population.*

Aspen

Twenty-eight existing aspen stands would be released from overstory shading and conifer competition, protected from browsing, and allowed to expand. In the short term, prescribed fire would enhance natural regeneration as soil heating stimulates root suckering. Existing suckers and saplings that are protected would become more vigorous.

In the long term, saplings would grow into larger size classes, becoming resistant to ungulate browsing as fences start to deteriorate. Overstory composition would change. Understory grass and forb cover would increase, as would deciduous riparian shade, root structure, and soil-holding capacity within the stands. Diversity of habitat would increase, especially foraging and nesting opportunities for neo-tropical migrants and cavity excavators including Lewis's woodpecker, red-eyed vireo, veery, and the red-naped sapsucker. Genetic diversity of the treated aspen stands would be maintained and preserved.

Roads

Table 36 displays the affected acres of snag habitat as a result of closing, decommissioning and constructing roads in the project area. Closing or decommissioning roads will secure potential habitat from the risks of firewood cutting and hazard tree removal as long as a wildlife biologist ensures the effectiveness of the closures. Road construction will affect potential dead and defective wood habitat. As a result snags could be removed from building the road, firewood cutting, and hazard tree removal.

Conclusion

Thinning and prescribed fire will be used to help restore historical stand structure and fire regimes in particular, on dry forest types. Treatments are considered beneficial to dry forest old growth dependent species in the long term (25+) years. OFMS would be converted back to OFSS, benefitting white-headed woodpecker, Flammulated owl, chipping sparrow, Lewis' woodpecker, and other dry forest associated species (see Table 37). Treatments occurring in late successional mesic mixed conifer habitats would reduce stand structure and may affect Vaux's swift, Townsends warbler, varied thrush, olive-sided flycatcher, and other associated species dependent on dense overstory. The MacGillivary's warbler may benefit as a result of increasing shrubs from opening the forest canopy.

Riparian woodland and shrub habitats would remain relatively unchanged with the exception of aspen stands. Species dependent on willow, alder, and cottonwood will be unaffected. In aspen stands, diversity of habitat would increase, especially foraging and nesting opportunities for neo-tropical migrants and cavity excavators including Lewis's woodpecker, red-eyed vireo, veery, and the red-naped sapsucker. Species associated with sub alpine forest and montane meadows would be unaffected by project activities.

Cumulative Effects

All of the activities in Table 6 have been considered for their cumulative effects on landbird species. The following discussion focuses on past, ongoing, and reasonable foreseeable future activities that may contribute adverse effects to landbirds and their habitats. Past actions, including timber harvest, livestock grazing, road construction, mining, wildfire, and fire suppression, among others, have all impacted landbird species and habitats individually and cumulatively.

Invasive plants lead to habitat degradation by competing with native vegetation. Galena project design mitigates the spread of noxious and invasive plants. In addition, the Malheur National Forest is in the process of beginning an environmental impact statement and decision controlling invasive plants on National Forest system lands. Future treatment of this infestation would cumulatively increase native plants and improve potential foraging and nesting habitat for birds.

Past timber harvest has caused a loss of mature open stands of ponderosa pine throughout much of the analysis area. The quality and quantity of habitat for species dependent on pine habitats has decreased. As a result edge habitat has increased making birds more vulnerable to predators. Road building associated with timber harvest has reduced the quantity of habitat available to some species, especially in riparian areas and aspen stands.

Fire suppression over the last century has resulted in the encroachment of fire intolerant species (Douglas fir, grand fir, and lodgepole pine) into biophysical environments where these species were historically uncommon. Resulting stands have benefitted some bird species while negatively affecting others. The Malheur National Forest fire suppression policy is not likely to change in the foreseeable future, further contributing to negative cumulative effects for those species dependent on open mature stands and snag habitat. However, Galena project design reintroduces fire on the landscape, maintaining stands with high portions of fire tolerant species and restoring dry forest types.

Livestock grazing in the uplands and along streams has also affected, and may still affect neotropical migratory bird habitat. Livestock grazing generally occurs after the majority of songbird breeding has

occurred, but may impact late breeding species, or individuals that are re-nesting after losing their initial brood. Cattle may have caused shifts in plant species composition and abundance through selection of more palatable forage species. Cattle reduce ground cover through trampling or consuming vegetation, decreasing cover habitat for some ground nesting birds. Past grazing in stream corridors has also reduced riparian shrub habitat. The conditions of some riparian areas and aspen habitats has been improved by new management practices and restoration activities in more recent years, but some areas are still not fully restored to conditions that are most suitable for associated bird species. Project design for Galena will ensure that important habitat including: ponderosa pine dry forest, riparian vegetation, woodland shrubs, and aspen persist on the landscape and will not be degraded as a result of implementation of the proposed activities when combined with ongoing livestock grazing.

In 1994 the Reed Fire burned 2,000 acres, and in 1996 the Summit Fire burned 30,000 acres, both of which are within close proximity to the project area. These fires created an immediate pulse of snags and shrub habitat. Portions of this post-fire habitat were salvaged, while some portions continue to provide high levels of these priority habitat types. Because of these fires, while there are snag deficiencies in the project area, adjacent subwatersheds provide an adequate supply to provide habitat.

In the past, private lands within the Galena project boundary have not been managed to retain snags and down wood. However, 98% of non-Forest Service land within the Galena project area is now owned by the Confederated Tribes of Warm Springs. The current management objectives for this land are to restore and maintain native habitat, with the ultimate goal of sustaining native fish and wildlife populations. Continued activity on these lands will help cumulatively improve habitat throughout the subwatershed.

Cumulatively, this project combined with other recent and ongoing prescribed burning and understory thinning would help restore dry forest habitats and aspen stands, benefitting bird species that use them. Like other recent timber sales, the Galena project has considered design features addressing conservation issues listed in the Northern Rocky Mountains Bird Conservation Plan (i.e. low intensity and severity burns, retention of snags and large trees, and mosaic patterns with refuge areas of untreated habitat among others), which allow for restoration while reducing short-term impacts on nesting birds.

The no action alternative would not treat neotropical migratory bird habitat in the analysis area. The habitats that currently exist within the project area would be maintained in the current condition, and provide for the species diversity, density, and distribution that currently exists in the short and midterm. In the long term, open and semi open pine stands would continue to be lost through multi-strata canopy development in the absence of fire. Considering the existing condition of these habitats within the analysis area, it appears likely that, without treatment, what suitable habitat that remains for dry forest dependent birds species will be converted to unsuitable habitat, potentially affecting populations and their distribution within the analysis area.

Under the proposed action alternative, treatments occurring in late successional mesic mixed conifer habitats would reduce stand structure and may have negative cumulative effects to species dependent on dense overstory. The action alternatives would improve dry forest habitats and the remnant aspen stand within the project area. The conversion of some of the OFMS stands to OFSS will increase species diversity by providing habitat for more species within the same geographical area. Positive cumulative effects, include moving more of this area towards HRV and the conditions recommended by Altman (2000), will benefit the species most negatively impacted by past timber harvest activities.

Malheur National Forest Featured Species

Regulatory Framework

Featured species are those identified in the Malheur National Forest Plan as species that require special protections. The Forest Plan (IV-30, 31) provides direction (standards 50-55) for the protection of habitat for these species. Table 38 lists the seven featured species currently on the forest. The table also includes their habitat requirements and whether habitat exists in the project area. Only species with habitat in the project area are discussed in detail. The sage grouse and upland sandpiper are also listed as Forest Service sensitive species, however they do not have habitat in the project area.

Featured species could be impacted by the type of propose activities in this project, which are thinning, prescribed burning, enhancement of aspen stands, and various road actions. These activities could potentially alter habitat conditions leading to an impact to individuals, populations, or if a predator, their associated prey species.

Analysis Methods

To determine the effects to featured species, potential habitat was identified for each species. Habitat was defined using the best available science obtained from literature reviews and knowledge of the project area. Within the project area, stand information that correlated with species requirements were identified by Most Similar Neighbor analysis, using GIS layers, aerial photographs, ground reconnaissance and stand exams. For each species, potential habitat was mapped and effects were determined by comparing the number of acres affected by proposed treatment. Treatments for each alternative are similar, with the exception of their location and intensity, and were compared to the no action alternative.

Existing Condition

Table 38. Malheur National Forest featured species with habitat requirements and presence in the project area

Featured Species	Habitat Requirements	Habitat present in project area
Northern goshawk (*Accipiter gentilis*)	A mosaic of mature, mixed conifer stands, with closed canopies and interspersed openings suitable of supporting a wide array of prey	Yes, three documented goshawk territories
Blue grouse (*Dendragapus obscurus*)	Clumps of mistletoe infected Douglas-fir on ridge tops or upper slopes of ridges	Yes
Sage grouse (*Centrocercus urophasianus*)	Open sagebrush plains ranging from 4000-9000 feet elevation	No
Osprey (*Pandion haliaetus*)	Large, dead trees suitable for nesting (30” dbh and <60’ tall) adjacent or near large rivers or lakes	Yes, along the Middle Fork of the John Day River
Pronghorn antelope (*Antilocapra americana*)	Open grasslands with low sagebrush as an important component	No
California bighorn sheep	Alpine-desert grasslands associated with	No

Featured Species	Habitat Requirements	Habitat present in project area
(*Ovis canadensis*)	mountains, cliffs, foothills, and river canyons	
Upland sandpiper (*Bartramia longicauda*)	Native prairie grasslands and montane meadows	No

Northern Goshawk (Accipiter gentilis)

The northern goshawk, a 'true' hawk highly adapted for forested landscapes, is found throughout the intermountain west (Hanauska et. al. 2003). In the Pacific Northwest, goshawks prefer to nest in mature, unlogged, or lightly managed forested habitats. These areas include sites with closed canopies (greater than 60%), northerly exposures, gentle slopes, and close proximity to water (Reynolds et al. 1992). Canopy closure is an important factor in nest site selection and, in the desired percentages, provides security from avian predators as well as decreasing impacts from human disturbance. Nest trees are typically dominant trees in the canopy (25-147 cm DBH) and are usually in Douglas-fir, ponderosa pine, and western larch (McGrath et. al. 2003).

Goshawk nest stand sizes vary in the Pacific Northwest from 25-207 acres and goshawks typically use 3-9 alternative nest sites distributed across a large landscape (Woodbridge and Dietrich 1994, McGrath et. al. 2003).

Post-fledgling areas include the nest stand and surrounding areas used by adults and juveniles prior to natal dispersal (Reynolds et al. 1992). Post-Fledgling Areas (PFA's) in eastern Oregon are composed largely of structurally complex late successional mixed conifer and ponderosa pine forests (McGrath 1997).

Northern goshawks are woodland hawks and their morphology (short, rounded wings and relatively long tails) is adapted for maneuvering and hunting in moderately dense, mature forests (Beier and Drennan1997). Recent peer-reviewed research suggests that goshawks forage in a variety of forested and non-forested environments (Brewer et. al. 2009). Small openings and forest edges in mixed conifer and ponderosa pine forests, in particular, appear to be important for foraging. These foraging habitats support higher plant diversities and, in turn, support a higher number of desirable prey species such as rabbits, squirrels, and grouse.

In the project area, there are 4,112 acres of OFMS (7%), cool-moist and warm-dry mixed conifer stands which provide suitable breeding habitat for goshawks. Secondary nesting habitat and additional foraging habitat are found on YFMS (14%), SEOC (69%), and UR (5%) on 25,208 acres, often lacking the large tree component.

There are three known nest territories in the project area Deerhorn Creek, Little Boulder, and Placer Gulch. A 30-acre nest site and 400-acre post fledgling area (PFA) has been established around each nest (a requirement in forest plan amendment #2). The stand structure within each of the PFAs is shown in Table 39.

Table 39. Stand structure for northern goshawk PFAs within the project area

	Goshawk Post Fledgling Area Name		
Structural Stage	**Placer Gulch**	**Deerhorn Creek**	**Little Boulder Creek**
Young Forest Multiple Strata (YFMS)	326	26	208
Stand Initiation (SI)	0	0	0
Stem Exclusion-Open Canopy (SEOC)	27	14	13
Stem Exclusion-Closed Canopy (SECC)	91	16	0
Old Forest Multi-Strata (OFMS)	8	437	221
Non-Forested	0	0	21
Total Acres	**452**	**493**	**463**

Blue (Dusky) Grouse (Dendragapus obscurus)

(Subspecies name is now 'dusky' grouse east of the Cascades, 'sooty' west of the Cascades)

Blue grouse is the largest forest grouse that occurs in Oregon and is a popular upland game bird. One of three grouse subspecies found in Oregon, they prefer coniferous forest (Douglas-fir, grand fir, sub-alpine fir) with a mixture of deciduous trees and shrubs near edges and openings. Blue grouse breed and nest in a variety of forest and shrub vegetation types from foothills to timberline. Blue grouse utilize large, mistletoe infected Douglas-fir trees, generally located within the upper 1/3 of slopes, as winter roosts. Dense coniferous thickets of small trees, stumps, and down logs are used by blue grouse for resting, drumming and escape cover. Grouse also utilize dense deciduous areas in riparian corridors. Blue grouse home ranges are typically between 1.25 and 5 acres, and can be found at mid-elevations and in subalpine areas, usually associated with openings and rocky areas. Winter range typically includes conifer forests from sea level to subalpine, with a wide range of habitats used during spring and summer. The forest plan standard for the protection of grouse habitat (IV-30, standard 50) states "maintain grouse winter roost habitat."

Habitat trend data evaluated for the Interior Columbia Basin over the past decade indicates that roughly 80% of the watersheds in the Blue Mountains show a decreasing trend for blue grouse habitat, with only 10% showing an increasing trend. Declines in primary (source) habitat are largely attributed to a reduction in late seral forest (Wisdom et. al. 2000).

Past fire suppression in the project area has allowed for the encroachment of shade tolerant conifer species. Subsequently, increased stand densities throughout the project area have resulted in an increase in insect damage disease, and parasitism, including dwarf mistletoe. Douglas-fir stands comprise a portion of the project area and contain some degree of mistletoe infestations. Formal surveys for blue grouse have not been conducted in the project area. However, approximately 4,000 acres (10%) of the Galena project area appears to have high quality blue grouse habitat in the form of subalpine forest.

Osprey (Pandion haliaetus)

Ospreys are highly migratory raptors that typically breed and nest along larger rivers, lakes, and reservoirs. Localized nesting is documented in the Blue and Wallowa Mountains with nest site substrate ranging from open-crowned/dead mature trees to utility poles (Marshall et. al. 2003). Ospreys feed almost exclusively on fish and documented nests in Oregon are almost always located close to water with

adequate fish populations. Henny et. al. (1978) found that 83% of 78 nests in Oregon were within 1 km of water and all were within 2 km (as cited in Ewins 1997).

Data from raptor migration counts and BBS routes suggest that populations have increased or remained stable in parts of the western United States since the mid-1980's (OFO 2010).

Ospreys have been documented on the forest and suitable nesting and foraging habitat exists in the project area along 4.7 miles of the Middle Fork of the John Day River (MFJDR). Within the project boundary there are approximately 10,600 acres of nesting habitat. The area considered as potential nesting habitat are those acres within the project boundary, and within 2 kilometers (1.2 miles) of the MFJDR.

Direct and Indirect Effects by Alternative

Alternative 1 – No Action

No thinning, prescribed fire, road building, or aspen treatment would occur. With no activities proposed, habitats would remain in their current condition. Use of habitats would not change from the way they are currently being utilized but some may not be self-sustaining over time.

There would be no direct/indirect adverse effects to goshawks from Alternative 1, because no commercial or pre-commercial thinning would take place and result in habitat alteration. Existing LOS stands (OFSS and OFMS structures) in the project area will remain as described in the existing condition section. Suitable habitat for nesting and foraging would remain the same or possibly decrease from response of old structure stands to disease and high intensity fire events.

There would be no direct/indirect adverse effects to blue grouse from Alternative 1. Past harvest in the project area has reduced some blue grouse habitat in the form of mixed-conifer mature forest. Suitable nesting and foraging habitat would remain the same.

Because no commercial or pre-commercial thinning would take place, there would be no direct/indirect adverse effects to osprey or their existing habitat from Alternative 1. Existing LOS stands in the project area will remain as described.

Alternative 2, 3, 4

Many wildlife species, including northern goshawk, blue grouse, and osprey that depend on down wood, snags, future snags, dwarf mistletoe brooms, dense forests with abundant saplings and small poles, and closed canopy-forests for survival and reproduction, are likely to be detrimentally affected by thinning and prescribed fire (Pilliod et. al. 2006).

Increased human presence during activities could also displace northern goshawk, blue grouse, and osprey during nesting, roosting, and foraging.

Northern Goshawk

Habitat alteration, such as management activities, can affect nest occupancy and productivity (Crocker-Bedford, 1998, Wisdom et. al. 2000). Because it decreases availability of appropriate nesting habitat, timber harvest methods that create large areas of reduced canopy cover (< 35-40%) are considered a primary threat to breeding goshawks (Bright-Smith and Mannan 1994, Beier and Drennan 1997). In addition, timber harvest activities near nests can directly cause nest failure (Boal and Mannan 1994).

Changes in forest structure related to fire suppression tend to increase cover and structure within source habitat for goshawk. However, due to a thicker understory component, some of the denser unburned forest stands may not be optimal goshawk habitat (Wisdom et. al. 2000). These denser stands are more vulnerable to stand replacing wildfires. Stand replacing fires would represent total loss of forest structure and, would subsequently greatly reduce goshawk nesting and foraging habitat.

Goshawks are generally highly sensitive to disturbance during the breeding season. Human disturbance to goshawk nests has been a suspected cause of nest abandonment (Reynolds 1992).

Under Alternatives 2, 3, and 4 treatments would occur in mature forest stands (OFSS, OFMS, YFMS) suitable for goshawk occupation and would involve varying degrees of commercial thinning, pre-commercial thinning, and prescribed burning. Under all action alternatives, harvest and thinning of trees would reduce overall forest canopy cover in the short term. This reduction in cover would likely impact northern goshawks and existing territories may be abandoned due to lack of preferred nesting and foraging habitat structure. Although in the long term, forest stand structure would be comprised of more LOS habitat, the focus of the proposed action is to accelerate single stratum structure, not the multi-strata preferred by goshawks, and any long term benefits to northern goshawks utilizing the project area are negligible. Thinning could also potentially alter foraging habitat by reducing canopy cover and, consequently, prey assemblages. Since goshawks prey on a variety of species and do not appear to select stands on the basis of prey abundance, but rather forest structure higher canopy (i.e. higher canopy closure, higher tree density), goshawk nesting and breeding activities are more likely to be adversely impacted than foraging (Drennan and Beier 2003). Conversely, since denser unburned stands are also more vulnerable to stand replacing fires, thinning may potentially benefit goshawks in the long-term by reducing the risk of forest structure loss.

Thinning is prescribed for one Post-Fledgling Area (PFA) within the Galena project area, Placer Gulch, for each action alternative. Currently, the Placer Gulch PFA is comprised predominantly (72%) of young, multi-strata forest. Placer Gulch PFA boundaries were delineated utilizing the best available habitat structure located within the vicinity of a documented nest site. This forest type (YFMS) has the potential to mature into more suitable habitat and would allow the PFA to progress toward the desired condition. Only 8% of the PFA contains the highest quality habitat type, OFMS, and this is located within the proposed thinning unit. Removing the only old forest multi-strata structure located within the designated PFA is expected to adversely impact northern goshawks utilizing the area.

Underburning is proposed for approximately 178 acres within one PFA, Little Boulder for each action alternative. Underburning would enhance goshawk prey conditions and is expected to advance stands toward late or old structural conditions.

Existing and potential nesting habitat would be monitored annually, dependent upon funding, for goshawk activity. If active nests are identified within or immediately adjacent to the project area, management activities would be prohibited within ½ mile of the nest sites from April 1st to September 30th in order to avoid disturbing goshawks during the breeding season. In addition 30 acres of the most suitable nesting habitat surrounding each active and historical nest tree are deferred from any burning and cutting.

Blue Grouse

Activities that would remove Douglas-fir trees with mistletoe would impact this species by reducing roost habitat and preferred forest structure. Since blue grouse depend on needles and buds of Douglas-fir and ponderosa pine during the winter, thinning of mature Douglas-fir and ponderosa pine would also impact winter food supplies.

Activities altering herbaceous brood cover, consisting mainly of native bunchgrasses and associated forbs, could be affected by prescribed burning. Herbaceous vegetation conceals the broods and contains insects, an important food source for blue grouse (Mussehl 1963). However, grasses and forbs suitable for blue grouse nesting cover would be expected to become established within several years (2 -5) after ignition events.

Under the action alternatives, some harvest of trees which can potentially provide winter roost habitat for blue grouse could occur. Removal of roost trees could impact individuals and displace them to other

areas. Under Alternatives 2 and 3, 27 acres (<1%) of subalpine habitat could be altered as a result of thinning activities. Alternative 4 would alter an additional 62 acres for a total of 89 acres or 2% of high quality habitat. During project implementation, it is expected that a degree of disturbance would occur. These activities would be limited in time and place and would not be expected to cause detrimental impacts to blue grouse. To ensure blue grouse winter roosts are provided, design criteria 12 (Chapter 2) will retain mistletoe infected trees. In addition, large mistletoe-infected or "wolfy" Douglas-fir trees along ridge tops and large scab openings will be retained.

Increased human presence during project activities could also disturb nesting and roosting blue grouse. Thinning would remove suitable roosting habitat, preferred forest structure, and could impact cover structure for broods. Additionally, prescribed burning, for all action alternatives would occur on 200 acres (5%) of high quality habitat. Prescribed burning would directly remove nesting habitat and, if implemented during the primary nesting season, could cause direct mortality of blue grouse adults and offspring. However, grasses and forbs suitable for blue grouse nesting cover would be expected to become established within several years (2 -5) after ignition events. Prescribed burning design criteria that would mitigate impacts to blue grouse are:

- Burn no more than 5,000 acres using prescribed fire in the Galena project area in any one year. Individual burn blocks larger than 1,000 contiguous acres will require a wildlife biologists input to ensure that big game forage and neo-tropical migratory bird objectives are being met.
- Avoid ignition in areas with riparian vegetation. Fire may be allowed to back into riparian areas with the objective to maintain a minimum of 40-50% of shrubs in a mosaic of untreated patches to meet big game forage and migratory bird objectives.
- Underburning outside of riparian areas will maintain a minimum of 20-30% of shrubs in a mosaic of untreated patches by using drip line burning or other methods to meet big game forage and migratory bird objectives.
- Underburns between April 15th and July 30th will maintain a mosaic of treated and untreated shrubs to reduce the effects of burning on ground nesting birds.

Osprey

Activities, such as thinning, that would remove potential or existing nest sites such as large trees and snags, within close proximity (2 km) to rivers and lakes could impact this species.

Under all action alternatives, there is no scheduled harvest of 21 inch dbh or greater trees. However, it is likely that some danger trees within potential habitat would be removed as a result of the proposed activities. Proposed thinning totaling 3,236 acres, 2,038 acres, and 3,816 acres for Alternatives 2, 3, and 4 respectively would occur within 2 km of the MFJDR. Since ospreys are known to nest in areas adjacent to suitable foraging habitat (fish-bearing waterways) proposed thinning could adversely impact ospreys utilizing the area by direct removal of existing and potential nest sites.

Prescribed burning would occur on 9,748 acres within 2 km of the MFJDR. Prescribed burning would likely burn some large snags, reducing potential nesting habitat.

Although the number of acres treated varies by alternatives, effect to the species is expected to be similar from each action alternative. With implementation measures in place, it is expected that osprey nest trees would be maintained and disturbance to nesting birds would be minimized. Design criteria mitigating effects to Osprey include:

- The district wildlife biologist will be consulted if any raptor nest is discovered so a buffer can be created and any other requirements of the species can be met before implementation of management activities.

- Retain all snags not considered a danger to logging operations, Forest Plan standard is 2.39 snags/acre, 21 inch dbh or greater. If 21 inch dbh snags are not available, retain snags of the largest representative diameter. Snags considered a danger to logging operations can be felled, but are to be left on site to meet wildlife habitat needs.
- Within "return to early seral species" units retain a minimum of 15 to 20 trees per acre >12 inches dbh for green tree replacements. More than a sufficient number of green tree replacements will be retained in all other harvest, pre-commercial thinning, and prescribed burn units. Leave green tree replacements in groups where possible.
- Avoid ignition within 100 feet of perennial and intermittent streams. Fire may be allowed to back into riparian areas with the objective to maintain a minimum of 40-50% to meet migratory bird objectives.
- Avoid ignition within 100 feet of standing dead trees 12 inch dbh or greater.

Roads

Road construction, often associated with timber harvest, further reduces snag density, potential osprey nesting habitat, as a result of the conversion of forest to roadway (Trombulak and Frissell, 2000, Delong et al. 2004, Wisdom and Bate 2008). Grub et. al. (1998) found no discernible behavioral response by goshawks when activities were greater than 1,200 feet from the nest and concluded that road-associated human use within primary habitat has the potential to negatively affect goshawks. Road construction could increase access to blue grouse habit making them more vulnerable to hunting mortality. Osprey response to disturbance varies. However, if osprey are disturbed after nesting has begun, particularly in remote areas where little human disturbance has occurred earlier in the season, breeding success could decrease (Ewins 1997).

Northern Goshawk

Road construction would reduce habitat for goshawk prey species and construction of temporary roads would fragment existing mature stands. However, for all action Alternatives 2, 3, and 4 open road densities will decrease as a result of project implementation. It is expected that the overall decrease in road densities will benefit goshawk and goshawk prey species. Road construction would not dissect any nest stands, PFA's, or mature forest in alternatives 2 and 3. However, under Alternative 4, new road construction would reduce habitat as a result of 0.2 miles of road construction within habitat outside of nest stands and PFA's.

Blue Grouse

Road construction would reduce habitat for blue grouse and allow access, potentially increasing mortality from hunters. However, for all action Alternatives 2, 3, and 4 open road densities will decrease as a result of project implementation. It is expected that the overall decrease in road densities will benefit blue grouse. No road construction would occur in subalpine habitat under any action alternatives, therefore no effects to blue grouse winter habitat would occur.

Osprey

Under Alternatives 2 and 4, seven miles of new road construction would occur within potential osprey nesting habitat. Therefore road construction and associated activities could reduce suitable nest sites. No new road construction would occur under Alternative 3 within osprey habitat. Timber harvest and associated activities could disturb nesting osprey and reduce breeding success. To mitigate these effects a district wildlife biologist will be consulted if any osprey nest is discovered so a buffer can be created and any other requirements of the species can be met before implementation of management activities.

Aspen Treatment and Protection

Aspen treatment and protection would change overstory composition of aspen stands. Understory grass and forb cover could increase potentially increasing prey species for goshawk and increasing insects, an important food source for blue grouse.

Affects to northern goshawk and blue grouse are likely to occur as a result of increased human presence during project implementation. Aspen stand treatments will not occur within existing goshawk territories, or winter blue grouse habitat. Ospreys are unlikely to be effected from aspen treatment and protection and all aspen stands are outside potential nesting habitat. Aspen stand protection would increase habitat for goshawk prey species, especially cavity nesting birds and woodpeckers, benefitting goshawk.

Cumulative Effects

All past, ongoing, and reasonably foreseeable future activities located in Table 6 of the Galena EIS that may contribute to adverse cumulative effects to northern goshawks, blue grouse, and osprey or their habitat were considered.

Active mining claims are not likely to affect foraging and nesting habitat for goshawk, blue grouse, or osprey. Therefore, mining claims are not likely to contribute to cumulative effects to goshawks.

Invasive plants lead to habitat degradation by competing with native vegetation. Galena project design mitigates the spread of noxious and invasive plants. In addition, the Malheur National Forest is in the process of beginning an environmental impact statement and decision controlling invasive plants on National Forest system lands. Future treatment of this infestation would cumulatively increase native plants, and thus improve blue grouse nesting and foraging habitat, as well as goshawk prey habitat.

Private lands within the Galena project boundary have been intensively managed. In the past, these lands have not been managed to retain snags and down wood. However, 98% of non-Forest Service land within the Galena project area is now owned by the Confederated Tribes of Warm Springs. The current management objectives for this land are to restore and maintain native habitat, with the ultimate goal of sustaining native fish and wildlife populations.

Northern Goshawk

Past grazing practices may have impacted herbaceous and shrubby vegetation that provides important food for goshawk prey species. However, current livestock grazing practices, including Forest Plan standards, provide for a sustained production of palatable forage for grazing by livestock and dependent wildlife species. Overall forage is not considered a factor limiting goshawk population viability, and consequently cumulative changes to foraging habitat, whether positive or negative, may not contribute to a measurable change in goshawk populations.

Nesting habitat is typically the primary limiting factor for goshawks. Historical timber harvest within and adjacent to the project area was largely related to area settlement and mining activities during the late 1800’s. The highest percentage of timber harvest included clear-cutting of old growth and was not geared toward retention of mature forest structure. Since 1995, the Forest Plan, as amended, has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages. Galena project design adheres to Forest Plan standards and goals, therefore stands will be managed to promote OFMS and OFSS development.

Road development, associated with logging activities, has also contributed to habitat loss and has fragmented habitat important for prey species. Galena proposes new and temporary road construction, road decommissioning, and road closures. Road densities after implementation of each alternative will meet and exceed standards set by the Forest Plan. In the short term, road use and on-site work would include increased human presence in the area and increase noise disturbance. After project implementation, road closures and decommissioning will reduce effects to breeding and nesting

goshawks. Future travel management will manage the road system on the forest, likely reducing open road densities and providing reduced human presence and noise disturbance to species,

Blue Grouse

Cumulatively, where livestock grazing coincides with nesting and foraging, grazing will likely reduce height of ground vegetation and possibly degrade habitat. Prescribed burning would benefit blue grouse habitat in the long-term by encouraging reintroduction of native grasses and forbs. Additionally, native planting and natural regeneration at post-burn sites (Summit Fire,1996; and Reed Fire 1994) adjacent to the Galena project area also provide additional nesting and foraging habitat.

Restoration of HRV in the dry forest types is expected to improve the health of the forest; reducing dwarf mistletoe infested Douglas-fir, as well as reducing cover structure important to blue grouse. Galena includes design criteria to retain mistletoe infested Douglas-fir, and would aid in mitigating potential impacts to blue grouse individuals and their associated habitat as a result of timber harvest.

Alternative 1 would not contribute to significant adverse cumulative effects to blue grouse populations. The combined effects of the Galena action alternatives and past, present, and reasonably foreseeable future activities would not be expected to adversely affect populations or viability of blue grouse within the analysis area.

Osprey

Grazing and past timber harvest and thinning have affected the quality and quantity of nesting and foraging habitat in the project area.

Cumulatively, where livestock grazing occurs, water quality may become diminished and osprey foraging habitat may be impacted. The Middle Fork of the John Day River has been intensively grazed historically and the Upper Middle Fork allotment, which exists in the project area, is currently grazed on a regular basis. Watershed improvements, geared toward protecting native fish populations, may mitigate some of these impacts.

Historical timber harvest within and adjacent to the project area was largely related to area settlement and mining activities during the late 1800’s. The highest percentage of timber harvest included clear-cutting of old growth and was not geared toward retention of mature forest structure. The Forest Plan, as amended, has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages and federally-managed thinning and regeneration projects have involved roughly 6,000 acres in adjacent areas. Standards and goals including snag retention and green tree replacement as well as design criteria for mitigating disturbances to osprey are incorporated in Galena project design.

Design features would be included to protect existing and potential osprey nest sites, therefore cumulative adverse effects would not be expected to reduce population viability of osprey as a result implementing the Galena project.

Heritage

Regulatory Framework

Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended, is the foremost legislation that governs the treatment of cultural resources during project planning and implementation. Implementing regulations that clarify and expand upon the NHPA include 36 CFR 800 (Protection of Historic Properties), 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), and 36 CFR 296 (Protection of Archaeological Resources).

The Pacific Northwest Region of the Forest Service, the Advisory Council on Historic Preservation (ACHP), and the Oregon State Historic Preservation Office (SHPO), signed a programmatic agreement regarding the management of cultural resources on National Forest system lands in 2004. The agreement outlines specific procedures for the identification, evaluation, and protection of cultural resources during proposed activities.

NEPA is also a cultural resource management directive as it calls for agencies to analyze the effects of their actions on socio-cultural elements of the environment. Laws such as the National Forest Management Act (NFMA) of 1976, the Archaeological Resources Protection Act (ARPA) of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, and Executive Order 13007 (Indian Sacred Sites) also guide Forest Service decision-making as it relates to heritage. The American Indian Religious Freedom Act (AIRFA) of 1978 requires that federal agencies consider the impacts of their projects on the free exercise of traditional Indian religions.

Forest-wide management standards found in the Forest Plan pertinent for this project include:

- Conduct a professionally supervised cultural resource survey on National Forest lands to identify cultural resource properties. Use sound survey strategies and the Malheur National Forest Cultural Resource Inventory Survey Design (Forest Plan IV-25, Standard 14)
- Consider the effects of all Forest Service undertakings on cultural resources. If a National Register and eligible property is affected, considerations shall include the formulation and analysis of alternatives, and the examination of interactions and impacts among cultural resources and other resource uses. Coordinate the formulation and evaluation of alternatives with the State cultural resource plan, the SHPO and State Archaeologist, other State and Federal agencies, and with traditional and religious leaders of Native American Indian groups and tribes with historic ties to the project planning area. (Forest Plan IV-26, Standard 15)
- Evaluate the significance of sites by applying the criteria for eligibility to the National Register of Historic Places.(Forest Plan IV-26, Standard 19)
- Protect National Register and eligible properties from human impacts and natural destruction. (Forest Plan IV-26, Standard 21)

Analysis Methods

The district archaeologist used several methods to determine the existing condition and the potential effects to heritage sites from proposed activities. The 2004 programmatic agreement between the Forest Service and SHPO was reviewed to ensure the requirements were met for this project. A pre-field review to identify sites already recorded from previous surveys was conducted. This review included inspection of site and project records, Geographic Information System electronic layer file analysis, and review of project maps showing where previous surveys were done. Field visits on around 1,000 acres verified the condition of a portion of known sites. During these site visits high probability areas that had been previously logged were resurveyed. Ethnographic records, mining, and railroad records were reviewed to identify areas previously impacted.

Existing Condition

Cultural resource identification efforts have focused on three primary types of resources: prehistoric archaeological sites (pre-1800s), historic archaeological sites (pre 1960s), and places that support resources of contemporary tribal interest. Most of the sites are in the northern two-thirds of the project area, north of the Middle Fork of the John Day River.

A majority of the cultural resource properties are mining and railway logging sites. There have been four cultural resource inventories previously conducted resulting in the discovery of 122 heritage sites which include 90 historic sites, 16 prehistoric, and 16 with both historic and prehistoric components. No traditional cultural properties (Parker and King, 1998) have been identified in the project area. Culturally important plant species, such as bitterroot, biscuitroot, wild rose, cattails, willow, camas, chokecherries, Lomatium, yampa, balsam flower seeds, currants, and huckleberries are present in the project area.

The area has been occupied by Native Americans from the Columbia Plateau and the Northern Great Basin culture areas for the past 11,000 years. The Columbia Plateau cultures included the ancestors of the modern Cayuse, Nez Perce, Umatilla, and the Warm Springs tribes (Suphan 1974). Northern Paiute people from the Great Basin also used the area. The area of the Middle Fork was used during the prehistoric period seasonally as small bands moved through the area collecting and gathering a wide range of food resources which included seeds, plants, rabbit, fish, and antelope (Couture 1996). The prehistoric sites are exclusively lithic scatters valued for their potential to provide scientific data to research efforts. The lithic scatters are generally small (< 3 acres although one site is 120 acres) and display sparse assemblages of formed stone tools, reduction flakes, and ground stone artifacts. Several of the cultural sites display potential for buried archaeological deposits.

More recently, the Middle Fork has been associated with mining, homesteading, ranching, and railroad logging (Musgrove, 1980). Mining landscape features such as placer tailings, waste rock piles, hydraulic ditch systems, prospect holes, adits, and shafts are common (Lindren, 1901). Mining related resources could be considered valuable due to their data potential and their ability to visually convey associations with important historic events or people. Railroad logging also produced numerous cultural resource properties including linear segments of railroad grades in various conditions, trestle remains, railroad ties and spikes, and other sites which may include wood structures and refuse of cans and bottles (Tonsfeldt, 1986). There is a railroad grade from the Sumpter Valley railway which crosses the project area and was listed on the National Register of Historic Places in 1987.

Direct and Indirect Effects by Alternative

A project is considered to have an adverse effect on cultural properties when it results in the alteration of characteristics that qualify the property for the National Register of Historic Places. The cultural properties that have been identified within the Galena project area are eligible or potentially eligible (unevaluated for the NRHP on the basis of their ability to yield scientific information that is important to studies of prehistory or history). Therefore, proposed activities that modify the patterning of surface or buried archaeological deposits are considered to result in an adverse effect.

Alternative 1

Under Alternative 1, there would be no direct effect on existing cultural resources since the sites would not face risk of disturbance associated with proposed activities. However, cultural properties would continue to be in jeopardy of damage or destruction by wildfire under the no action alternative. This alternative would not enhance habitats that support fisheries, wildlife, or plant species that are traditionally important to regional tribes of American Indians (Keyser et al., 1988).

Alternative 2, 3, 4

Under all action alternatives there would be no effect to heritage sites since disturbance to sites would be avoided during any proposed activity including commercial harvest, pre-commercial thinning and pile burning, and road activities. Prescribed burning and aspen treatments as proposed, are not expected to have an impact on any known sites.

Known sites that are within a unit boundary would be flagged and no activity would occur within the heritage site. Some heritage sites are large areas, and treatments will be limited to periods of sufficient snow cover to avoid disturbing the ground. If a new heritage site is located during the proposed activities, then work would be stopped and the district archaeologist would be notified. The cultural resource would be evaluated, and a mitigation plan developed in consultation with SHPO, if necessary.

It is possible that timber harvest operations could directly impact the scientific or scholarly value of individual archaeological deposits by disrupting the patterning present in surface or subsurface deposits of artifacts, ecofacts, and archaeological features, however, any effects would be marginal at the project scale. The value of these sites as symbols of important historic events, themes, or patterns may be diminished if these qualities are not recognized and protected. In most cases these effects, should they occur, would be minor and unlikely to cause a significant impact. Some habitats for culturally important plants by American Indians may be enhanced by proposed tinning and prescribed burning activities. Riparian dependent species, such as willow would benefit as fuel loading is reduced and natural reestablishment of native vegetation occurs.

Any minor effects, from timber harvest or increases in erosion, should they occur, would be isolated and unlikely to cause a significant impact. Reduction of the severity of potential wildfires would enhance the long-term stability of archaeological and historic resources.

Cumulative Effects

The existing condition of heritage sites in the project area, as described above, reflects the cumulative effects of past and present activities. Past and present activities which resulted in the presence of many sites are historical mining and historical logging activities (Table 6). All alternatives would have no adverse effects on heritage sites since any effect would be mitigated per the 2004 programmatic agreement, there would be no negative cumulative effects of future foreseeable actions. Activities that improve habitat for culturally important plants will add cumulatively to thinning projects and riparian restoration projects across the forest that also enhance habitat for these plants.

Visuals

Regulatory Framework

The Forest Plan designated Highway 7 and Highway 26 as sensitivity level 1 corridors and County Road 20 as a sensitivity level 2 corridor. These consist of visible and potentially visible landscapes along major travel routes where the traveling public has a high-to-medium sensitivity to the scenery. The goal is to "manage corridor viewsheds with primary consideration given to scenic quality and growth of large diameter trees. Visual quality objectives (VQO) of retention, partial retention, and modification will be applied while providing for other uses and resources." Forest Plan standards for foreground retention limit the size of created openings to 2 acres, stress the use of uneven aged management, and limit the percentage of foreground area created opening at any one time to 10%. The intent is to create stands composed of large over story ponderosa pine in an open park like setting which features the large trees as well as healthy under story trees. A Visual Corridor Plan has been developed for management of lands along Highway 7. This was directed by the 1991 Malheur National Forest Land and Resource Management Plan.

The Landscape Aesthetics Handbook requires an analysis that considers effects that impact natural appearing landscapes. The agency is directed "to prescribe management which promotes sustainability" (Agriculture Handbook number 701, Landscape Aesthetic, A Handbook for Scenery Management, 1995, pg. 23). It is not only the existing landscape against which comparisons are based, but what is ecologically sustainable and desirable.

Analysis Methods

The district visual quality specialist used several methods to determine the existing condition of visual quality and sustainability and to determine effects by alternative. The visual quality specialist, having previous knowledge of the project area and after several field visits, reviewed the proposed prescriptions of units to identify areas where visual quality could be enhanced. The Forest Plan standards for VQO were reviewed. The landscape aesthetics handbook was used in designing unit prescriptions.

Effects to visual quality are measured by whether alternatives meet the VQO outlined in the Forest Plan. The VQO is determined by views from foreground and middle-ground. Impacts from thinning trees could change views by reducing site cover. Providing considerations for design in harvest prescriptions with of patches of smaller trees and variable tree density are ways to maintain visual quality within units. Effects to landscape aesthetics are measured by positive or negative impacts to scenic stability and scenic integrity.

Existing Condition

Foreground and middle ground views from County Road 20 and Highway 7 have VQO of retention, partial retention, and modification. Currently the project area shows a low level of disturbance where some partial cutting has taken place and natural regeneration of early and late seral species has occurred. Generally, past harvest units were located away from visual foregrounds and middle grounds. A limited amount thinning has occurred in areas visible from nearby highways. Scenic integrity is a measure of intactness of the landscape and to what level a proposal deviates from a natural appearance. Impacts that introduce negative elements to the landscape reduce the scenic integrity. Scenic integrity and stability have been in decline because of high fuel loadings and stocking levels. Many options exist to meet visual quality objectives in foreground and middle ground views in the long term, due to natural levels and arrangement of stand diversity and moderate topography.

In general, activities that reduce the sustainability of natural forest eco-systems decrease scenic stability. Impacts that improve or support sustainability of the forest eco-system increase forest stability. Existing

scenic stability is an indication of sustainability of a landscape. A landscape with a low rating would be difficult to maintain over time. The existing scenic stability is determined by considering current condition of key resources and current trends that are occurring.

Currently, there are numerous trends in this planning area that indicate that the scenic stability is in decline or could be rated low. The coniferous forest is generally overstocked in both ponderosa pine types as well as mixed fir types, with excess ground and ladder fuels. Natural processes associated with fire exclusion are obvious. These conditions will make it difficult to keep wildfire starts from expanding rapidly and burning intensely. Fire suppression has resulted in a change in species and structural stage composition, reducing the sustainability of the forest.

Direct and Indirect Effects by Alternative

Alternative 1

Under alternative 1 the VQO foreground and middle-ground views from County Road 20 and Highway 7, would be maintained and the existing landscape character would not be altered by proposed activities. The effects to scenic stability could be considerable due to potential of epidemics of insects or disease or large stand replacement wildfire remaining high and would continue to increase. In the event of an uncharacteristic wildfire many of the desirable elements of landscape character would be lost for an extended period of time. Scenic integrity would be reduced from not thinning overstocked stands resulting in reduced visual sight distances.

Alternative 2, 3, 4

Under all action alternatives, the effects to visual quality are expected to be positive in the long-term by increasing the sustainability of the project area. The VQO foreground and middle-ground views from County Road 20 and Highway 7 would be maintained, and are not expected to change as a result of any proposed activities. Effects under all alternatives are expected to be similar, except would vary in magnitude based levels of disturbance proposed by alternative.

In the long-term commercial harvest and pre-commercial thinning would create a more scenic and sustainable forest along the foreground and middle-ground areas. Thinning would improve landscape character by opening up foreground views and allowing more light to reach the forest floor. The effects would include improved health by reducing competition for remaining fire resilient tree species, a shift in size classes as openings become occupied by pioneer species, and improved growth rates in leave trees. Timber harvest units would add a variety of line, form, color and texture to the landscape. Forest users may see a modified forest in the foreground, middle ground, and background, where harvest and prescribed burning are implemented.

Scenic stability would increase from the reduction in stand densities to provide conditions for ponderosa pine and western larch. Commercial thinning would have minimal negative impacts to scenic integrity as thinning at variable densities would introduce variation and desirable change into foreground views as well as promote changes in form, structure, and color. Immediately following proposed activities the landscape character would appear slightly altered due to soil disturbance from logging and slash piles. Tractor skidding would be evident in foreground views for 1 to 5 years. Skyline skidding would be evident in middle and background views for 5 to 10 years.

Scenic integrity would be positively affected by action alternatives. Resiliency would be improved to forested stands, commercially harvesting at variable densities. This reduces the competition of available light, water, and space for regeneration of early seral species.

Road construction can have a major impact on visual quality. From a visual perspective roads are created lines that are generally not natural appearing, often with cut and fill slopes that detract from the natural view. These effects would be evident. The action alternatives would not construct any new roads that

would detract from the visual experience in travel corridors. All proposed roads, both temporary and permanent, would meet visual quality objectives.

Hand line and machine line placed to control prescribed fire are very necessary but can create a line of disturbed soil and vegetation that detracts from the natural setting. Hand lines would be evident for 1 to 5 years. Prescribed burning in the visual foreground would be designed to minimize the visibility of scorch and mortality to larger trees. Low intensity fire would be allowed to creep through the forested areas adjacent to highways. Tree mortality would be minimal (not exceeding 20%) in the 200 foot area adjacent the highways. The mortality would be limited to smaller sapling size trees. To ensure the larger pine trees within 200 feet of the highway would not be killed during burning, extra protection measure would be implemented. Needle scorch on lower branches of trees would be apparent immediately after burning and would persist for 1 to 2 years. These effects are short-term and would appear slightly altered until re-growth of the understory vegetation occurs within a year after burning. At this time the forested area would again have the current natural appearance.

Cumulative Effects

The existing condition of VQO in the project area, as described above, reflects the cumulative effects of past and present activities. Past and present activities which resulted in the VQO of retention, partial retention and modification include the high density of roads from historical and recent timber harvest projects (Table 6). Since all alternatives would have no effects on the VQO, there would be no cumulative effects.

Roads

A Forest-wide roads analysis was completed (MNF 2004) which resulted in identifying a group of roads that were recommended as the minimum primary road system for the forest. The analysis was designed to provide decision-makers with information needed to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are more in balance with available funding for needed management actions. This analysis was reviewed and incorporated by the Galena IDT during the roads analysis process for this project.

A roads analysis was completed for the Southeast Galena project (MNF 2002), an area larger than the current project area. This roads analysis builds on the Forest-wide roads analysis by addressing local road needs that would complement the minimum primary road system. During this analysis, representatives from various resource areas assessed the existing road system in seven subwatersheds, including the present Vinegar Creek and Little Boulder Creek-Deerhorn subwatersheds. The team used a set of analysis questions to analyze roads related to impacts on ecosystem functions and processes. The analysis resulted in the overall framework used to determine specific road activities proposed by alternative for this Galena project.

Appendix B includes the road analysis completed for this project, which consists of a list of roads within the Galena project area. This is the result of the Galena IDT recommending whether to keep roads open, close roads, move roads from riparian areas, and decommission roads. This list includes the existing roads present in the project area, a list of roads by alternative proposed for activities including maintenance, reconstruction, new road construction, moving roads out of riparian areas, road closures and road decommissioning. The list includes the roads to be used for haul routes and chip trucks by alternative during project implementation. The list concludes with the extent of the road system within the project area after each action alternative would be implemented. Appendix C contains maps of roads proposals by alternative.

Regulatory Framework

The Forest Plan provides direction to address road density concerns by establishing open road density goals of no greater than 3.2 miles/square mile in big game summer range, 2.2 miles/square mile in big game winter range. The forest has generally met those open road density goals, which are monitored on a watershed basis. However, there are still many subwatersheds that have open road densities that exceed these levels.

Analysis Methods

Roads in the project area were field checked and forest road databases (GIS and INFRA) were updated to reflect existing conditions. The Galena IDT reviewed the forest-wide roads analysis, the Southeast Galena roads analysis, and the field data collected to determine their recommendations for each road within the project area. The analysis of road densities in the project area as related to the Forest Plan standards was completed by the wildlife specialist and is documented in the Management Indicator Species (MIS) for Big Game section on page 192.

Data in the GIS databases were inspected and corrected as determined. These corrections primarily addressed newly identified inconsistencies in data values that varied among alternatives or between on-the-ground conditions and database values. Approximately 7 miles of road listed as closed in the DEIS were identified as ineffectually closed and reclassified as open. The majority of these road segments are proposed to be opened under the three Action Alternatives in the DEIS. Other authorized road segments that had been omitted inadvertently and were also included.

Existing Condition

A total of 230.4 miles of road, owned and administered by various agencies, organizations, and individuals, are located within Little Boulder Creek-Deerhorn Subwatershed and Vinegar Subwatershed which comprise the project area. Approximately 188 miles of open and closed Forest Service authorized roads located in the two subwatersheds that comprise the project area.

About 34.43 miles of open or closed roads lie in Riparian Habitat Conservation areas (RHCA) associated with PACFISH Category 1, 2 or 4 streams. About 17.59 miles of historically decommissioned road segments lie within RHCAs.

Most of the roads require some maintenance to meet current road maintenance objectives and classification standards. Maintenance is generally scheduled commensurate with funding. With increasing budget constraints, the agency cannot adequately maintain the majority of roads at their designed maintenance level.

The use of fords at Davis Creek and at Dead Cow Gulch and the tendency of nearby native road segments to retain moisture during wet periods or when stream run off is high can limit accessibility. The exposure of rock in the road bed of a segment of the 2614402 road also limits access.

Roads in the vicinity of Little Butte Creek, uphill of the closed 2000020 road ford, are not currently connected to the rest of the road system although they access Management Area 1 and 2, General Forest and Rangeland. Most of these roads are in adequate condition although some shallow rutting is occurring in localized areas.

Some authorized roads, especially those located west of Davis Creek and south of the Middle Fork of the John Day, have developed from user-created roads dating from or shortly after the completion of railroad logging or were built to former road standards that are no longer considered adequate or safe. These roads, in addition to being brushed in, often have tight or poorly banked curves or other alignment concerns that do not allow for the passage of modern log trucks and chip vans.

Two segments of private road are located within the project boundary. No actions are proposed on these segments. These roads are displayed in Table 40 for information but since no activities are proposed for them, they are not included in the alternative tables later in this report.

Table 40. Summary of existing open, closed and decommissioned roads by project area subwatersheds

Road Status	Little Boulder Creek – Deerhorn SWS	Vinegar Subwatershed	Total Roads
Closed	31.20	59.05	**90.25**
Open (High Clearance)	39.31	58.29	**97.6**
Past Decommissioned	8.98	24.98	**33.96**
FS Total			**221.81**
County Road 20	6.71	1.79	**8.50**
Private	0.01	0.12	**0.13**
Total within Project Boundary	**86.2**	**144.2**	**230.4**

Additionally, within the project area there are approximately 59.68 square miles. The existing open road density is 1.8 mi/mi^2, and open and closed road density is 3.3 mi/mi^2 (Table 42).

Direct and Indirect Effects by Alternative

The road activities proposed by alternative are found in Table 41 and are further described under the alternative section of Chapter 2. Appendix B provides a list of each road number with miles for these activities. Under the action alternatives levels of traffic and use would temporarily increase. Some currently closed roads would be temporarily opened for use and closed again as activities are completed.

Table 41. Proposed road activities – new construction, maintenance, reconstruction, haul, and temporary road construction by alternative (miles)

Proposed Road Activity	Alternative 2	Alternative 3	Alternative 4
New Road Construction	12.6	1.1	14.7
Temporary Road Construction	3.1	0	3.1
Road Maintenance	69.7	65.4	69.7
Road Reconstruction	21.4	13.8	26.3
Road Decommissioning	21.9	19.9	21.2
Road Haul in Project Area	104.8	79.7	115.4
Total Road Haul (including roads outside project boundary)	121.2	92.9	131.8
Miles of road relocated from RHCAs	6.2	0	6.2

Due to the design of the road system, product haul and other access needs will utilize roads that cross into nearby subwatersheds. Alternative 2 includes maintenance on 15.2 miles and reconstruction on 1.2 miles of roads outside the project area. Alternative 3 includes maintenance on 14.7 miles and reconstruction on 0.4 miles of roads outside the project area. Alternative 4 includes maintenance on 15.2 miles and reconstruction on 1.2 miles of roads outside the project area.

Within the project area, existing open road densities are 1.8 mi/mi^2 as shown in Table 42. This figure includes 8.5 miles of County Road 20 and 0.13 miles within private lands. Open road densities will decrease within each action alternative to approximately 1.4 mi/mi^2. Open and closed road densities will also be reduced from the existing condition by each action alternative. Total road densities will remain unchanged between the existing condition and alternative 3, and will increase slightly within alternatives 2 and 4. However, this measure includes decommissioned roads which will remove access, restore the hydrologic function, and re-establish vegetation.

Table 42. Road densities within the project area by alternative (miles of road per square mile)

	Open Roads miles^2	Closed Roads miles^2	(Open + Closed Roads) miles^2	(Open + Closed + Decommissioned) miles^2
Alternative 1	1.8	1.5	3.3	3.9
Alternative 2	1.4	1.7	3.1	4.1
Alternative 3	1.4	1.6	3.0	3.9
Alternative 4	1.4	1.8	3.2	4.1

Alternative 1

Road Condition

The agency would continue to complete routine maintenance commensurate with funding. Maintenance to meet current road maintenance objectives and classification standards would occur based on the Forest's road maintenance schedule.

As described under the Existing Condition, failure to maintain roads may lead over time to conditions that may compromise the integrity of the road surface or sub-grade, impede access, or require greater driver awareness for efficient and safe travel.

Access

The existing Forest road system, including open, closed and decommissioned roads (Table 40), would remain and continue to provide access at existing levels to the project area. The distribution of roads between hillslopes and RHCAs would remain the same as under the Existing Condition. Open road densities in the project area would continue to be 1.8 mi/mi^2. Open and closed road densities would remain at 3.3 mi/mi^2.

Alternative 2

Road Condition

The proposed activities which affect road condition are summarized in Table 41 by alternative. Levels of traffic and use would temporarily increase on the roads where maintenance and reconstruction are proposed and on the new construction. Road reconstruction and maintenance would improve overall road conditions during the project activities and for at least five years afterwards.

Under Alternatives 2 and 4 new permanent roads would be constructed allowing low standard roads located in RHCAs and elsewhere to be decommissioned. Some native surface roads currently located in RHCAs and elsewhere would be relocated (new construction) to the uplands to reduce the amount of sediment entering the streams and maintain access. Alternatives 2 and 4 would also construct new permanent roads to areas previously accessed by railroad and horse, including areas where local use converted railroad grades into roads. Additionally, culverts designed to allow fish passage are proposed in Alternatives 2 and 4 to replace the fords across Davis Creek and Dead Cow Gulch.

Road reconstruction and maintenance has been designed to focus on long-term permanent roads to make them safe for administrative and public access. All action alternatives would maintain roads commensurate with actual use, therefore the amount of maintenance actually accomplished would vary depending on existing road conditions, season of use, and other factors. The type of road maintenance activities which may occur on roads used for commercial haul could include:

- Blading and shaping of road surface and ditches
- Removing excess materials from roadway
- Constructing or reshaping of drain dips, grade sags, waterbars, or cross ditches
- Spot rocking road surfaces

Road maintenance activities would sustain the integrity of road beds and provide safe, efficient access. Activities such as blading, cleaning ditches, and brushing out would also correct erosion problems associated with roads used for commercial harvesting, extend the life of drainage features and improve safety and sight distance. Reconstruction of selected road segments is expected to bring low standard roads up to current standards for safety and access by modern vehicles used for commercial activities. Road conditions are expected to be improved while allowing for the temporary increase in use.

Maintenance to meet current road maintenance objectives and classification standards on roads not used for commercial harvesting would occur based on the Forest's road maintenance schedule and conditions on these roads would change over time as described for the No Action Alternative.

Due to the design of the road system, product haul and other access needs would utilize roads that cross into nearby subwatersheds. Alternative 2 includes maintenance and reconstruction on 15.2 and 1.2 miles of road, respectively, outside the project area. Road condition would be improved as described previously for maintenance and reconstruction.

Access

The Forest road system would continue to provide access to the project area although the balance of open, closed and decommissioned roads (Table 43) would shift with an overall decrease in local access although access at the landscape scale would remain about the same.

All new permanent roads would be constructed to allow low standard roads located in RHCAs to be decommissioned and continue to provide access to much of the area, particularly in the area between Dead Cow Gorge and Deerhorn Creek, where access may be slightly improved and made more direct. Access would be shifted to this area from an area higher on Deerhorn Creek as the final segment of the 2614452 road would be decommissioned. Ease of access between Dead Cow Gulch and Davis Creek would be slightly reduced as the new roads do not extend away from Road 2614452 as far as the current system does. Other new permanent roads, including two which are being re-authorized from the current status of decommissioned, would be constructed to areas previously harvested by railroad and horse to provide long term access under permit but would be closed to routine use. Under reconstruction, culverts would be installed on two fords which would extend periods of accessibility.

Nearly nine miles of low standard road in RHCAs would be decommissioned. About one mile of this decommissioning results from the construction of new roads on hillslopes in the area between Davis Creek and Deerhorn Creek. About 0.4 mile of low standard road in Category 1 and 4 RHCAs, along Davis Creek and a tributary, would be decommissioned as a result of building 0.07 mile of new road in the Category 1 RHCA, and additional road on the adjacent hillslope, which would provide replacement access on a higher standard road mostly outside of the RHCA.

Some currently closed roads would be temporarily opened for use and closed again as activities are completed. New temporary roads, authorized under the timber sale contract, would provide access to skyline and tractor landings. Temporary roads would be blocked and made unusable at the end of sale activity and would not be added to the road system as authorized roads.

Table 43. Alternative 2 - Summary of open, closed and decommissioned roads (miles)

Activities Proposed Under Alternative 2	Closed Roads	Open Roads	Decommissioned Roads
Existing Condition[1]	90.25	97.47	34.11
Open Roads to Closed Roads	16.59	(-16.59)	
New Construct Roads - Closed	9.53		(-0.75)
New Construct Roads - Open		3.06	(-0.31)
Closed Roads to Open Roads	(-0.11)	0.11	
Closed Roads to Decommissioned	(-13.08)		13.08
Open Roads to Decommissioned		(-8.83)	8.83
Total in Project Area	**103.18**	**75.22**	**54.96**
Roads Used in Other Subwatersheds	1.61	14.80	

Activities Proposed Under Alternative 2	Closed Roads	Open Roads	Decommissioned Roads
Total for Project	104.79	90.02	54.96

[1]*County Road 20 and Private roads not included in existing open road mileage*

Alternative 3

Road Condition

The proposed activities which affect road condition are summarized in Table 41 by alternative. Discussion of effects on road densities are found in the specialists' effects analyses. Levels of traffic and use would increase on fewer roads and effects on road condition would be similar to those described for Alternative 2 except on fewer roads as show in Table 44.

Reconstruction would not occur on the low standard roads west of Davis Creek and east of Deerhorn Creek. These roads would not be improved to current standards for safety and access by modern vehicles used for commercial (timber) activities. Maintenance to meet current road maintenance objectives and classification standards on roads not used for commercial harvesting would occur based on the Forest's road maintenance schedule and conditions on these roads would change over time as described for the No Action Alternative; under Alternative 3 fewer roads would be brought up to standard during commercial activities. Use of roads in nearby subwatersheds would be the same as described for Alternative 2.

Access

The Forest road system would continue to provide access to the project area which would be intermediate between the current condition and Alternative 2 with a smaller shift in the balance of open, closed and decommissioned roads (Table 44). More local access on lower standard and more seasonally-limited roads would be provided between Davis and Deerhorn creeks. No new permanent roads would be constructed although access to two local areas would be increased by the reauthorization of two currently decommissioned roads. Access to the area immediately east of Deerhorn Creek would be reduced or made less direct by decommissioning the last segment of the 2614452 road without constructing new road. Access generally to the south side of the project area would be continue to be limited in timing since two fords would remain.

Nearly eight miles of low standard road in RHCAs would be decommissioned and access would be redirected to roads on nearby hillslopes. Access to the west side of Davis Creek would continue to be limited by the low standard road (2614402 segment) along one of its tributaries. Under Alternative 3 native surface roads currently located in RHCAs would not be relocated to the uplands and the amount of sediment entering streams would not be reduced. Alternative 3 proposes minimal new permanent road construction in areas where the road was previously decommissioned, so the road bed has already been disturbed.

Some currently closed roads would be temporarily opened for use and closed again as activities are completed. Temporary roads would not be constructed.

Table 44. Alternative 3 - Summary of open, closed and decommissioned roads (miles)

Activities Proposed Under Alternative 3	Closed Roads	Open Roads	Decommissioned Roads
Existing Condition[1]	90.25	97.47	34.11
Open Roads to Closed Roads	14.89	(-14.89)	

Activities Proposed Under Alternative 3	Closed Roads	Open Roads	Decommissioned Roads
New Construct Roads - Closed	0.75		(-0.75)
New Construct Roads - Open		0.31	(-0.31)
Closed Roads to Open Roads	(-0.11)	0.11	
Closed Roads to Decommissioned	(-13.08)		13.08
Open Roads to Decommissioned		(-6.78)	6.78
Total in Project Area	**92.7**	**76.22**	**52.91**
Roads Used in Other Subwatersheds	1.61	14.83	
Total for Project	94.31	91.05	52.91

[1]*County Road 20 and Private roads not included in existing open road mileage*

Alternative 4

Road Condition

The proposed activities which affect road condition are summarized in Table 41 by alternative. Discussion of effects on road densities are found in the specialists' effects analyses. Levels of traffic and use would increase on more roads and effects on road condition would be the same as those described for Alternative 2 except for four locations. Alternative 4 includes the construction of about two additional miles of road off the existing 2614452 road. The effects of this new construction are similar to those described for new construction in Alternative 2 except that one of these roads provides crossings on Deerhorn Creek and one of its tributaries on more roads. Since Alternative 4 extends the 2614452 road, the final segment of the existing road is proposed for closure, not decommissioning. Finally the extension of road 2614452 provides access to the currently isolated, closed roads in the Little Butte Creek drainage where maintenance/reconstruction of some roads is expected to improve condition as previously described.

Maintenance to meet current road maintenance objectives and classification standards on roads not used for commercial harvesting would occur based on the Forest's road maintenance schedule and conditions on these roads would change over time as described for the No Action Alternative. However fewer roads would not be maintained/reconstructed in association with commercial activities. The effects of the use of temporary roads would be the same as those described for Alternative 2.

Access

The Forest road system would continue to provide access to the project area although the balance of open, closed and decommissioned roads (Table 45) would shift with an increase in local access although access at the landscape scale would remain about the same. New permanent roads would be constructed to allow low standard roads located in RHCAs to be decommissioned and continue to provide access to much of the area, particularly in the area between Dead Cow Gorge and Deerhorn Creek, where access may be slightly improved and made more direct. Access would be shifted to this area from an area higher on Deerhorn Creek as the final segment of the 2614452 road would be closed. However providing the culvert crossings at Deerhorn Creek and its tributary would improve access under permit. Ease of access between Dead Cow Gulch and Davis Creek would be slightly reduced as the new roads do not extend away from Road 2614452 as far as the current system does. Other new permanent roads, including two which are being re-authorized from the current status of decommissioned, would be constructed to areas previously harvested by railroad and horse to provide long term access under permit but would be closed to routine

use, including the extension of road 2614452 (which would also affect access to and use of the formerly isolated roads). Under reconstruction, culverts would be installed on two fords which would extend periods of accessibility.

Nearly nine miles of low standard road in RHCAs would be decommissioned. About one mile of this decommissioning results from the construction of new roads on hillslopes in the area between Davis Creek and Deerhorn Creek. About 0.4 mile of low standard road in Category 1 and 4 RHCAs, along Davis Creek and a tributary, would be decommissioned as a result of building 0.07 mile of new road in the Category 1 RHCA (and additional road on the adjacent hillslope) which would provide replacement access on a higher standard road.

Some currently closed roads would be temporarily opened for use and closed again as activities are completed. New temporary roads, authorized under the timber sale contract, would provide access to skyline and tractor landings. Temporary roads would be blocked and made unusable at the end of sale activity and would not be added to the road system as authorized roads

Table 45. Alternative 4 - Summary of open, closed and decommissioned roads (miles)

Activities Proposed Under Alternative 4	Closed Roads	Open Roads	Decommissioned Roads
Existing Condition[1]	90.25	97.47	34.11
Open Roads to Closed Roads	17.3	(-17.3)	
New Construct Roads - Closed	11.57		(-0.75)
New Construct Roads - Open		3.06	(-0.31)
Closed Roads to Open Roads	(-0.11)	0.11	
Closed Roads to Decommissioned	(-13.08)		13.08
Open Roads to Decommissioned		(-8.14)	8.14
Total in Project Area	**105.93**	**75.2**	**54.27**
Roads Used in Other Subwatersheds	1.61	14.82	
Total for Project	107.54	90.02	54.27

[1]*County Road 20 and Private roads not included in existing open road mileage*

Cumulative Effects

Existing conditions of roads reflect the cumulative effects of past and present activities in and around the project area including historical timber harvest where numerous railroad grade and roads were constructed (Table 6). Past road construction was limited prior to 1940, but intensified from then until 1980 to the point where road density exceeded three to four miles per square miles on most of the forest. Many roads built during that period were poorly located requiring frequent maintenance.

Under Alternative 1, since there would be no change in the road system or in scheduled maintenance, cumulative effects related to the road system or to forest access would not occur although the backlog of routine maintenance would continue to accumulate and may result in reduced accessibility as road condition becomes compromised after many decades. The road system would not be expanded by the addition of new authorized roads.

The proposed road closures of these poorly located roads would reduce the cumulative effects related to the maintenance cost for the entire road system. The cumulative effects of these alternatives and road closures that are likely in the future would be a reduction of sedimentation, improved water quality, fewer

roads to maintain, less money spent on maintenance, reduction in access for all motorized vehicles, and less disturbance to wildlife. There would be ongoing and future actions that could affect roads and access. Future timber harvest projects will also conduct a roads analysis to determine road changes needed. These changes would include road closures and decommissioning which would have a beneficial cumulative effect on road densities and impacts to resources.

Overall routine access to this part of the Forest would be slightly decreased by the re-distribution of the road system, the decommissioning and closing of roads, and the closing of new construction although the new construction would also increase access available under permit. The backlog of routine maintenance would continue to accumulate but the magnitude of the backlog would be smaller than under the No Action Alternative.

Under Alternative 3, the amount of roads is less than that discussed for Alternative 2 but the timing restrictions, due to the continued use of low standard roads, would be greater. Under Alternative 4, the overall routine access to this part of the Forest would be slightly decreased by the re-distribution of the road system, the decommissioning and closing of roads, and the closing of new construction although the new construction, especially of the two miles unique to Alternative 4, would also increase access available under permit. The backlog of routine maintenance would continue to accumulate but the magnitude of the backlog would be smaller than under the Alternative 2, but greater than Alternative 4.

Future projects listed in Table 6 will continue to address road density and resource damages caused by roads. It is likely that densities will continue to decrease with future projects, increasing the amount of funding available for maintenance per mile of road across the forest. Travel management will also look at the existing road system and eliminate cross-country travel, limiting the access to closed road systems currently being accessed. Additionally, road densities will likely decrease under that project, reducing roaded access across the forest. However, any future decisions related to road access will be analyzed under that decision, looking at the effects of that proposed action cumulatively with past, present and other reasonably foreseeable future projects.

Recreation

Regulatory Framework

The National Forest System lands encompassed within the Galena Project area have been inventoried using the Recreation Opportunity Spectrum (ROS) system to determine what recreation opportunities and settings are available to visitors. The project area falls within the Roaded Natural, Roaded Modified, Semi-Primitive Motorized and Semi-Primitive Non-Motorized classes of the ROS. Management direction for recreation as outlined in the Forest Plan is to continue to maintain existing settings.

Analysis Methods

The area analyzed for recreation impacts includes the Galena Project area. The Malheur National Forest uses ROS classes to develop management direction for recreation on the forest. This analysis will use the ROS classes assigned during Forest Plan development as the basis of this assessment.

The source of the recreation information is the Forest GIS data base that was compiled from the recreation inventory information and field visits to the project area.

Table 46. ROS classification in the Galena project area

Recreation Opportunity Spectrum	Acres
Roaded Modified	11,181
Roaded Natural	16,693
Semi-Primitive Motorized	7,616
Semi-Primitive Non-Motorized/Semi-Primitive Motorized	1,287

The principal method for analyzing environmental consequences in the Galena Project area is based on the desire or expectation of forest visitors for specific types of experiences and settings. These settings and experience opportunities can be described using the Recreation Opportunity Spectrum (ROS) guidelines. The effects on the recreational resource can be assessed by analyzing the change in the acres of each ROS class that would result under the alternatives. A change in ROS class would reflect a change in the available recreation opportunities.

Under all alternatives, the project area will continue to provide a wide range of recreation opportunities, activities, settings, and experiences; however, the roaded settings clearly dominate. In the short term, all action alternatives generally result in a small increase in roaded settings and no change in the Semi-Primitive Non-Motorized settings. Methods used to evaluate the effects of the alternatives include: changes in the ROS, harvest in currently important recreation places, recreation sites, roadless area, and other activities. A map depicting the ROS for the Galena Project Area is below.

Existing Condition

Recreation Opportunity Spectrum

The project area is managed as Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded Modified, and Roaded Natural. Table 46 displays the existing ROS categories. Recreation opportunities are divided between the motorized (35,490 acres), and non-motorized (1,286 acres) categories.

Currently, the remaining unroaded settings are in the Semi-Primitive Non-Motorized class in summer and Semi-Primitive Motorized class in winter in the Vinegar Hill-Indian Rock Scenic area, and Semi-

Primitive Motorized in the Dixie Butte Roadless Area and Semi-Primitive Non-Motorized in the Greenhorn Roadless Area.

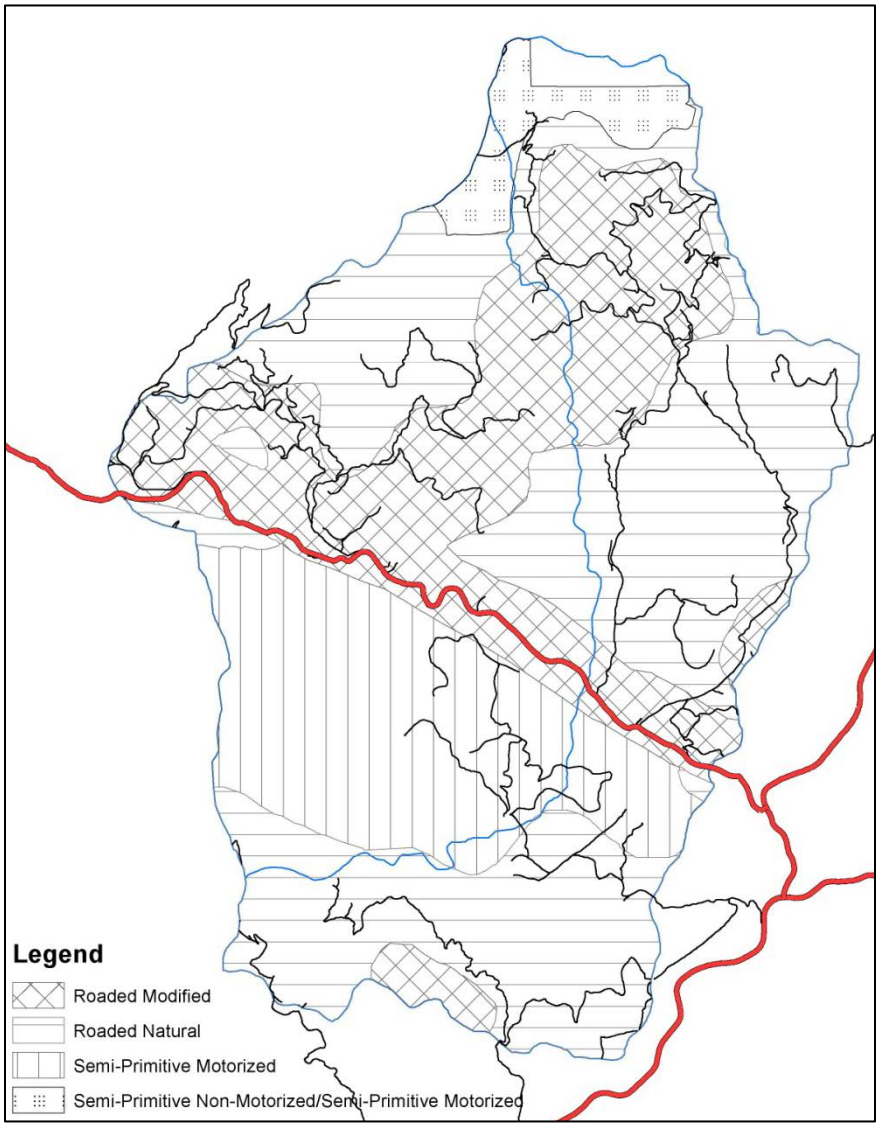

Figure 4. Recreation Opportunity Spectrum across the Galena Project area

Developed Campgrounds

Two developed campgrounds occur within the project area. The Middlefork Campground and the Deerhorn Campground are used consistently throughout the use season, but use is highest during the big game hunting seasons in the fall.

Dispersed Campsites

The majority of dispersed campsites are within riparian areas with little evidence of water quality impacts and concerns. There are approximately 92 dispersed campsites scattered throughout the project area. Usage of these sites varies throughout the year, with the majority of sites showing heaviest use during the fall hunting season. Use of OHVs is often associated with dispersed camping. In dispersed camp sites where there is regular concentrated use, the ground becomes compacted and the vegetation is not as vigorous as non-dispersed use areas.

Hunting and Other Recreation

Currently, the Galena project area contains a wide variety of opportunities for recreational activities. This area plays an important role by providing settings for various types of outdoor recreation, such as hunting, camping, huckleberry and mushroom picking, driving in the woods, hiking and winter activities. Viewing opportunities are abundant at Vinegar Hill-Indian Rock Scenic area. Due to ease of access from U.S. Highway 26 and County Road 20, this area is popular with recreationists where visitors may enjoy the project area year round for outdoor recreational opportunities. County Road 20, Forest Service roads 2010, 2612, 2614 and 2055 provide the main access for roaded and other recreational activities. With the exception of U.S. Highway 26 and County Road 20, the major road corridors are gravel-surfaced, one-lane routes initially developed to provide timber and mineral access. These roads now provide access for recreational activities.

The area is popular during big game bow and rifle seasons in late summer and fall. Due to the longer and earlier season, bow-hunter numbers have increased in recent years and this trend may continue. Table 47 below shows other activities occurring on the Malheur National Forest, but not necessarily within the project area.

Table 47. Activity participation on the Malheur National Forest (FY 2009)

Activity	Percentage of visitors who participated in this activity
Developed Camping	16.2
Primitive Camping	37.8
Viewing Wildlife	39.3
Viewing Natural Features	32.6
Visiting Historic Sites	3.6
Relaxing	38.3
Picnicking	22.3
OHV Use	14.9
Motorized Trail Activity	13.2
Snowmobiling	8.0
Driving for Pleasure	54.5
Fishing	11.0
Hunting	49.7
Gathering Forest Products	6.5
Hiking / Walking	47.3
Horseback Riding	2.5
Bicycling	3.3

Visitors could participate in multiple activities hence total does not equal 100%.

Developed Trails and Trailheads

Snowmobile route #S5401 follows Forest Road 2010 for 7 miles. This segment is part of a larger trail system that attracts touring snowmobilers. Use of this route during the winter recreational season is generally December 15th through April 15th, though timing varies with snow conditions.

The Princess Bike Trail #B5039 follows County Road 20 for 9 miles and Forest Road 2010 for 12 miles. This is a shared route with snowmobile trail #S5401. The Princess Bike Trail #B5039 is in fair to good condition with minor maintenance needs. This trail follows along a ridge with good vistas. Tread is native surface with subalpine fir and an abundance of wildflowers in the summer. The portion of trails that follows roads will have little maintenance needs other than posting signs.

The Davis Creek Bike Trail #B5040 is a shared route with hikers, horses, OHVs and bicycles and follows County Road 20 for 9 miles to Forest Road 2050, on Forest Road 791 for 0.6 miles to Davis Creek Trail #244. These trails have low use during the spring, summer, and fall seasons.

The Davis Creek trail #244 is 11.8 miles long, and a ROS class of Roaded Modified. This is a General Purpose trail, designated foot, horse, bicycle, and 2-wheeled motorbike use. The Davis Creek Trail is designated for motorized use. However, it was originally constructed to accommodate two-wheeled traffic (motorcycle). Due to the extensive popularity of four-wheelers, the demands of this trail have expanded to include wider-based motorized vehicles or OHVs. A portion of trail goes through Semi-Primitive Motorized and Roaded Natural ROS classes and another portion of trail is within the Dixie Butte Roadless area. This trail is popular for OHV riding, horseback riding and hiking.

The Blackeye trail #243 is 2.4 miles long with 2 miles within the project boundary. This is a designated foot, horse and bicycle trail with undeveloped snowmobile use in the winter. The route lies in the Vinegar Hill-Indian Rock Scenic area. The west end trailhead is outside of the project area. Access on east end is from Forest Road 2010219, approximately ¼ miles to Vinegar Hill-Indian Rock scenic area boundary. This low use trailhead requires high clearance for access. The trailhead area is undeveloped meadow/scab near an old cabin site. The existing trail provides a fairly primitive recreational experience through dense unmanaged stands of mixed conifer forest in an unroaded area. The trail is managed for hiking and horseback riding. Most use occurs during summer months and fall hunting seasons.

Direct and Indirect Effects by Alternative

Alternative 1

Since there are no proposed activities proposed with Alternative 1, the existing recreation opportunities would not change from their existing condition. There would be no change in the recreation opportunity spectrum or impacts to developed or dispersed campsites.

There would be no change in road miles available for public travel. The No Action Alternative would not result in any direct or indirect effects. Hunting, fishing, or other recreational uses of any area will not change because improved roads usually mean better access, which results in an increase of recreational visitors.

It is expected that as human populations increase and as recreational means of transportation advances, there will be an associated increase in need for road-related recreation activities.

The project area would continue to be at risk for high severity fires and bark beetle outbreaks. The occurrence of a high severity fire may reduce the amount of area suitable for recreation activities for several years. Post-fire snags and snags from bark beetles would create visitor hazards and potentially increase management requirements to limit visitor access for several years. Large fires can be distracting or dangerous to Forest visitors and modify the recreation setting. Large fires could damage recreation facilities if prescribed fire is eliminated from the project area.

Alternative 2, 3 & 4

Recreation Opportunity Spectrum

The appearance and recreational experience will change in the short term due to prescribed fire, timber harvest, and other associated activities under Alternatives 2, 3 and 4. While there will be additional seeking experiences currently found in the Semi-Primitive Motorized will either tolerate the change in setting associated experiences, or be displaced to other parts of the forest. Those seeking roaded access and a more modified environment may find more opportunities available to them as harvest activities take place.

The recreation experience in Vinegar Hill-Indian Rock Scenic Area will not be impacted since no management activities would occur. The current ROS classification in this area is Semi-Primitive Non-Motorized and Semi-Primitive Motorized during the winter. It will be managed for Semi-Primitive Non-Motorized guidelines and the ROS boundary will remain the same. The rest of the project area will not be affected from any of the proposed actions from a ROS standpoint.

Developed Campgrounds

Harvest and fuel treatment is proposed south of the Middlefork and Deerhorn Campgrounds. The sights and sounds of equipment and people during the harvest and fuel treatment will affect the recreation experience in Alternative 2, 3, and 4. The segment of County Road 20 that passes the Middlefork and Deerhorn campgrounds will be used to haul 20% of the projected volume and has the most potential for impact on recreationists. Road treatments and aspen treatments associated with each of the action alternatives will not impact developed campgrounds

Dispersed Campsites

Within the project area there are currently 92 known dispersed camp sites in the project area. All action alternatives include proposals to close roads (road 2000131 and road 2010036) which access two existing dispersed campsites. Additionally, one mapped dispersed campsite is located along a road (road 7000024) that will be decommissioned. However, this site is located along a road that is currently closed. These three dispersed campsites will no longer be available for use after road closures and decommissioning occurs (Table 48 and Figure 5). Recreationists utilizing other dispersed campsites might be impacted by thinning, burning and aspen restoration activities overlapping in time. However, these effects will be limited to the duration of activities and will likely not persist after implementation is completed.

Table 48. Dispersed campsites that will be impacted from proposed road closures under each action alternative

Site Number	Road Existing Condition	Road Status Alt 2	Road Status Alt 3	Road Status Alt 4	Site Type	Roads
30	Open	Closed	Closed	Closed	Dispersed Camp Area	2000131
97	Closed	Decom	Decom	Decom	Dispersed Camp Area	7000024
129	Open	Closed	Closed	Closed	Dispersed Camp Area	2010036

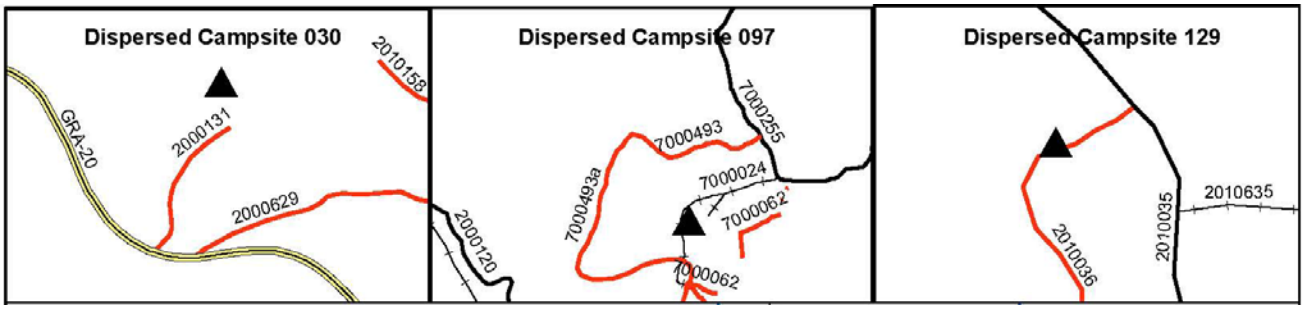

Figure 5. Map of dispersed campsites that will be impacted from the proposed road closures

Hunting, and Other Recreation

The different project activities with the potential to impact recreation are common to all the proposals as described in Alternatives 2, 3, and 4. Each of these Alternatives propose slightly different levels but the effects to the public involved in different recreation activities common to the area are relatively the same.

The short-term effect of harvest activities may displace recreationists, particularly those who cannot tolerate changes to their traditional recreation setting. These changes may include decreased aesthetic appeal near dispersed campsites and displacement of wildlife in traditional hunting areas. Short-term impacts to hunters and other recreationists may also occur by physically closing access to areas during harvest activities and log haul. Harvest and log haul activities would increase sights and noise from equipment and people within the project area, which may adversely affect the tranquility of the recreation experience for some individuals within and outside of the project area. This may include late summer and fall hunting seasons which are a popular recreation use period. Haul routes will be heavily used by logging traffic, creating a higher level of safety concern for the recreating public using roads. Closure of some roads and portions of trails within the project area to public use during logging and hauling activities would improve public safety, but would have a short-term negative effect on recreational access to the area.

Road closures are not expected to greatly impact recreation access. Approximately 21 miles of road are proposed for decommissioning in Alternative 2, 20 miles in Alternative 3 and 21 miles in Alternative 4 of road decommissioned.

Long-term effects will be safe and adequate roaded and trail access for the recreating public, through the cutting of danger trees. The recreating public would benefit from this road work because visitor travel access would improve. As noted through National Visitor Use Monitoring, driving for pleasure is the highest recreation activity on the forest.

Landings, skid trails and stumps from thinning activities would be apparent, fading within a few years as stumps darken and vegetation is established in exposed soil. With improved growth from thinning, the quantity of old forest structures in the project area would increase substantially over the next 10 to 50 years. Visitors would see greater numbers of large diameter trees across the landscape. Open stands of large orange-barked pine trees would become a more dominant part of the landscape. Multi-storied mixed conifer stands would still be part of the mosaic, maintaining landscape diversity.

It is anticipated that Oregon Department of Fish and Wildlife will continue to offer hunting opportunities in this area as part of their management of big game. General bow hunting and controlled rifle hunts will

have similar seasons and numbers of tags. The number of bow hunters has increased in recent years and trend may continue.

There will be little to no effect, adverse or positive, on the existing recreation use patterns, and opportunities by implementation of Alternatives 2, 3 or 4. These alternatives do not change the current condition relative to recreation use patterns.

Developed Trails and Trailheads

Proposed road closure and decommissioning would not affect existing designated snowmobile trail.

If winter logging and plowing of haul Forest road 2010 occur, temporary impacts to snowmobile activities may result. This road is a groomed snowmobile trail which receives moderate use because of the higher elevation and longer snowpack that lasts throughout the season. The use of this haul route would be restricted to “logging use only” during weekdays and potentially closed to all travel on weekends. If winter logging does occur, snow plowing would directly affect approximately 7.8 miles of snowmobile route in Alternatives 2, 3, and 4. This would not only affect the snowmobile use during the period of active hauling but render the trail inaccessible until the route received sufficient snow cover (12 inches or more) to allow over snow travel. The indirect effect would be a reduction in opportunities available for over snow vehicle recreation outside the project area.

Forest Road 2010 is an access road into harvest and fuels treatment units. During harvest activities, log haul may conflict with bike users. The trail receives a low amount of use, thus the potential for conflict is low.

Road closures and/or area closures would be in place during harvest and fuel reduction activities, potentially affecting short-term recreation use of Forest Road 2010.

Each action alternative will close road 2010219, which access Blackeye Trailhead #243. The road to access this trailhead is approximately 0.25 miles long from the intersection of road 2010 and has been relatively inaccessible for several years due to degrading road conditions. While the road to this trailhead will be closed to vehicle traffic, access to the trailhead will still be available to recreationists. Proposals to relocate the Blackeye Trailhead and realignment of the trail along the 2010 road will be analyzed in the future when funding permits.

A segment of hiking/horse/bicycle/OHV trail #244 lies within the project area. This trail has an established trailhead on the east end of the trail. Harvest units and fuel treatment, including prescribed fire is proposed along a segment of Trail #244. This will affect the use of the trail during periods of this activity. Burning is scheduled in the spring and fall which coincides with popular hunting seasons for turkey and big game. This will have a direct effect on access to this area during the hunting season and an indirect effect on the use of the area if habitat is altered.

Trail users will experience a variety of short-term visual impacts along the Davis Creek Trail. Visual impacts will vary according to the level of tree stands adjacent to the trail. Stumps and logging slash will be highly visible in the short-term, but will become less noticeable as under-story vegetation develops.

Cumulative Effects

The area considered for recreation cumulative effects are the Vinegar Creek and Little Boulder Creek-Deerhorn subwatersheds and trails that bisect the project area. All past, ongoing and reasonably foreseeable future activities in Table 6 have been considered for their cumulative effects on recreation.

Alternative 1

Under this alternative, since there will be no direct or indirect effects on recreation, there will be no cumulative effects on the recreation opportunity spectrum, campgrounds, hunting or trailheads.

Alternatives 2, 3, 4

There are varying levels of evidence of past management in the project area, with the overall appearance remaining predominantly natural. The area is still consistent with the Roaded Natural, Roaded Modified, Semi-Primitive Non-Motorized and Semi-Primitive Motorized ROS classes under which the area is to be managed. The proposed action would retain or enhance the existing ROS class for this area. There are no ongoing or reasonably foreseeable future actions that would have a measurable cumulative effect on the ROS classes across the forest.

Since campsites will not be impacted from this project, there is no potential for cumulative effects to developed recreation sites across the forest. Within this project, three dispersed campsites will be impacted by road closures or decommissioning associated with this project. Across the project area there will continue to be 89 dispersed campsites and 1,389 across the forest. Since this represents approximately 0.2% of the dispersed campsites across the forest, it is not anticipated that there will be cumulative effects to dispersed campsites. Displaced recreationists will have ample opportunities to utilize other dispersed and developed sites across the project area, the district and the forest.

It is expected that there may be greater opportunity for road closure breaching and motorized off-road cross country travel to occur where harvest opens up timber stands. This may create greater conflicts with non-motorized recreation. However, the Malheur National Forest is currently in the process of analyzing changes in travel management. It is foreseeable that motorized off-highway cross country travel would be prohibited across 1,337,770 acres on the Forest where it is not already prohibited, with the exception of motorized off-highway cross country travel from designated open routes for the sole purpose of dispersed camping when resource damage caused by motor vehicle use can be avoided. The distance that motorized off-highway cross country travel would be allowed from open routes to existing dispersed camp sites would vary by alternative considered in the travel management analysis. Existing dispersed sites in a riparian area would also have a setback distance from the stream where motorized access would be restricted. Off Highway Vehicle (OHV) opportunities would be reduced by some road closures and the motorized off-highway cross-country restriction imposed by the Forest Travel Management Plan.

Air Quality

Regulatory Framework

The Malheur National Forest fire management plan, (USDA 2007) defines how the fire management program is implemented on the forest and is based on achieving resource objectives defined in the Forest Plan standards and guides. The standards in this plan are intended to supplement, and in some cases take the place of, national and regional policies, standards, and guidelines found in Forest Service manuals and handbooks and the Pacific Northwest Regional Guide. Air quality standards require that impacts be minimized, especially in Class 1 airsheds and smoke sensitive areas. Mitigation measures should be used when appropriate burning conducted in accordance with the state Smoke Management Plan (Forest Plan IV-40).

The framework for controlling air pollutants is mandated by the 1970 Clean Air Act (CAA), as amended. The CAA was designed to "protect and enhance" the quality of air resources, and encourage reasonable actions for pollution prevention. State Implementation Plans (SIPs) are developed to implement provisions of the CAA, specifically the National Ambient Air Quality Standards (NAAQS). Section 160 of the CAA requires measures "to preserve, protect, and enhance the air quality in national parks, national wilderness areas… and other areas of special national or regional natural, recreational, scenic, or historic value." Stringent requirements are established for areas designated as Class 1 airsheds, which include wilderness areas over 5,000 acres in existence before August 1977. Designation as a Class I area allows only very small increments of new pollution above existing levels.

The Regional Haze Rule (40 CFR 51.308-309) requires states to establish goals for improving visibility in Class 1 airsheds and to develop long-term strategies for reducing emissions of air pollutants that cause visibility impairment. The Regional Haze Rule requires smoke management programs to address visibility impairment in mandatory Class 1 airsheds due to emissions from prescribed fire activities. The State has designated all Class 1 airsheds sensitive to smoke during the visibility protection period, which is defined as July 1 to September 15, during which restrictions on burning apply for purposes of visibility protection.

Prescribed burning in Oregon is managed by the Oregon Department of Forestry (ODF) under the Oregon Smoke Management Plan (OSMP). The OSMP is intended to minimize smoke impacts by conducting forest burning under weather conditions that disperse smoke and direct smoke away from populated areas. Burning on National Forest system lands only occurs with prior approval granted by ODF.

Analysis Methods

To assess smoke management, differences in smoke emissions were compared by alternative. The Clean Air Act sets air quality standards for particulate matter (PM) for particles less than 10 microns in diameter (PM10) and less than 2.5 microns in diameter (PM2.5). Amounts of estimated PM10 and PM2.5 emissions were calculated using the Consume software and the Fastrax reporting system. State smoke forecasts which predict wind direction and smoke mixing height, would be obtained prior to all burning to ensure smoke intrusions would not occur in the local smoke sensitive receptor areas.

Existing Condition

The Strawberry Mountain Wilderness is a Class 1 airshed located around 18 miles to the southwest of the project area. Additionally, the North Fork John Day wilderness located on the Umatilla National Forest is directly north of the project area. State of Oregon monitoring has not shown degraded visibility and protection periods from burning have not been set for Class 1 airsheds in Eastern Oregon. The towns of John Day, Burns, and Baker City, 20-90 miles away from the project area, are listed in the OSMP as smoke sensitive receptor areas, and thus protected by the highest standard in the plan.

Prevailing winds in the area are from the west and southwest. During the day, diurnal heating forces air up-valley and up-slope, out of the area. During the night, air follows drainages towards nearby small communities of Austin, Bates, and Galena (15 miles away). Inversions affecting air quality occur mostly during winter months, but can develop in the morning hours and dissipate by noon.

Air quality current conditions in surrounding sensitive areas is limited to short-term impacts resulting from wood burning, prescribed burning, and field burning. The greatest impact to the wilderness area is from field burning in the Willamette Valley and Central Oregon and from summer wildfires that occur to the south and west. These sources contribute to haze and can last for several days in spring and summer.

Direct and Indirect Effects by Alternative

Alternative 1

Under the no action alternative with no prescribed burning or pile burning, the least impact on air quality would occur. Fuels would remain and continue to accumulate, increasing the potential for large, severe wildfires. Wildfires would contribute large amounts of smoke during summer months, when diurnal inversions can concentrate smoke at low elevations. Wildfires tend to occur at the driest time of the year, and fuels are more completely consumed producing three to five times more emissions than early or late season prescribed fires. Smoke concentrations have high particulate levels that cause health problems, and violate summertime Class 1 air quality visibility standards. The communities of Prairie City, Unity, John Day, Bates, Austin, Galena and possibly LaGrande and Baker City would be impacted by smoke from a wildfire in this area.

Alternative 2, 3, 4

Burning would follow the guidance provided by the Oregon Smoke Management Plan. Under all action alternatives, approximately 100-140 pounds per acre of PM2.5 emissions and 120-180 pounds per acre of PM10 emissions would be produced from prescribed burning of around 19,913 acres. Approximately 21-42 pounds per acre of PM 2.5 emissions and 24-46 pounds per acre of PM 10 emissions would be produced from pile burning all slash from thinning activities. Emissions from a wildfire are generally 3-5 times more than from prescribed burning. Emissions from pile burning would be during a different time of year than the underburning. The prescribed burning would be limited to less than 5,000 acres per year. There would be short-term impacts to communities and residences down wind and in drainages adjacent to prescribed fire. There would also be short term impacts along Highway 26 and Highway 7. All prescribed burning would comply with applicable federal, state and local air quality regulations.

Alternative 3 would produce less smoke from pile burning than Alternative 2, as fewer acres would be thinned. Alternative 4 would produce more smoke from pile burning than Alternative 2 or Alternative 3 as more acres would be thinned. The low elevation communities of Austin and Bates would be impacted by smoke from prescribed burning. Past experience of prescribed burning in this area has shown that diurnal winds settle smoke in low areas and valley bottoms. During night, air follows drainages in the valley towards Galena. During the day, diurnal heating forces air up the valley and up the slope out of the valley toward Bates and Austin.

Prescribed burning would likely impact highway visibility and potentially impact driver safety. Signing would reduce the risk lasting for around 3 to 4 days. If driving conditions warrant, ODOT would be contacted to flag traffic or use pilot car drivers.

Smoke sensitive areas, the La Grande Basin (approximately 45 air miles to the northeast of the project area) and the north half of Ada County, Idaho (approximately 150 air miles southeast of the project area) may be affected by prescribed burning because of transport winds but it is expected to be minimal because of smoke dilution over time and space. The Strawberry Mountain Wilderness would not be

affected by prescribed burning during the visibility protection periods of July 1 to September 1 because burning would not occur during this time period.

Cumulative Effects

Emissions produced from burning under all action alternatives would maintain air quality standards. There is a potential for prescribed burning to occur at the same time from nearby timber projects in various units, such as Crawford, Balance, and plantation thinning. Total emissions produced from concurrent projects from National Forest System lands would meet air quality standards. It is likely that only one or two projects, in isolated areas, would undergo burning at the same time. The dilution of smoke over time and space from concurrent burning would limit the cumulative effects. All burning will be coordinated to reduce cumulative effects and meet all applicable laws and regulations. Therefore, the cumulative effects of multiple prescribed burning projects would not cause air quality to decline outside of standards.

Rangeland

Regulatory Framework

The authority to protect, manage, and administer the National Forest System, and other lands under Forest Service administration for range management purposes, is found in the following two acts:

- Multiple Use Sustained Yield Act, 1960 established the policy and purpose of national forests to provide for multiple use and sustained yield of products and services.
- Forest and Range Renewable Resources Planning Act, 1974 established public land policy and guidelines for management, protection, development, and enhancement of public lands.

The Forest Plan, as amended, provides general direction, objectives, and goals for the management of forest resources including (Forest Plan IV-2):

- Provide a sustained production of palatable forage for grazing by livestock and dependent wildlife species. (Goal 20)
- Manage rangelands to meet the needs of other resources and uses at a level which is responsive to site specific objectives. (Goal 21)
- Permit livestock use on suitable range when the permittee manages livestock using prescribed practices. (Goal 22)

The Malheur National Forest Post Fire Grazing Interim Guidelines (2007) is an interim guide providing direction that establishes minimum timeframes an area would be rested from grazing following a wildfire or prescribed fire.

Analysis Methods

Rangeland conditions and possible effects of the project were analyzed using a variety of informational sources to determine the expected effects to forage production if the proposed alternative was implemented. Both positive and negative effects from this proposed project have been examined; including short and long term costs and benefits, additional management demands, displacement of livestock, forage increases/decreases and improved conditions for herd management along with rangeland improvements and infrastructure.

Existing Condition

Livestock grazing is currently authorized through three Term Grazing Permits on three allotments within the Galena project area. These allotments are: Dixie, Upper Middle Fork, and Lower Middle Fork. The Sullens allotment is a vacant allotment, livestock are not authorized to graze the allotment at this time.

The Galena project area lies almost entirely within the Upper Middle Fork allotment. The Upper Middle Fork allotment consists of 9 pastures. The Shop, River and Tailings pastures are small, riparian pastures designed to enhance and protect riparian habitat along the Middle Fork John Day River (MFJDR). These pastures are only used to facilitate the turn-out and turn-off of cattle on the allotment. The remaining pastures; Caribou, Blackeye, Upper Vinegar, Lower Vinegar, and Austin are located north of County Road 20 and the MFJD River; Ragged, Butte Creek, and Deerhorn are located south of County Road 20 and the MFJDR. The Blackeye and Ragged pastures were established as range research pastures and have since been absorbed, respectively, into the Caribou and Butte Creek pastures. On average 485 cattle are authorized to graze the allotment from June 1 through October 15. Grazing on the allotment is managed through a deferred-rest rotation system with no single pasture being grazed at the same time in consecutive years.

The project area also includes the Lower Middle Fork, Sullens, and Dixie allotments. Each of these allotments contain less than 1% of the project area within their boundaries, therefore the effects to rangeland conditions were not analyzed and will not be discussed further on these allotments.

Table 49. Allotments in the Galena Project area

Allotment / Pasture Name	Acreage	Allotment Acres within Project Area	Percentage Within Project Area
Upper Middle Fork Allotment			
Caribou/Blackeye	10,263	8,660	84%
Upper Vinegar	5,543	5,496	99%
Lower Vinegar	7,000	6,469	92%
Austin	4,483	1,006	22%
Deerhorn	13,871	11,916	86%
Butte/Ragged	13,334	1,830	14%
Shop/Tailing/River	315	307	98%
Total	*54,809*	*35,684*	*65%*
Lower Middle Fork Allotment			
Total	*59,120*	*33*	*0.06%*
Dixie Allotment			
Total	*26,874*	*74*	*0.28%*
Sullens Allotment			
Total	*46,426*	*306*	*0.66%*
Snow Creek Allotment			
Total	*17,436*	*50*	*0.29%*

These Allotments are primarily defined by three distinct ecosystem types: North facing slopes are characterized by steeper terrain and densely timbered mixed conifer stands with elk sedge/pine grass understory, riparian systems are often without a sedge/rush and shrub component. The south facing slopes are characterized by a grassland type ecosystem that contains moderate amounts of Idaho fescue and bluebunch wheatgrass with a Ponderosa Pine/Douglas Fir overstory. Drainage bottoms are characterized by meadow types, primarily dominated by Kentucky bluegrass and meadow foxtail. Riparian systems are composed of sedges and rushes with an Alder dominant canopy.

Prior to European-American settlement of the area, fire played a dominant role in shaping the landscape. Current policies of fire suppression have significantly altered the ecosystem. Areas of open ponderosa pine stands have been converted to dense, overstocked, dead and dying stands of diseased forest which provide little in the way of forage for grazing animals. Conifers have encroached upon areas that were once open meadows and dry rangeland. Densely stocked forest stands have succumbed to insects and disease, and reduced vigor because of overcrowding. Where significant tree mortality has occurred, fallen

trees restrict movement of livestock, thereby further limiting the amount of forage available for domestic livestock.

Understory vegetation in cold forest has probably changed the least of any forest type, since management was initiated. Because of dense canopy cover, understory species tend to be sparsely represented and tolerant of shade. Riparian shrubs are few, except where disturbance has created gaps.

Moist forests support a more varied and abundant understory that increases wherever light becomes more available. Elk sedge and pinegrass are widespread, along with a number of forbs. Bunchgrasses and upland shrubs are noticeably sparse, but increase with the availability of light.

Dry forests have generally sustained more alteration to the understory due to a combination of past management practices, the loss of regular fires, and current populations of wild and domestic ungulates, and therefore is the most changed from its historical condition. Native understory grasses and forbs in dry forest environments are adapted to short fire return intervals, and common species such as Idaho fescue, bluebunch wheatgrass, blue wildrye, tailcup lupine, and heartleaf arnica are stimulated by low intensity burns, especially where adequate light is available. Canopy gaps and a mosaic pattern of forest openings enhance opportunities for the growth of such species. The alteration of natural fire regimes has resulted in uncharacteristically dense shade from the overstory in areas heavily stocked with climax tree species, with a resulting decrease in grass cover and forage availability.

Native grass and forb species are still predominant in the dry forest, but in areas have been mixed with non-native species (intermediate wheatgrass and Kentucky bluegrass) introduced to stabilize soils along roads, skid trails, and landing sites, while enhancing domestic livestock forage. Some of these same disturbed locations now host populations of invasive plants.

Forage species response time is often very rapid to change, such as green up the year following a fire. Because of this we generally think of short-term effects as under five years and long-term effects as over five years.

Direct and Indirect Effects by Alternative

Alternative 1

There are no planned projects associated with the No Action Alternative. Therefore there would be no direct effects to existing forage resource or permitted grazing activities from this alternative. Forage use by livestock in uplands and riparian areas would continue at their present level.

No action within the project area would leave the range vegetation in its present condition of slowly improving from historic grazing, however still below historic conditions. Primary rangeland would continue to decrease as conifer encroachment and dense shading reduced groundcover. Over time, under current Forest Plan grazing standards, a slow upward trend in the range condition would continue.

However, under this alternative the existing forage base would continue to decline in vigor and abundance as tree canopy cover increases and becomes closed. Tight canopies reduce available sunlight on the forest floor, increase the duff layer, and reduce soil moisture and nutrients. Carrying capacity would decline as grasses, forbs, and shrubs are crowded out by shade-tolerant species, resulting in a reduction of available forage. If more suitable rangeland is not created by future management projects or natural disturbance, the number of livestock permitted to graze on this watershed may need to be decreased in the future to avoid unacceptable environmental damage.

With Alternative 1, structural rangeland improvements and ecological plots will not be at risk of damage or destruction by management activities and there would be no closure or decommissioning of roads. The current road access to spring developments, salt grounds and fence lines would remain. In the long term, as forest health declines, the abundance of downed logs is likely to present more physical difficulties to livestock grazing operations and decrease access to available forage.

No additional ground disturbance will occur, so grasses and grass-likes are not as likely to be disturbed by noxious weeds. Aspen stands will continue to degrade, as livestock and wildlife grazing will retard new growth. Declining resource conditions and increased canopy cover would also favor larger high-intensity wildfires in the long term. With more intense fire regimes, less palatable and/or non-native invasive species will increase. Invasive plants readily establish in high intensity burns and can prevent re-establishment of native forage.

Alternative 2, 3, 4

Alternatives 2, 3 and 4 will decrease canopy cover through timber harvest and prescribed fire, which is expected to increase the quantity and quality of rangeland vegetation. Table 50 displays the estimated number of acres within the allotment where forage would be improved through vegetative treatments and prescribed burning for each action alternative. Therefore each of these alternatives can be expected to decrease the impacts of cattle grazing on riparian zones by providing cattle more suitable rangeland to use. Any road building outside of riparian areas may also tend to reduce the amount of time livestock spend in riparian areas by providing better access to suitable rangeland away from streams.

Silvicultural Treatments

The primary effect of forest stand treatments and associated road construction on Range vegetation resources is the removal and the disturbance of herbaceous cover. This affects the diversity of the herbaceous layer and the quantity and quality of available forage and depends on the location, stand prescription, fuels prescription, and current condition of the herbaceous vegetation in the proposed units.

Commercial harvesting and precommercial thinning treatments would increase available forage for livestock. The amount of forage increase varies between alternatives depending on the acres treated and type treatment, the more a treatment reduces tree canopy cover the more availability of sun and nutrients to forage species. Thus, a shelterwood treatment opens a stand more than a commercial thinning treatment and both of these treatments opens the stand more than a precommercial treatment.

Table 50. Comparison of effects by alternatives to forage resources

Alternatives	Harvest Acres	Prescribed Burn Acres	Estimated Forage Improvement Acres (After 5 Years)
2	8,339	19,913	7,642
3	6,752	19,913	7,324
4	9,778	19,913	7,930

This vegetation is available until the tree canopy closes again and shades out the lower growing vegetation. In the short-term, harvest units would provide transitory range. Transitory range should provide more forage than occurred before the timber harvest or with the no action alternative; however, livestock grazing capacities are not based on transitory range.

Densely shaded stands opened up by thinning or harvest cuts would allow forage production to increase, especially that of pinegrass, elk sedge and dry site bunchgrasses (Idaho fescue, bluebunch wheatgrass). Forage production would begin to improve rapidly with the reduction of competition for light, and higher yields may continue for a decade or more depending on light conditions in this range environment. An increase in forage production should improve livestock distribution over the pastures. It may also reduce pressure on riparian zones. Livestock management/herding would be improved with more open vegetation since livestock movement is less restricted and livestock are more visible.

Removal and thinning of trees will produce slash that will impede livestock movement and inhibit growth of ground vegetation. Following the treatment slash through piling and burning (usually within 5 years after harvesting), the overall ground vegetation should increase in stands that have been thinned. Livestock movement will improve with these treatments.

Generally, the units in need of silvicultural treatments receive limited use by livestock. After treatment these units are more apt to attract livestock as the forage and access is increased; however, the distance of the unit to water sources will dictate the amount of usage. Because of the large size of the grazing pastures in the planning area, the staggered and varied treatments of this transitory range will not have a measurable influence of the carrying capacity of the range. Timber harvest units which open up previously inaccessible areas will provide livestock with attractive places to graze and can reduce the reliance on adjacent riparian zones for forage.

Forest stand treatments have an indirect effect of promoting better livestock distribution due to improved quality of forage. Indirect effects related to management of grazing permits include loss of control if gates are left open or fences are logged over. This in turn causes loss of control of livestock and resultant loss of effective management of the rangeland vegetation.

Aspen Treatments

The aspen enhancement will take approximately 35 acres out of livestock grazing by fencing out the stands, many which are in primary range. This is acceptable due to the overall benefits to the clones and the removal of grazing from key areas within the RHCA's. Fencing aspen stands to protect them from grazing would reduce the amount of available forage on the allotment and may remove livestock water sources important for proper distribution.

Prescribed Burning

The vegetation of the Blue Mountains is highly adapted to periodic fire in forest, shrublands, and grassland ecosystems. Fire was once an integral function of the majority of ecosystems in northeast Oregon. A rest period from grazing after prescribed fire is not anticipated in areas that support an understory dominated by rhizomatous grass & sedge, such as pinegrass and elk sedge, which are fire resistant and recovery very quickly after fire. Generally in these plant communities, pinegrass and elk sedge increase with disturbance. Prescribed fire in these plant communities promotes pinegrass, ponderosa pine regeneration and dry site bunchgrasses. Within the grassland and/or bunchgrass dominated understory plant communities prescribed fire helps provide vitality, stimulates grass vigor, promotes bunchgrasses and controls stocking. Overall prescribed fire activities are beneficial to the rangeland resource.

Generally spring burns have the fewest undesirable effects to forage species, perhaps due to higher soil moistures. However bluebunch wheatgrass has a higher mortality if spring burned, over fall burning. In the elk sedge/pinegrass communities, low to moderate severity fire may result in rapid rhizome extension and greater palatability.

Burning impacts on plant species in this project will vary in response to a variety of conditions such as the weather, season of burning, plant morphology, current plant condition and vigor, accumulated litter, soil moisture and ultimately the fire intensity. Fire intensity is probably the most influencing factor that may affect individual plants and forage production. The wide variation in burning intensity across treatment units (unburned to light to moderate) will create wide variability in results and recovery. Low intensity fires will have low plant mortality and stimulate plant vigor. Plants with increased vigor produce more leaf matter and set more seed resulting in an increase in forage production. Increased plant mortality is expected with heavier fuel loading. In these areas re-seeding with native plant seed mixes will be necessary.

Low intensity burn is expected where fuel loads are mostly herbaceous, and there is very little woody material, less than 1 ton per acre as in open grassland with only light shrub cover. When prescriptions call for broadcast burning of scattered fuels, the burning impacts will be wide spread over the unit, with severe burning intensity creating cover voids but with surviving plants interspersed throughout the unit. Bunched slash and piles burned at landings mean certain death of all understory species, re-seeding is appropriate.

Long-term impacts of prescribed burning are anticipated to be positive in terms of moving treatment units towards the HRV and improving both watershed values and production of rangeland resources. Burning effects include the release of nutrients which have been tied up in the system so that there is a stimulant (fertilizer affect) on the understory. Recovery of vigor and production in the herbaceous species is quickest for pinegrass and elk sedge, and with low intensity fires, dry site bluebunch wheatgrass and Idaho fescue should be stimulated by the defoliation. However, maintenance of historical conditions over the long term will require more follow-up treatment so that shrub recovery may not reach pretreatment levels or dominate understories. Historical conditions on these sites probably did not have heavy shrub cover in many places since fire return intervals thinned the shrub cover repeatedly.

Prescribed fire has an indirect effect of promoting better livestock distribution due to improved quality of forage. Indirect effects related to management of grazing permits include loss of control if gates are left open or fences are burned up. This in turn causes loss of control of livestock, and resultant loss of effective management of the rangeland vegetation.

Burned areas may need to be rested from livestock grazing. All burning will be coordinated with the district range specialist in order to limit economic impacts on the grazing permittee.

Roads

Road closures would not have a significant adverse effect on riparian or upland range forage availability. However, road closures would affect livestock management in the long term as snags fall across roads which currently provide open and unobstructed livestock driveways. Approved grass seed mixes should be applied to decommissioned roads to establish native plant species which would prevent and reduce erosion and establishment of invasive plants. New road construction will offer travel ways to livestock, increasing distribution through the allotment.

Closing and decommission roads that are currently used as livestock driveways will slow herding and pasture moves resulting in trailing and increase the time spent in grazing units.

Cumulative Effects

The reasonable and foreseeable future activities in the project area include motorized and non-motorized recreation, road construction and maintenance, and resource enhancement projects.

Alternative 1, No Action, will not move the project area towards a healthier, resilient, diverse and sustainable ecosystem. Under the No Action Alternative resources within the analysis area will continue to degrade. Forage production will decline, thereby reducing the quantity of primary and secondary rangeland.

If no action is taken forage quality and production will continue to decline, reducing the quantity of primary, secondary and suitable rangeland over time. There would be a decreased likelihood that the area could be managed in the long term toward open forest conditions, consistent with the historical range of variability. Less forage availability in the upland area would increase use by ungulates (both domestic and wildlife) in more open riparian areas.

Alternative 2, 3, and 4 will move the project area towards a healthier, resilient, diverse and sustainable ecosystem. The earliest management activities had the most profound effect on current conditions; many streams within the planning area were affected by grazing. Logging and road building provided livestock

increased access to riparian areas and changed the forested area composition to favor less fire resistant species. Fires suppression has maintained this composition. Actions taking place within the watershed today include: recreation (hiking, camping, horseback riding, off-road vehicle use, fishing, and hunting), prescribed burning, commercial thinning, grazing and associated range improvements and road maintenance and construction. Past actions in or near the project area include timber management, fuel management, fire suppression, grazing, recreation, firewood cutting, big-game management, and road and facilities construction and maintenance. All activities have influenced the current forest composition and structure, and the management infrastructure of the area. Thus, these activities are still reflected, with individual variance, in the current condition of the area's natural resources and human environmental values

Large areas treated with fuel reduction treatments will offer greater safety against the potential for severe wildfires in the future, which would eliminate large areas available to grazing for periods up to 5 years.

The watershed has been actively managed for timber production in the past. Early mining and related activities that have severely altered the riparian areas and portions of the uplands have in most part provided improved access for livestock. A result of this improved access was to increase the level of use on riparian areas by livestock.

Invasive Plants

Regulatory Framework

Forest-wide standards are to implement a weed control program to confine present infestations and prevent establishment of noxious weeds in new areas. The forest strives to implement the Pacific Northwest (PNW) Regional Strategy for Noxious Weeds and Non-native Invasive Plant Management that is tiered to the National Forest Service Strategic Plan. The forest conduct annual noxious weed surveys. Noxious weed control measures on the forest presently consist of mechanical and hand pulling of weeds in affected areas.

This document is tiered to the PNW Region Final Environmental Impact Statement for the Invasive Plant Program (R6 2005 FEIS). The record of decision amended the Forest Plan by adding management direction relative to invasive plants. The Galena project would comply with the new management direction. This project would also be in compliance with the record of decision for managing competing and unwanted vegetation (1988 ROD) and the 1989 mediated agreement. This project is in compliance with the Federal Noxious Weed Act, as amended.

Analysis Methods

The district range specialist used several methods to determine the existing condition of invasive weeds and to determine the expected effects of each alternative. The state of Oregon weed list and the Grant County weed list were reviewed to identify known weeds of concern in the general area. A Geographic Information System map was reviewed showing the existing known weed infestations in the project area. The data on this map came from surveys on the forest recently performed by the Nature Conservancy and older surveys done by the Forest Service. The range specialist also performed ongoing visual monitoring of the project area to identify expansions of known sites and look for introduction of new species. All documented weed sites from these surveys are recorded in a National database, Natural Resources Information System (NRIS). The database includes individual site records indicating the location, size of infestation, plant numbers and density, type of past treatment implemented, recommended follow-up treatments and effectiveness.

Existing Condition

Invasive plants include both noxious weeds and invasive exotic weeds. The Galena project area has some invasive plants due to past disturbances such as logging operations in the past 50 years. In areas where landings were used, there is residual woody material where some noxious weeds have moved into. Species include spotted knapweed (*Centaurea Sp.*) and Canada thistle (*Cirsium arvense*) comprising around five percent of the project area. Most infestations are less than one acre in size. There are also isolated instances of invasive plants including hounds-tongue (*Cynoglossum officinale*) along roads within the project area. Weeds along roads only comprise around one percent of the project area at this time. There are some annual invasive plants such as venata grass found in a few places in the project area. The forest continually identifies new noxious weed infestations and reports occurrences for inclusion into the NRIS database.

Direct and Indirect Effects by Alternative

The main concern related to invasive plants is the spread of existing plants and the introduction of new species. Weeds are spread in many ways, including activities from timber harvesting, prescribed burning, and road use. The analysis scale for invasive plants and possible impacts of proposed activities on the spread of weeds is within the project area.

Alternative 1

Under this alternative, there would be no change to the existing rate of spread, nor a change in the introduction of new species. Minor changes in spread would occur where invasive plants are found along roads. Monitoring and control measures for noxious weeds conducted by the forest would continue.

Alternative 2, 3, 4

Under all action alternatives, there would be a spread of invasive plants directly related to the amounts of disturbance from the proposed activities. Road use and construction of new roads would increase the potential area for non-native and noxious establishment of weeds and the potential for introducing new species. Within harvest unit areas, disturbance by tractor yarding would encourage the spread of invasive plants. Mobilizing equipment would have the potential to introduce and transport noxious weeds. Prescribed burning would increase traffic on roads within the project area during burning operations, which could spread weeds. The results of 19,913 acres of prescribed burning on the vegetation, however, would have positive impacts by increasing the vigor of native species and removing old duff, discouraging invasive plant growth. However, design measures are in place related to invasive plant impacts to reduce the potential spread of non-native and noxious species to a minimum. It is anticipated that the extent of invasive species in the project area will not increase at a measurable scale after implementation is completed.

Cumulative Effects

The existing condition of invasive plants as described above reflects cumulative effects of past and present activities. Past and present activities which resulted in the presence of invasive weeds include historical and recent timber harvest, associated road construction, and historical livestock grazing (Table 6).

Of the reasonable foreseeable actions listed under the Cumulative Effects section of this chapter, there are foreseeable activities that would cumulatively have a positive impact on reducing the rate of spreading weeds. The upcoming weeds EIS would positively impact the rate of spread in the project area by proposing to treat areas with invasive plant infestations. Future treatment of infestation would cumulatively result in fewer invasive plants allowing for an increase in the growth of native grasses.

Any nearby timber harvest activities could cumulatively increase the rate of spread due to increased harvest and road activity; however, impacts would be minimized through design measures. Continued livestock grazing could have a cumulative impact on the spread of invasive weeds.

Economics

Although individuals and communities over a wide geographic area use national forest resources, the residents and businesses of counties near the forest depend most heavily on the availability of the resources. Consequently, the effects of forest management on social and economic factors are strongest within these areas. For this reason, the Malheur National Forest primary zone of influence is defined as Grant and Harney counties in Oregon.

Regulatory Framework

The Forest Plan management goals related to economics are to:

- Provide a sustained flow of timber for lumber, fiber, or associated wood products at a level that will contribute to economic stability, while providing for regional and national forest management. (Forest Plan p. IV-2, Goal 24)
- Provide and utilize wood fiber in the form of saw timber, fiber, or associated wood products, while minimizing losses and maximizing outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards. (Forest Plan p. IV-2, Goal 25)
- Provide an economic return to the public. (Forest Plan p. IV-2, Goal 26)
- Contribute to the social and economic health of communities, which are significantly affected by national forest management. (Forest Plan p. IV-3, Goal 42)

Minimum specific management requirements are identified in 36 CFR 219.27, to accomplish goals and objectives for the National Forest System. Forest Service policy sets a minimum level of financial analysis for project planning (FSH 1909.17). NEPA requires integrated use of the natural and social sciences in all planning and decision-making that affects the human environment. The human environment includes the natural and physical environment, and the relationship of people to the environment (40 CFR 1508.14).

NEPA (40CFR 1502.23) addresses non-commodity values, stating:

> *For the purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis, and should not be, when there are qualitative considerations.*

Analysis Methods

The social and economic effects of the proposed management alternative were assessed in terms of viability of harvestable timber, employment supported and income provided. The following sections describe each of these criteria in detail.

Viability of Harvest

Although the Galena project has both a commercial and non-commercial component, harvest viability is only relevant to the commercial component. Therefore, viability of harvest was only analyzed for those units that had a commercial component.

The computer program, TEA_ECON, was used to estimate the sale revenues based upon the estimated tentative advertised bid rates per hundred cubic feet ($/ccf) for the commercial acres of the action alternatives. These bid rates indicated the economic viability of harvesting timber. The estimates of these bid rates were based on the most current estimates of the following at the time of analysis:

- Estimated volume per acre – estimated from local knowledge of stands. All volume is in hundreds of cubic feet (ccf). An average commercial unit volume was estimated at 7 ccf per acre.

- Species Composition – estimated at 70 percent ponderosa pine, and 30 percent Douglas-fir and other species for the sale as a whole. Estimated Volumes of Sawtimber are shown in Table 51.
- TEA_ECON – an economic analysis tool that allows the user to perform timber sale accounting at the planning or sale layout level. The program uses price and cost data and the quarterly updated regional record of timber sale transactions to generate gross timber values, estimated advertised rates, and cash flow estimates.

Table 51. Commercial acreage and volume estimates

	No Action	Alternative 2	Alternative 3	Alternative 4
Commercial Unit Area (Acres)	0	6,813	3,971	8,386
Ponderosa Pine Sawtimber (ccf)	0	31,357	18,257	40,543
Other Sawtimber (ccf)	0	13,440	7,825	17,376
Total Sawtimber (ccf)	0	44,797	26,082	57,919

Table 52. Assumed costs of commercial sale

Cost Center ($/CCF)	Alternative 2	Alternative 3	Alternative 4	Year
Sale Preparation	16.67	16.67	16.67	0
Sale Administration	10.87	10.87	10.87	1-2
Stump to Truck	100.89	102.17	133.11	1-2
Log Haul	24.13	24.13	24.13	1-2
Road Maintenance	1.12	1.92	0.86	1-2
Road Construction/Reconstruction	8.59	8.89	7.45	1-2
Brush Disposal and Erosion Control	0.55	0.55	0.55	1-2

Preliminary Value of Timber Removed based on a weighted average for all sales actually sold within Appraisal Zone 3 (primarily Blue Mountain forests) within the last 12 months from date of analysis.

Costs — logging systems, log haul, road maintenance, contractual, brush disposal, erosion control, and other development. These costs were discounted to present net values at a rate of 4 percent

An initial tentative advertised sawtimber bid rate was determined by subtracting the costs associated with logging from the base period prices adjusted for the quality of the material and current market conditions. This rate was reduced by 10 percent per current appraisal methods (Transaction Evidence Appraisal) to account for competition between bidders. It is important to note that advertised bid rates have fluctuated over the last few years reflecting the volatility of the timber market. Prices would likely change in the when the actual sale appraisal occurs, depending on market conditions at that time. Therefore, these estimates should only be considered rough approximations of future conditions. As a result, calculated bid rates were rounded to the nearest dollar. Timber sale revenues were also discounted to present values at a rate of 4 percent.

Base Period Price: The volume-weighted average bid price of competitively sold timber sales in the previous 4 quarters. This value is updated quarterly.

Employment and Income

Employment and income effects from the commercial units were derived from multipliers obtained from the IMPLAN (Impact Analysis for Planning) model, and from the forest-level Timber Sale Program Information Reporting System (TSPIRS) analysis in fiscal years 1996 to 1998 (USDA 1998, USDA 2000). Analysis of employment (jobs) and income assumed that all harvesting would occur over the next one to two years. Two years was used for this analysis. Employment coefficients were 0.0029 direct jobs per ccf and 0.0018 indirect jobs per ccf. The direct income coefficient was $83.84 per ccf and the indirect and induced income coefficient was $54.12 per ccf.

Job estimates were based on the assumption of a direct relationship between changes in harvest volumes and manufactured output. In other words, a percentage change in harvest volume would result in an equal percentage change in manufactured output and employment. The model assumed that the price of timber is constant in response to changes in the supply of timber; the mills would not adjust their use of the factors of production (labor and equipment) to increase efficiency as a response to changes in the price or supply of timber; and the mills would not change their output per timber input in response to changes in timber supplies or changes to their mix of labor and equipment. Job estimates included temporary, permanent full-time, and part-time employment. Employment effects from recreation and domestic-livestock grazing activities were not analyzed because only minor or no changes were expected in the level of use for these activities. The estimates provided by this analysis also did not include unpaid family workers or sole proprietors. Estimates apply to communities and counties in the regional impact zone and not necessarily to any one county.

Levels of harvest volume by alternative would affect employment and income in several ways:

- Directly - (employment associated with harvesting, logging, mills and processing plants for sawtimber, pulp, chips, veneer and plywood)
- Indirectly - (industries that supply materials, equipment, and services to these businesses)
- Induced - (personal spending by the business owners, employees, and related industries)

Several factors would influence the ability of any one county or community to experience the largest extent of the harvest-related employment and income effects. The financial viability of the timber sale proposals would influence whether potential purchasers closest to the project area could compete with other purchasers to acquire the majority of the supply. Changes to bid rates would likely occur during appraisal, depending on actual market conditions at that time. Employment projections would depend on other factors such as market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

There are no IMPLAN employment multipliers for non-commercial thinning projects, so direct and indirect employment from the thinning of the non-commercial units could not be estimated. However, the cost paid for this work was assumed to go directly into the local economy as direct income. Indirect income was estimated as being in the same proportion to direct income as in a commercial timber sale.

Economic Efficiency

Economic efficiency is a term used to describe how well inputs are used to achieve outputs when all inputs (activities) and all outputs (including market and non-market) are identified and valued. All costs and all benefits to society are included; amounts of each output are not pre-established but are produced in amounts that maximize net public benefits" (FSH 1909.17, §11.1).

Due to unavailable information, the non-wood outputs from this project could not be valued. Therefore, the economic efficiency of this project was measured by cost effectiveness, as recommended by FSH 1909.17. Cost effectiveness analyses attempt to determine the least costly alternative to produce the desired result. The objective of the cost effectiveness analysis was to show a relative measure of difference between alternatives. Where harvest viability was analyzed for only the commercial units, cost effectiveness was analyzed for all units, together. The analysis focused on identifiable and quantifiable ecosystem benefits and costs for each alternative in terms of the present net value to assess which alternative came nearest to achieving the purpose and need over the largest land area at the least cost. All dollar values were discounted in terms of the present net value (2010 dollars). The real (exclusive of inflation) discount rate used was 4 percent.

The measurement of economic efficiency differs from the measurement of harvest viability in that economic efficiency attempts to put values on the full range of inputs and outputs (both market and non-market) associated with the project, while harvest viability is more an accounting procedure that only considers the costs and revenues of the project as expressed in timber markets.

Table 53. Employment and income by alternative

	No Action	Alternative 2	Alternative 3	Alternative 4
Timber Volume (ccf)	0	44797	26082	57919
Employment				
Direct (Jobs)	0	130	76	168
Indirect (Jobs)	0	81	47	104
Total (Jobs)	0	211	123	272
Income				
Direct ($)	0	$3,755,780	$2,186,715	$4,855,929
Indirect & Induced ($)	0	$2,424,414	$1,411,558	$3,134,576
Total ($)	0	$6,180,194	$3,598,273	$7,990,505

Employment coefficients are 0.0029 direct jobs and 0.0018 indirect jobs per ccf. The direct income coefficient is $83.84 direct and $54.12 indirect and induced income per CCF. Employment Coefficients for non-commercial thinning projects are unavailable.

In this project, cost effectiveness was measured in terms of present net value (PNV) per acre or:

PNV/acre = Present Net Costs/acre – Present Net Revenues/acre

Measurable costs and benefits on commercial units were based on costs and revenue from timber volume proposed for harvest and described under the assumptions for harvest viability.

Existing Condition

Viability of Harvest

The viability of harvest is dependent upon the market prices for raw wood fiber and the costs of harvest that are identified in the economics specialist report in the Galena project record. Market prices are determined by the supply and demand relationships that exist for wood fiber on a global scale.

Local sawmills that could bid on the sawtimber from this project are located in La Grande, Pilot Rock, Prairie City, and John Day. In addition to local sawmills, one large logging contractor usually bids on local timber sales, and if successful, could sell the sawtimber to the same local sawmills.

Employment and Income

Agriculture, manufacturing (particularly wood products), and food processing are important sources of employment and income in this region. Reliance on timber and forage from federal lands is moderate to high in several counties in the impact zone (Haynes et al. 1997). Many communities in the impact zone are closely tied to the forest in both work activities and recreation. Cattle production and forest products provide the core employment for Grant and Harney counties. Forest products industries include 2 major lumber mills and numerous logging companies. Wood products employment totaled 230 direct jobs (such as mill workers and loggers) and 51 indirect jobs, approximately five percent of the total non-farm employment in Grant and Harney counties (average annual in 2010). Local government, retail trade, and services employ the most people in Grant and Harney counties, (Oregon Employment Department 2010). The area surrounding the project area is rural, and has a disproportionately high unemployment compared with the Oregon state average and the National average.

Economic Efficiency

Volumes, costs, and revenues from the commercial units were analyzed for cost effectiveness. The derivation of the commercial unit data is described in the Harvest Viability section of this report.

Direct and Indirect Effects by Alternative

Levels of harvest volume by alternative would affect employment and income in several ways:

- Directly - employment associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood,
- Indirectly - industries that supply materials, equipment, and services to these businesses, and
- Induced - personal spending by the business owners, employees, and related industries.

Alternative 1

Viability of Harvest

The No Action alternative would not harvest timber, so would not affect harvest viability.

Employment and Income

This alternative would not harvest timber and therefore, would not support direct, indirect, and induced employment, or increased income to local economies. Declining trends in timber harvesting from National Forest lands would continue in the future and contribute to declines in wood products employment over the next two decades. Changes in the economic base and wood products infrastructure for the impact area would also continue to be influenced by fluctuations in market prices, international market conditions, changes in technology, and industry restructuring.

Economic Efficiency

The public would incur no costs, nor realize any benefits of timber harvest in this area. No Action would yield a present net value of 0 due to the data limitations (described in the “Methodology and Assumptions” section of the specialist report in the Galena Project Record) for quantifying economic benefits and costs beyond those identified at the project level. This value ignores the risks to forest health, vigor, and fire resistance that would increase without implementation of this project, and the resulting losses in timber values and non-market benefits. Data limitations do not allow for the quantification of

this risk, however, this risk would likely reduce the present net value. Ongoing costs associated with management of the area, including the continuation of economic losses in stand values from recurring forest health problems, would continue.

Alternative 2, 3, 4

Viability of Harvest

The TEA_ECON program was run for harvest viability. The results of each program run, and the effects of all alternatives on harvest viability, are shown in Table 54.

Table 54. Estimated average bid prices and net present value for commercial units ($/ccf)

	No Action	Alternative 2	Alternative 3	Alternative 4
Average Bid Price ($/ccf)[1]	0	24.74	22.37	1.60
Discounted Sale Revenues ($)	0	971,186	511,367	81,207
Discounted Sale Costs ($)	0	1,191,529	693,740	1,540,554
Present Net Sale Value ($)	0	-220,343	-182,373	-1,459,346

[1]*The average bid price is rounded to the nearest dollar. Logging systems and related costs have a major impact on bid price. Alternative 4 has helicopter logging with the associated costs which is reflected in the bid price.*

Commercial harvests show positive bid rates. This indicates each alternative would produce a viable harvest. When the costs of the commercial component are considered, each commercial harvest would be considered “below cost. This condition is reflected in the negative net sale proceeds for each alternative. Although the sale would be below cost, the sale would still be viable and legally allowed to take place according to Forest Service policy.

As shown in Table 54 Alternative 2 would produce the highest amount of revenue, estimated at $971,186. Its costs would also be $1,191,529. This would produce an estimated present net value of $-220,343 for the commercial component. Alternative 3 would produce revenue, estimated at $511,367. Its costs would also be $693,740. This would produce an estimated present net value of $-182,373 for the commercial component. Alternative 4 would produce the lowest amount of revenue, estimated at $81,207. Its costs would also be $1,540,554. This would produce an estimated present net value of $-1,459,346 for the commercial component.

Employment and Income

In general, the primary effect on timber harvest-related employment would occur from commercial harvesting associated with Alternatives 2, 3, and 4 over the next two years. Financially viable sales would be necessary to provide opportunities for timber harvest-related employment. Based upon the harvest data and the IMPLAN multipliers provided, small increases in employment would be expected (Table 53).

Contracts for the noncommercial areas and activities will also provide jobs through contracting; this is not estimated in the employment estimates in Table 53.

The distribution of economic impacts would depend on the location of the timber purchaser awarded the contracts at the time of the sale, the availability of equipment and skills in the impact area, and the location and availability of the wood processing facilities and related infrastructure. Processors outside of Northeast Oregon could also potentially bid on the sales and distribute the jobs and income effect to other counties in the Blue Mountains or outside of the area entirely.

As Table 53 shows, Alternative 2 would generate $6,180,194 in direct, indirect, and induced local income and support approximately 211 jobs over the 2-year period, and contribute approximately 91 percent toward the 2010 annual average of 230 jobs of timber-related employment. Alternative 3 would generate $3,598,273 in direct, indirect, and induced local income and support approximately 123 jobs over the 2-year period, and contribute approximately 53 percent toward the 2010 annual average of 230 jobs of timber-related employment. Alternative 4 would generate $7,990,505 in direct, indirect, and induced local income and support approximately 272 jobs over the 2-year period, and contribute approximately 118 percent toward the 2010 annual average of 230 jobs of timber-related employment.

Economic Efficiency

Market benefits that could occur as a result of the proposed activities include increases in forest productivity and value for the remaining trees by eliminating competitive stress and reducing the risk of growth-limiting insect attack.

Table 55. Estimated net present value

	No Action	Alternative 2	Alternative 3	Alternative 4
Commercial Harvest (Acres)	0	6,813	3,971	8,405
Commercial Units	0	164	114	201
Average Bid Price ($/ccf)	0	24.74	22.37	1.60
Discounted Revenues	$0	971,186	511,367	81,207
Discounted Costs	$0	1,191,529	693,740	1,540,554
Present Net Value	$0	-220,343	-182,373	-1,459,346
Present Net Value per Acre	$0	-32.00	-46.00	-174

Externalized costs such as those resulting from damage to soils, losses in wildlife habitat, and mobilized sediment in local streams are not well defined or measurable at the project level in terms that provide comparison of assigned dollar values

Table 55 shows that Alternative 2 would have a present net value of $-220,343 and would have a net value per acre $-32.00. Alternative 3 would treat the least amount of acres have a present net value of $-693,740 and would have a net value per acre of $-46.00. Alternative 4 would treat the most acres and has a present net value of $-1,459,346 and would have a net value per acre of $-174.

This economic analysis assessed the alternatives in terms of harvest viability, local employment and income, and economic efficiency as measured by cost effectiveness. Table 56 summarizes the results of the analysis.

Table 56. Summary of economic measurement Criteria estimates for all alternatives

	No Action	Alternative 2	Alternative 3	Alternative 4
Area Treated (Acres)	0	6813	3971	8386
Commercial Volume (ccf)	0	44,797	26,082	57,919
Commercial Bid Rates ($/ccf)	0	$24.74	$22.37	$1.60
Local Employment (jobs)	0	211	123	272
Local Income	0	$6,180,194	$3,598,273	$7,990,505

	No Action	Alternative 2	Alternative 3	Alternative 4
Discounted Revenue	0	$971,186	$511,367	$81,207
Discounted Costs	0	$1,191,529	$693,740	$1,540,554
Present Net Value	0	$-220,343	$-182,373	$-1,459,346
Present Net Value per Acre	0	$-32.00	$-46.00	$-174.00

Cumulative Effects

Viability of Harvest

Estimates for tentative advertised sawtimber bid rates for the proposed action are within the range of rates experienced by the three Blue Mountain forests (Malheur, Umatilla, and Wallowa-Whitman) within the last two years (Musgrove, 2004). Because of the competitiveness of the market, and its global nature, the no action alternative or Alternatives 2, 3 and 4 would not affect prices, costs, or harvest viability of other present or future timber sales in the economic impact zone. There are also residual effects from past timber sales within the subwatershed which would not have a detrimental effect on the viability of harvest of the action alternatives.

Employment and Income

The Malheur National Forest Land and Resource Management Plan (Forest Plan) established an allowable sale quantity (ASQ) for the forest of 38.4 million cubic feet or 211 million board feet (MMBF) average per year. An ASQ is an upper limit for the plan period, not proposals for sale offerings or an assigned target. Actual sale levels, depend on factors such as limitations of modeling, changes in law and regulations, changes in budgets, and site-specific conditions. The Regional Foresters Eastside Forest Plans Amendment 2 (1995) and PAC FISH and INFISH in 1995 are Forest Plan amendments that were developed in response to some of these changing factors. A combination of the factors listed above has resulted in a trend of overall decline in the Malheur National Forest's annual offering of timber volume since the 1990 Forest Plan went in to effect.

The selection of the no action alternative has the potential to continue the decline of timber-related employment in the rural communities of Grant and Harney Counties. Continued declining trends in timber harvesting from the National Forest System (NFS) lands would potentially continue to impact wood products employment and associated indirect employment. Cumulative loss in timber-related jobs could affect the remaining infrastructure and capacity of the local rural communities, and could disrupt the dependent local goods and services industries.

The proposed action alternatives would provide some potential short-term economic relief by utilizing commercially thinned saw logs. This material would potentially be used to support the two saw mills in the John Day/Prairie City area. The amount of local economic relief would be determined by whether the purchaser is local or distant, what mills(s) local or distant actually received the logs, and the price for the lumber. These cumulative economic effects could cause beneficial "quality of life" social effects, especially when combined with other ongoing Forest Service Timber sales within Grant and Harney Counties that are providing employment and income. There are foreseeable projects in the two counties in various stages of planning that potentially may add to the Forest's annual timber offerings for 2012 or 2013. For example, the Soda Bear, and Starr projects on the Blue Mountain Ranger District, and the Dairy, and Jane projects on the Emigrant Creek Ranger District, and the Elk 16 project on the Prairie City Ranger District. These ongoing and foreseeable projects are expected to add cumulatively to the employment and income of Grant and Harney counties within the life of the Galena project.

Economic Efficiency

The economic efficiency of other past, ongoing, or foreseeable future activities would not affect, and not be affected by any effects not already described since the effects are independent from project to project.

Inventoried Roadless Areas, Areas Analyzed for Potential Wilderness

Regulatory Framework

This section of the EIS discloses the affected environment and environmental consequences for Dixie Butte and Greenhorn inventoried roadless areas (IRAs), Dixie Butte and Greenhorn potential wilderness areas (PWAs), and other remaining undeveloped lands. These three resource topics (IRA, PWA, other undeveloped lands) are grouped and discussed together because they share a set of terminology and interrelated history.

During public involvement for this project, and in past similar projects, a wide range of terms have been used by respondents, the courts, and the Forest Service when referring to these topics such as roadless, inventoried roadless area, unroaded, un-inventoried roadless, potential wilderness area, undeveloped lands, and roadless expanse.

From the mid-1970s through 2001 the Forest Service maintained a roadless area inventory of undeveloped lands that we used and updated for the Roadless Area Review and Evaluations (RARE and RARE II), and in support of Land and Resource Management Planning completed in 1990. All during that time we called these polygons ‘roadless areas’ or 'inventoried roadless areas' (IRA). With completion of the Roadless Area Conservation Rule (RACR) in 2001 these lands ceased being just an inventory, and IRAs became more of a designation, with fixed boundaries and prohibitions set by Forest Service regulation (36 CFR 294). Confusion ensued because two Forest Service maps used the same name; IRA. One map had fixed boundaries set by the RACR and another map had changeable boundaries based on inventory criteria.

To address this situation, the Forest Service created a new term for their inventory of undeveloped lands called 'potential wilderness areas' (PWA) to make a clear distinction between the IRA term used by the 2001 RACR. This terminology addition was made policy by changing the 2006 handbook for wilderness evaluation (FSH 1909.12 Chapter 70) and is also reflected in the 2008 Forest Service NEPA regulations (36 CFR 220). In the regulations, potential effects to ‘inventoried roadless areas’ and ‘potential wilderness areas’ are factors in determining whether a CE, EA or EIS is the appropriate NEPA document for a particular project. The term ‘other undeveloped lands’ is presented and used in this document to provide a consideration for the balance of those remaining lands that did not meet the inventory criteria for potential wilderness, were not designated an IRA under the RACR, and do not contain roads and evidence of timber harvest (see definitions below).

In the early 2000s Oregon Wild, a local interest group, conducted their own inventory across Oregon, including the Malheur National Forest, using inventory criteria they developed for their purposes. The Sierra Club, a national interest group, has recently produced an inventory using inventory criteria they developed for their purposes. Polygons on both maps are referred to as ‘inventoried roadless areas’ or ‘roadless areas’ or ‘unroaded’, or ‘un-inventoried roadless areas.’ Confusion ensued again on this issue because there are conflicts between the Forest Service maps and maps presented by two interested groups. Each map appears to be based on different definitions and inventory criteria.

The terms and definitions as stated below will be used in this site-specific analysis. The four resource topics are based on current law, regulation, agency policy, and the Malheur Land and Resource Management Plan, as amended.

> **Wilderness:** Federal land retaining its primeval character and influence without permanent improvements or human habitation as defined under the 1964 Wilderness Act. It is protected and managed so as to preserve its natural conditions which (1) generally appear to have been affected primarily by forces of nature with the imprint human

actively substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and confined type of recreation; (3) has at least 5,000 acres or is of sufficient size to make practical its preservation, enjoyment, and use in an unimpaired condition, and (4) may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest (Malheur Forest Plan, page GL-45).

Inventoried Roadless Areas (IRA): These areas were identified in the 2001 Roadless Area Conservation Rule (RACR) in a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation Final Environmental Impact Statement, Volume 2, dated November 2000, which are held at the National headquarters office of the Forest Service, or any subsequent update or revision of those maps (36 CFR 294.11). These areas were set aside through administrative rulemaking and have provisions, within the context of multiple use management, for the protection of inventoried roadless areas. Most IRA boundaries are substantially identical to those identified as 'Roadless Areas', referred to in the 1982 planning rule (36 CFR 219.17) and identified by the Forest Plan, FEIS, Appendix C; however some localized, minor differences in boundaries may exist.

All roadless area acres were allocated to various management area strategies as disclosed in the Malheur Forest Plan FEIS, Appendix C and described in the Record of Decision (page 14-17) for the FEIS. Some management area strategies were intended to retain the undeveloped roadless character of the roadless area and some management area strategies were intended to develop the lands with timber harvest and road building activities; thus forgoing roadless character.

Potential Wilderness Areas (PWA): Areas of potential wilderness identified using inventory procedures found in Forest Service Handbook (FSH) 1909.12, Chapter 71 are called potential wilderness areas. The inventory is conducted by the Forest Service with the purpose of identifying potential wilderness areas in the National Forest System. The National Forest System Land and Resource Management Planning Rule (currently the 1982 Rule, 36 CFR §219.17) directs that roadless areas be evaluated and considered for wilderness recommendation during the forest planning process.

Potential wilderness areas (PWAs) are not a land designation decision, they do not imply or impart any particular level of management direction or protection, they are not an evaluation of potential wilderness (Chapter 72), and lastly they are not preliminary administrative recommendations for wilderness designation (Chapter 73). The inventory of PWAs does not change the administrative boundary of any inventoried roadless area (IRA). Forest Plan management allocations for these unroaded areas do not change because of their analysis for potential wilderness. These management area allocations are classified as non-wilderness and focus on big game habitat and timber production.

Typically, PWAs substantially overlap, and/or are contiguous with inventoried roadless areas. PWAs may also be contiguous with designated wilderness. PWAs overlap inventoried roadless areas only where those acres of land are consistent with the inventory criteria (FSH 1909.12 Chapter 71) and may extend beyond IRA and wilderness boundaries consistent with inventory criteria.

Other undeveloped lands: These acres of land have either no history of harvest activity or the impacts from harvest are no longer visible, do not contain forest roads, do not contain power line right-of-ways, are not on ground disturbed from mining activity in the past 50 years, and are not designated as a wilderness area or area analyzed for potential wilderness.

Analysis Methods

Oregon Wild, Sierra Club and the Blue Mountain Biodiversity Project submitted scoping comments about the roadless issue to the Galena project. These groups asked the Forest Service to consider the impacts to roadless characteristics in the project area. The comments describe the areas using many different terms including, but not limited to, inventoried roadless areas, proposed wilderness, roadless, unroaded, contiguous unroaded, contiguous roadless extent, roadless expanse, and un-inventoried roadless.

This EIS discloses impacts to a number of resources sensitive to the construction of new forest roads or from our system of existing roads. A road is defined and criteria and methods for inventorying a road conform to agency policy. Definitions and inventory criteria do not change project to project, Forest to Forest; they are common agency-wide. It would not be reasonable for a single individual or group to assert their own definition of a road or how to inventory a road system and then ask the Forest Service to disclose the impacts of 'their road system' on resources present such as elk habitat, fish habitat, or potential wilderness areas. Further, it is unreasonable to consider one version of inventoried forest roads to analyze impacts to elk and fish habitat and then apply a second version of roads in another analysis (PWA, undeveloped lands) within the same EIS. Inventories of resources and facilities in support of the Galena project have been predicated on agency policy and procedures. The situations described above confound our ability to conduct a clear and meaningful effects analysis for the 'roadless' issue in the Galena project area.

To resolve this confusion the Forest Service uses its discretion to rely on agency policy, agency definitions of terms, and agency procedures for the inventory of resources and facilities. Inventory criteria and procedures for potential wilderness areas are found in Forest Service Handbook 1909.12, Chapter 71. This analysis identifies an areas potential to be analyzed at a forest plan level for potential wilderness, and does not evaluate an areas wilderness potential.

The effects to areas identified for potential wilderness and other undeveloped lands were based on maps and polygons created using agency inventory procedures. The descriptions of environmental consequences disclosed in Chapter 3 of the EIS for IRA/PWAs and other undeveloped lands applies across the project area and connected areas along the project perimeter.

An outcome of the analysis for areas of potential wilderness was the identification of isolated polygons of other undeveloped lands. These polygons did not meet inventory criteria as areas of potential wilderness and they are not inventoried roadless areas or a designated wilderness area. Each individual polygon of isolated land has no history of harvest activity, effects of past harvest are no longer visible, do not contain power line right-of-ways, does not have ground disturbance from mining activity in the past 50 years and does not contain forest roads. They are polygons of varying acreages all less than 5,000 acres within the project planning area.

Existing Condition

Dixie Butte and Greenhorn

The Dixie Butte and Greenhorn roadless areas are identified and mapped in Appendix C of the Forest Plan and are also identified in the set of maps for inventoried roadless areas (IRAs) in the Forest Service Roadless Area Conservation FEIS, Volume 2, dated November 2000. There are no meaningful differences between the boundaries of the Dixie Butte and Greenhorn roadless areas identified in Appendix C of the Forest Plan and the 2001 Dixie Butte and Greenhorn IRA boundaries; therefore, impacts to these two topics will be discussed together.

Overall resource management addressed by the Forest Plan is comprised of management goals, objectives, Forest-wide standards and goals (Forest Plan IV-1 to IV-45), and management area allocations

(Forest Plan IV-46 to IV-139). The roadless area issue is primarily addressed in the Forest Plan through management area allocations (Forest Plan ROD p. 16 and Forest Plan III-14).

The scale of analysis is the Galena project planning area, and the Dixie Butte and Greenhorn areas of potential wilderness (which include the Dixie Butte and Greenhorn IRA's).

Indicators of comparison between alternatives for PWAs/IRAs are the values and features that often characterize inventoried roadless areas (36 CFR 294):

- High quality or undisturbed soil, water, and air
- Sources of public drinking water
- Diversity of plant and animal communities
- Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land
- Primitive, semi-primitive, non-motorized and semi-primitive motorized classes of dispersed recreation
- Reference landscapes
- Natural appearing landscapes with high scenic quality natural integrity and apparent naturalness, solitude and remoteness, and
- Traditional cultural properties and sacred sites and
- Other locally identified unique characteristics or special features
- Change in acres of IRAs
- Change in inventoried acres of PWAs. Degree of change and impact to a future evaluation of potential additions to the National Wilderness Preservation System in Land Management Planning.

There are no lands designated in the project area as wilderness, wilderness study areas, or national recreation areas, therefore there would be no impacts to any congressionally designated areas. There are portions of two inventoried roadless areas (IRA) within the project boundary: Dixie Butte and Greenhorn Mountain. These areas were identified in the Forest Plan, Appendix C as roadless areas (since changed terminology to IRAs) and were also included in the Forest Service Roadless Area Conservation Rule (RACR).

The Dixie Butte IRA is 12,000 acres in size and there is around 5,300 acres within the project boundary. The Greenhorn Mountain IRA is 16,000 acres in size and there is around 3,100 acres within the project boundary. Within both the IRAs there are no proposed timber harvest activities, mechanical fuel treatments or road construction.

There are two areas of potential wilderness identified in this analysis, one area associated with the Dixie Butte IRA and the other associated with the Greenhorn IRA as displayed on Table 58 and Map 18 in Appendix C. The areas of potential wilderness associated with the Dixie Butte IRA include approximately 8,613 acres with about 5,514 acres within the Galena project boundary and 3,094 acres outside the project boundary. The areas of potential wilderness associated with the Greenhorn IRA include approximately 23,907 acres with about 3,183 acres within the Galena project boundary and 20,541 acres outside the project boundary (Table 58).

Lands with values and features that often characterize inventoried roadless areas are increasingly important within developed landscapes in order to provide clean drinking water and function as biological strongholds for populations of threatened and endangered species. They provide areas that are important

for biological diversity, dispersed outdoor recreation, and also serve as bulwarks against the spread of non-native invasive species and provide reference areas for study and research (36 CFR 294, page 3245).

Within PWAs human influences have had less impact on the natural appearance or long-term ecological process compared to managed lands. The current condition of soil, water quality, air quality; plant and animal communities; habitat for threatened, endangered, and sensitive species; noxious weeds, recreation; and cultural resources within the IRA/PWA/Other Undeveloped Lands are described elsewhere in Chapter 3 of this EIS. Opportunities for primitive recreation are limited to hiking, mostly cross-country, and hunting.

Livestock grazing has occurred within most areas for at least the past 100 years, fire suppression activity for approximately that same length of time, and also dispersed recreation, including hunting and camping. Past railroad logging and mining throughout the area has altered the landscape from undisturbed forested ecosystem to a landscape of varying degrees of man's influence and remnant structures and ground disturbance. Light Detection and Ranging (LIDAR) imagery shows extensive ground disturbance from these two activities in the PWAs and surrounding areas. Railroad grades are still visible on the ground through LIDAR in IRAs, PWAs and other undeveloped lands. It is likely that many of the areas indicated as undeveloped saw timber harvest between 1910 and 1920 and are not completely without human influences.

Ongoing firewood gathering and removal of danger trees along forest roads that border areas of potential wilderness changes the vegetation, leaves stumps, and presents a managed appearance within a developed transportation corridor. Over the past several decades, fire exclusion has altered natural ecological processes. Suppression of fire in these areas has helped create the stand composition and structure that is now present. In the dry upland forest, stands once dominated by open park-like stands of ponderosa pine have closed in with shade tolerant species such as Douglas-fir and grand fir. The amount of this situation across this landscape is uncharacteristic and un-natural.

Table 57. Galena Project planning area management inventory for PWAs

Land Area	Acres
Total acres inventoried within project planning area	37,200
Total acres of lands within the project planning area with evidence of:	
Past harvest	5,461
Mining	1,200
Forest roads (Including areas within 300 feet of a forest road)	14,205
Total Acres with evidence of management (overlapping in several instances)	**20,866**
Total Acres with evidence of management (any evidence of management activities)	**18,538**

Table 58. Dixie Butte PWA & Greenhorn PWA within project planning area

Dixie Butte PWA within project planning area	
Dixie Butte PWA that overlaps with the Dixie Butte IRA[1]	4,523
Dixie Butte PWA that extends outside and contiguous to the Dixie Butte IRA and is within the project boundary	991
Total Acres	**5,514**

Greenhorn PWA within project planning area	
Greenhorn PWA that overlaps with the Greenhorn IRA[1]	2,400
Greenhorn PWA that extends outside and contiguous to the Greenhorn IRA and is within the project boundary	783
Total Acres	**3,183**

[1] *Approximately 827 acres of the Dixie Butte IRA and 751 acres of the Greenhorn IRA within the project area did not meet inventory criteria as a PWA because these acres had substantially recognizable tree stumps, contained active mining claims, contained forest roads, were within 300 feet of a forest road, or were segmented and isolated by a forest road or mining claim.*

Motorized ATV use on designated trails and motorized use on existing forest service system roads surround both PWAs and are apparent. Opportunities for a feeling of solitude, the spirit of adventure and awareness, serenity, and self-reliance are limited by the size and shape of the PWA. Nearby, non-conforming sights and sounds of roads and activities may be heard and seen from within both the Dixie Butte and Greenhorn PWAs.

Outdoor education or specialized scientific studies were identified as possible opportunities within the two PWAs. No other special features or unique qualities (geological, air quality, wildlife, T&E habitat, biological, ecological, cultural, or scientific) were identified as specific to the inventory of PWA within the project area (EIS, Chapter 3 and Project File).

Direct and Indirect Effects by Alternative

There are two proposed activities under all action alternatives that would occur within the IRAs/PWAs, prescribed burning and aspen treatments. Under each action alternative there is around 20,000 acres of proposed prescribed burning and around 1,539 acres would be within the Dixie Butte IRA and around 406 acres would occur within the Greenhorn Mountain IRA. Of the areas proposed for aspen restoration, around 4 acres would be in the Dixie Butte IRA and around 2 acres would be in the Greenhorn Mountain IRA (Appendix C, Map 18).

Alternative 1

There would be no direct effects to the Dixie Butte or Greenhorn PWA, because no activities would occur in the project planning area. The affected environment would remain unchanged, except by natural processes and ongoing management activities. Biological and ecosystem functions would continue. The landscape would likely continue developing complex fuel loads. A wildfire may burn more extensively and kill more trees within forest stands which would result in larger acreages of blackened landscapes compared to prescribed fires. Some forest visitors may avoid blackened landscapes until green vegetation returns after 3 to 5 years. Fire is a natural occurrence and expected disturbance process in this landscape.

Alternative 2

No road construction would occur in the Greenhorn PWA therefore, no road use or maintenance would occur. Less than 0.2 miles of road would be constructed in the Dixie Butte PWA and closed at the end of the project, impacting approximately 13 acres. This area runs parallel to an existing road and would impact Polygon 182 in the analysis for potential wilderness, removing this polygon from being included in a PWA post project. No other roads exist in these PWAs and no other road use or maintenance would occur.

No timber harvest would occur in the Greenhorn PWA in Alternative 2. The only impact to the Greenhorn area is the treatment of an aspen stand located mostly inside the IRA, but does overlap slightly with the PWA boundary. This treatment would remove competition from conifer trees on up to two acres in each stand and all trees cut would be left on site.

Within the Dixie Butte PWA, commercial thinning would occur on 34 acres. This harvest is within Polygon 182, which would be removed from being included in a future potential wilderness inventory, changing the area available for potential wilderness from 5,514 acres to 5,454 acres within the project area. This is the same polygon that is impacted by the road construction in Alternative 2. The majority of the acres analyzed for potential wilderness outside of the IRA are allocated to Forest Plan Management Areas 1 and 2 General Forest and Range. Aspen treatment would occur on two sites within the Dixie Butte IRA, but not in the Dixie Butte PWA. This treatment would remove competition from conifer trees on up to two acres in each stand and all trees cut would be left on site.

Landscape prescribed fire would occur on approximately 2,039 acres in the Dixie Butte PWA and 663 acres in the Greenhorn PWA. Within the IRAs, landscape prescribed fire would occur on 406 acres in the Greenhorn IRA and 1,539 acres in the Dixie Butte IRA. Landscape prescribed burning would require the construction of handline which would include the cutting of some small diameter trees, snags that pose a hazard to workers, and the limbing-up (pruning) of other trees incidental to prescribed burning activities. Trees cut during handline construction would not be removed from the site. None of these activities would remove these areas from either continued inclusion in the IRA or from future inclusion in an analysis for potential wilderness.

Table 59 is a summary of proposed activities that would occur in the Dixie Butte and Greenhorn IRA. Table 60 and Table 61 show a summary of the proposed activities that would occur within the areas analyzed for potential wilderness within the project planning area.

Alternative 3

No road construction would occur in the Greenhorn or Dixie Butte IRAs or PWAs. Therefore no road use or maintenance would occur.

No timber harvest would occur in the Greenhorn or Dixie Butte IRAs or PWAs. The only impact to the Greenhorn area is the treatment of an aspen stand located mostly inside the IRA, but does overlap slightly with the PWA boundary. This treatment would remove competition from conifer trees on up to two acres in each stand and all trees cut would be left on site. Aspen treatment would occur on two sites within the Dixie Butte IRA, but not in the Dixie Butte PWA. This treatment would remove competition from conifer trees on up to two acres in each stand and all trees cut would be left on site.

Landscape prescribed fire would occur on approximately 2,091 acres in the Dixie Butte PWA and 663 acres in the Greenhorn PWA. Within the IRAs, landscape prescribed fire would occur on 406 acres in the Greenhorn IRA and 1,539 acres in the Dixie Butte IRA. Landscape prescribed burning would require the construction of handline which would include the cutting of some small diameter trees, snags that pose a hazard to workers, and the limbing-up (pruning) of other trees incidental to prescribed burning activities. Trees cut during handline construction would not be removed from the site. None of these activities

would remove these areas from either continued inclusion in the IRA or from future inclusion in an analysis for potential wilderness.

Table 59 is a summary of proposed activities that would occur in the Dixie Butte and Greenhorn IRA. Table 60 and Table 61 show a summary of the proposed activities that would occur within the areas analyzed for potential wilderness within the project planning area.

Alternative 4

No road construction would occur in the Greenhorn PWA therefore, no road use or maintenance would occur. Approximately 2 miles of road would be constructed in the area analyzed for potential wilderness outside of the Dixie Butte IRA impacting approximately 141 acres. These roads connect an orphaned road system and would directly impact polygon 170 and 182. Post project these areas would not meet inventory criteria for potential wilderness. No other roads exist in these PWAs and no other road use or maintenance would occur.

No timber harvest would occur in the Greenhorn PWA in Alternative 4. The only impact to the Greenhorn area is the treatment of an aspen stand located mostly inside the IRA, but does overlap slightly with the PWA boundary. This treatment would remove competition from conifer trees on up to two acres in each stand and all trees cut would be left on site.

Within the Dixie Butte PWA, commercial thinning would occur on 387 acres. This harvest is within Polygon 170, 182, 116 and a small portion of 110. Polygons 110 and 116 would be impacted only from harvest activities, while polygons 170 and 182 would have both harvest and road construction. These polygons would be removed from being included in a future potential wilderness inventory making the new potential wilderness area approximately 4,795 acres within the project area from 5,514 acres before activity. The majority of the acres analyzed for potential wilderness outside of the IRA are allocated to Forest Plan Management Areas 1 and 2 General Forest and Range. Aspen treatment would occur on two sites within the Dixie Butte IRA, but not in the Dixie Butte PWA. This treatment would remove competition from conifer trees on up to two acres in each stand and all trees cut would be left on site.

Landscape prescribed fire would occur on approximately 1,396 acres in the Dixie Butte PWA and 663 acres in the Greenhorn PWA. Within the IRAs, landscape prescribed fire would occur on 406 acres in the Greenhorn IRA and 1,539 acres in the Dixie Butte IRA. Landscape prescribed burning would require the construction of handline which would include the cutting of some small diameter trees, snags that pose a hazard to workers, and the limbing-up (pruning) of other trees incidental to prescribed burning activities. Trees cut during handline construction would not be removed from the site. None of these activities would remove these areas from either continued inclusion in the IRA or from future inclusion in an analysis for potential wilderness.

Table 59 is a summary of proposed activities that would occur in the Dixie Butte and Greenhorn IRA. Table 60 and Table 61 show a summary of the proposed activities that would occur within the areas analyzed for potential wilderness within the project planning area.

Table 59. Activities proposed in the Dixie Butte and Greenhorn IRA in all action alternatives

	Landscape Prescribed Fire	Commercial Harvest	Non-Commercial Thin	Aspen Treatment	Road Construction
Greenhorn IRA	406 acres	None	None	2 acres	None
Dixie Butte IRA	1,539 acres	None	None	4 acres	None
Dixie Butte and Greenhorn IRA (outside project boundary)	None	None	None	None	None

Table 60. Activities proposed in the Greenhorn PWA

Areas Analyzed for Potential Wilderness					
	Landscape Prescribed Fire	Commercial Harvest	Non-Commercial Thin	Aspen Treatment	Road Construction
Alt 2	663 acres	None	None	None	None
Alt 3	663 acres	None	None	None	None
Alt 4	663 acres	None	None	None	None

Table 61. Activities proposed in the Dixie Butte PWA

Areas Analyzed for Potential Wilderness					
	Landscape Prescribed Fire	Commercial Harvest	Non-Commercial Thin	Aspen Treatment	Road Construction
Alt 2	2,039 acres	34 acres	None	None	13 acres
Alt 3	2,091 acres	None	None	None	None
Alt 4	1,396 acres	387 acres	None	None	141 acres

Alternatives 2, 3, 4 – Common Effects

Primitive, Semi-Primitive Non-Motorized Classes of Dispersed Recreation

The primary recreational uses in the project planning area are dispersed camping, ATV use, snowmobiling, and big game hunting. Landscape prescribed fire activities which would occur mainly in the fall of the year would have a short-term, one to two year, effect on scenic values and use of dispersed hunting campsites. Smoke may reduce the quality of the experience for recreationists and hunters in dispersed campsites, but it would be short-term effect. The opportunity to enjoy semi-primitive and remote recreational experiences would remain unchanged in the long-term.

Natural Appearing Landscapes with High Scenic Quality, Other Locally Identified Unique Characteristics and Traditional Cultural Properties

Apparent Naturalness, Scenic Quality, and Remoteness

There would be no direct effect to the apparent naturalness, scenery, and sense of solitude and remoteness within the Inventoried Roadless Areas from timber harvest and road construction because those actions are not proposed in these areas. Alternative 2 will have impacts to a 60 acre polygon and Alternative 4 will have impacts on 718 acres within the Dixie Butte PWA, reducing the apparent naturalness, scenery and sense of solitude and remoteness. Alternative 2 however represents less than 1% of the total project area eligible for potential wilderness, and Alternative 4 represents a reduction in approximately 8% within the project area.

The sights and sounds of timber harvest and road building machinery adjacent to PWAs would reduce a sense of naturalness several miles into a PWA during project operations but would not persist in the long term.

Prescribed burning within these areas would change composition and structure of vegetation (EIS, Chapter 3). For a few years burned areas would display a blackened color until grasses, brush, and herbaceous species recover. Dead trees, particularly small trees (saplings to poles) would be evident over a 5 to 10 year period. Few overstory trees are expected to be killed. Outside the burned areas, the conditions described in the affected environment for both PWAs would remain unchanged except by natural processes and ongoing management activities such as grazing and hunting.

Landscape prescribed burning would require the construction of handline which would include the cutting of some small diameter trees, snags that pose a hazard to workers, and the limbing-up (pruning) of other trees incidental to prescribed burning activities. Wherever possible, natural features such as rock outcrops and drainage bottoms would be used as natural barriers to avoid the need to construct fire line. Where firelines must be constructed to contain prescribed fire, the lines would be constructed and rehabilitated using Minimum Impact Suppression Tactics (MIST) to mitigate impacts to the roadless character of the IRAs. The sight of some random tree stumps left after handline construction incidental to prescribed burning activities could affect the natural appearing landscape and sense of solitude for some. Trees cut during handline construction would not be removed from the site. Prescribed burning and future fires would cumulatively change composition and structure of vegetation which could affect some forest visitor’s sense of naturalness and remoteness.

Aspen stands would be expected to flourish following removal of competing conifers and in the short term the down conifer trees and stumps will be visible and the feeling of remoteness would be reduced. Over time and after aspen growth increases to camouflage down conifers and stumps the feeling of remoteness would increase due to increased vegetation and foliage.

Unique Qualities and Traditional cultural properties

There would be no direct effect to special features within IRAs because timber harvest and road construction actions are not proposed. Therefore the existing conditions described in the affected environment would remain unchanged except by natural processes and ongoing management activities such as grazing and hunting. Although there is harvest activities proposed in the Dixie Butte PWA in Alternatives 2 and 4, all traditional and sacred cultural sites within areas analyzed would be avoided (Chapter 2).

Change in IRA/PWA acres

All acres within both Dixie Butte and Greenhorn IRAs would remain in the inventory following implementation of all action alternatives (Table 59). Two of the aspen stand treatment areas are not within the potential wilderness areas and one has approximately 5% of the 2 acres within the PWA.

Within the areas analyzed for potential wilderness, Alternative 2 and Alternative 4 would have reductions in the areas that meet the requirements for inclusion in the Dixie Butte PWA. There currently are approximately 5,514 acres in the Dixie Butte PWA that met the eligibility requirements; this remains unchanged in Alternative 3. Alternative 2 removes approximately 60 acres from the eligible inventory, and alternative 4 removes approximately 719 acres from the eligible inventory (Table 60 and Table 61).

Thus, following implementation, acres identified by alternative within both Dixie Butte and Greenhorn PWAs would be available for consideration in an evaluation of potential wilderness (FSH 1909.12, Chapter 72) and preliminary administrative recommendations for wilderness designation (FSH 1909.12, Chapter 73) during forest plan revision.

However, if congress wishes to establish a wilderness area, they are able to include areas both inside and outside the potential wilderness area boundaries.

Table 62. Acres of Inventoried PWAs Remaining by Alternative

Potential Wilderness Areas (inside project area)	Alternative 1 (acres)	Alternative 2 (acres)	Alternative 3 (acres)	Alternative 4 (acres)
Dixie Butte PWA	5,514	5,454	5,514	4,795
Greenhorn PWA	3,183	3,183	3,183	3,183

Cumulative Effects

Past timber harvest activities in the region have impacted the composition and structure of many areas within the project. Stumps from logging and railroad grades are still evident in many cases and can impact a visitor's perception of solitude and remoteness, although these impacts can diminish over time. Wildfire exclusion and suppression efforts have also impacted stand composition, creating conditions experienced today with increased ladder fuels and high forest density. These conditions have increased the potential for a large wildfire to occur. Although a large wildfire would not remove an area from being eligible as a PWA, it would impact the apparent naturalness, solitude and remoteness of the area.

Impacts to the changes in acreages by alternative will impact the ability for areas to be identified in a potential wilderness analysis on future projects within the planning area. However, after a period of time where the impacts are no longer visible, these areas will be eligible to be included in an inventory of potential wilderness areas. Current and future mining sites where impacts are identifiable will also remove areas from analysis as potential wilderness. Mining claims which are abandoned will be eligible for inclusion in the potential wilderness area inventory after 50 years.

No reasonably foreseeable future actions were identified that would change the condition of this area. Thus, following implementation, all acres identified by alternative within both Dixie Butte and Greenhorn PWAs would be available for consideration in an evaluation of potential wilderness (FSH 1909.12, Chapter 72) and preliminary administrative recommendations for wilderness designation (FSH 1909.12, Chapter 73) during forest plan revision.

Other Undeveloped Lands

Regulatory Framework

An outcome of the PWA inventory process found at FSH 1909.12, Chapter 71 was the identification of polygons of other undeveloped lands. These polygons did not meet inventory criteria as potential wilderness areas and they are not inventoried roadless areas or a designated wilderness area. Each individual polygon of land has no recent history of harvest activity and does not contain forest roads. They are stand-alone polygons of varying acreages all less than 5,000 acres within the project planning area (Table 63).

There are no forest-wide or management area standards specific to other undeveloped lands in the Malheur Forest Plan however there are management areas that emphasize a non-motorized condition or prohibit harvest of timber. All lands, including other undeveloped lands, are managed consistent with forest-wide standards and guidelines and by designated Forest Plan management area allocations.

Analysis Methods

The scale of analysis is represented by the Galena project planning area. Other undeveloped lands have intrinsic ecological and social values because they do not contain roads and evidence of recent timber harvest. These values are used as indicators of comparison to display effects between alternatives. Values and features that often characterize an inventoried roadless area (36 CRF 294) were specifically avoided as indicators of comparison to reduce confusion as described in the Regulatory Framework and Analysis Method section of the Inventoried Roadless Areas, Areas Analyzed for Potential Wilderness, and Other Undeveloped Lands section. Other undeveloped lands are not inventoried roadless areas or potential wilderness areas, however they do share some similar characteristics that help serve as indicators of comparison.

Indicators of comparison between alternatives are:

- Intrinsic social values
- Change in acres of other undeveloped lands

Existing Condition

Table 63 displays the acres of other remaining undeveloped lands within the Galena project planning area. In the 37,200 acre Galena project planning area, approximately 9,965 acres have been identified as isolated polygons of other undeveloped lands, approximately 8,697 acres have been identified as potential wilderness areas (PWA), and the remaining 18,538 acres are developed and managed (contain evidence of past harvest, mining and/or forest roads). Individual polygons of other undeveloped lands less than an acre were eliminated from further study because no special or unique resource values were identified and the description of effects to individual pieces of land less than one acre are better disclosed as part of the other resource effects section in this EIS.

Table 63. Inventory of Land Areas within Galena Project Planning Area

Land Area	Acres
Acres inventoried for PWAs within the project planning area	37,200
Lands within the project planning area with evidence of past harvest, mining and/or forest roads (including land within 300 feet of a forest road).	18,538
PWAs within the project planning area boundary	8,697
Other undeveloped lands (remaining acres with no evidence of past harvest and forest roads that did not meet PWA criteria).	9,965

Table 64 displays the number, size class, and approximate acres represented. Approximately 60 percent of the polygons are in the 1 to 100-acre size class. For perspective, one square mile is about 640 acres and the closest designated wilderness area (North Fork John Day) is over 107,000 acres. The residual shape of each undeveloped polygon is the result of boundaries created by past harvest, mining and road building. The largest polygon of other undeveloped lands is approximately 778 acres.

Table 64. Size class and acres of other undeveloped lands in the Galena Project planning area

Number of Polygons	Size Class	Approximate Acres
101	1 to 20.0 acres	674
44	20.1 to 100 acres	2,065
10	100.1 to 200 acres	1,325
4	200.1 to 400 acres	1,280
8	400.1 to 1,000 acres	4,621
0	>1,000.1 acres	0

The majority of the 9,965 acres of other undeveloped lands are allocated to Forest Plan Management Areas 1 and 2 General Forest and Range, 4A-Big Game Winter Range, and 14-Visual Corridors. All of these management areas allow timber management on a scheduled basis, all types of prescribed fire may be used to accomplish management objectives, and road construction, reconstruction and maintenance are permitted within Forest Plan standards and guidelines.

Other undeveloped lands include soils, water, fish and wildlife habitat etc. that have not been directly impacted by past harvest, mining and road building, or the impacts are not readily evident. Indirect impacts have and continue to occur from today's fragmentation of vegetation. The current condition of soil, water and air quality; plant and animal communities; habitat for threatened, endangered, and sensitive species; noxious weeds, recreation; and cultural resources within the project planning area, including other undeveloped lands are described elsewhere in Chapter 3 of this EIS.

Human influences have had limited impact to long-term ecological processes within the other undeveloped lands. Disturbance by insects and fire has been and most likely will continue to be the factors with the most potential to impact the area. Opportunities for primitive recreation are limited to hiking, mostly cross-country, and hunting. Ongoing firewood gathering and removal of danger trees along forest roads that border each polygon changes the vegetation, leaves stumps, and presents a managed appearance within a developed transportation corridor.

Opportunities for a feeling of solitude, the spirit of adventure and awareness, serenity, and self-reliance are limited by the size and shape of the polygon. Distance and topographic screening are also factors. The optimum shape and location to retain solitude and a sense of isolation from noise and sights of other humans and their activities would be at the center of a circle. Areas greater than or equal to 5,000 acres or about 8 square miles may have sufficient size to offer a sense of solitude yet this may vary by individual. Long narrow shapes provide less distance from noise at their midpoint. Nearby, non-conforming sights and sounds of roads and timber harvest can be heard and often seen from within 162 polygons of other undeveloped lands because they are all less than one square mile in size and none are a perfect circle in shape.

Three additional polygons exist larger than 640 acres. Polygon 60 is surrounded on all sides by roads and not adjacent to an existing PWA. The southern boundary of Polygon 60 is Highway 7, and a majority of the northern boundary is an open road. Two roads, one closed and one open, enter the polygon and could reduce the sense of naturalness experienced by a visitor.

Polygon 128 is essentially comprised of two strips of land connected through a narrow gap. The northern border is adjacent to private lands and the southern and western boundaries are adjacent to open roads. At its widest, the polygon is approximately 0.5 miles wide, although the average width is narrower.

Polygon 180 is long and narrow, only 0.5 miles across at its widest and in several locations is less than 1/10 of a mile wide. The eastern boundary of the polygon is adjacent to an open road, while many portions of the western boundary are adjacent to closed roads. However, extensive open roads exist adjacent to many portions of the polygon, likely giving a forest user little feeling of solitude or a sense of naturalness because of nearby sights and sounds.

Several other undeveloped land polygons are within an existing IRA or are adjacent to an area analyzed for potential wilderness. These stands however did not meet the criteria because they were either separated by a road, separated by an active mining claim, had evidence of past harvest that was not included in the “Past Harvest” electronic layer file in Geographic Information Systems, or were not added to assist in on-the-ground identification of a potential wilderness boundary.

Some of the stands within the undeveloped area adjacent to the Dixie Butte PWA are in an area completely surrounded by roaded areas. The undeveloped acres referenced above are essentially “fingers” of undeveloped lands between dead end roads and not large blocks of undeveloped lands, often connected through necks less than ¼ to ½ mile wide. Examples include polygon 181, which is adjacent to polygon 170, but is connected through a “neck” approximately 0.2 miles wide. Field checking of the site also showed evidence of stumps and other management activities. These units are connected to the PWA through small gaps and would likely not fit the original intention of a PWA. Small ‘noses’ of land that are adjacent to existing potential wilderness areas might also be included in the other undeveloped lands because of a topographic influence that makes on the ground identification easier and does not include land of significant size, generally 1,000 acres or more.

The existing condition of all remaining 18,538 acres of land within and affected by the project presents a landscape that has been managed and is generally developed in nature; these lands contain evidence of past harvest, active mining, and forest roads. Past management actions and current conditions within the 18,538 acres reflect the multiple-use intent and decisions made in the Forest Plan (1990 as amended), and reflects consistency with Forest Plan management area allocations.

Direct and Indirect Effects by Alternative

Alternative 1

There would be no direct effects to undeveloped lands because no activities would occur in these areas. The affected environment would remain unchanged, except by natural processes and ongoing

management activities. Biological and ecosystem functions would continue. The landscape would likely continue developing complex fuel loads. A wildfire may burn more extensively and kill more trees within upland forest stands which would result in larger acreages of blackened landscapes compared to prescribed fires. Some forest visitors may avoid blackened landscapes until green vegetation returns after 3 to 5 years. Fire is a natural occurrence and expected disturbance process in this landscape. All polygons of other undeveloped lands would continue to not meet inventory criteria as potential wilderness areas and would continue to not be an inventoried roadless area or a designated wilderness area.

Alternative 2, 3, 4

Table 65. The number of acres of activities and miles of road proposed under each action alternative that occur within other undeveloped lands

Activities within other undeveloped lands	Alternative 2	Alternative 3	Alternative 4
Commercial Harvest	2,983	1,207	3,489
Prescribed Fire	5,832	5,832	5,832
Non-commercial Thinning	240	648	168
New Road Construction	8.7	0	9.1
Temporary Road	1.3	0	1.3

Timber harvest and associated activities in Alternative 2 would occur on approximately 2,983 acres of other undeveloped lands. Alternative 2 would also include 8.7 miles of system road constructed and an additional 1.3 miles of temporary road constructed in other undeveloped lands to facilitate haul.

Timber harvest and associated activities in Alternative 3 would occur on approximately 1,207 acres of other undeveloped lands. There would be no system road constructed or temporary road constructed in other undeveloped lands under Alternative 3.

Timber harvest and associated activities in Alternative 4 would occur on approximately 3,489 acres of other undeveloped lands. There would be approximately 9.1 mile of system road and 1.3 mile of temporary road constructed within other undeveloped lands to facilitate access and haul.

The increased numbers of stumps and the open nature of the forest stand would likely be the most apparent visual change resulting from implementation. In the long term (about 50+ years), the project would result in the development of historical open, park-like conditions, characterized by larger diameter trees, though more stumps would be present than currently exist.

The descriptions of environmental consequences to the ‘intrinsic physical and social values’ of other undeveloped lands applies to undeveloped lands polygons displayed in Maps 19-21 in Appendix C.

Maps 19, 20, and 21 display the locations of proposed harvest and roads within other undeveloped areas by action alternative. Harvest and road building would create stumps which would reduce the size of the undeveloped polygons. However all harvest and road building is consistent with the intent and standards of the forest plan.

Intrinsic Social Values

Proposed timber harvest, road construction, and prescribed fire activity in other undeveloped lands would create stumps which would reduce the size of the other undeveloped lands polygon. The lands would appear managed and developed. The sights, sounds, and changes in vegetation from timber harvest and

associated road construction and use would further decrease the natural integrity and sense of naturalness within harvest units and along roads. All harvested units would remain forested after harvest although skid trails, stumps, and landings would be evident. Stand structure would change, therefore diversity of plant and animal communities may shift from current patterns but ecological diversity would remain (Chapter 3, Forest Vegetation section). Impacts to natural integrity and sense of naturalness would likely be evident until stumps and vegetation canopies are no longer substantially recognizable (about 75 to 100 years). The sounds of timber harvest and road building machinery from active units would reduce a sense of naturalness and solitude during project operations but would not persist in the long term. Other impacts, such as tree marking paint and logging slash would be visible in the short term (about 5 to 10 years). Impacts such as closed roads, skid trails, and tree stumps would be evident much longer.

The increased numbers of stumps and the open nature of the forest stand would likely be the most apparent visual change resulting from implementation. In the long term (about 50+ years), the project would result in the development of historical open, park-like conditions, characterized by larger diameter trees, though more stumps would be present than currently exist.

Prescribed burning would change composition and structure of vegetation (Fuels, Chapter 3). For a few years burned areas would display a blackened color. Outside the burned areas, the conditions described in the affected environment for areas with wilderness potential would remain unchanged except by natural processes and ongoing management activities such as grazing and hunting.

These lands would continue to not meet inventory criteria for potential wilderness areas. This outcome is consistent with the intent of the land allocation decisions made in the forest plan. The impacts to soil, water quality, air quality, plant and animal communities; habitat for threatened, endangered, and sensitive species; recreation, noxious weeds, and cultural resources are disclosed in other sections of this Chapter and are not reiterated here.

Environmental effects to resources in other undeveloped lands due to the implementation of proposed project activities would be consistent with applicable laws, regulations, and Forest Plan management area standards and guidelines (see previous sections of this chapter for Findings of Consistency for each resource).

Other undeveloped lands with no proposed thinning or mechanized activity (6,743 acres in Alternative 2, 8,111 acres in Alternative 3, and 6,309 acres in Alternative 4) would still be classified as other undeveloped lands and would retain their intrinsic physical, biological and social values as described in the affected environment. They would remain free of developments such as forest roads or timber harvest stumps. All acres of other undeveloped lands within the project planning area would still not be considered PWAs, inventoried roadless areas, or a designated wilderness area. These undeveloped lands would remain as small scattered areas detached from each other by terrain, roads, and harvest activities.

Change in Acres in Other Undeveloped Lands

All acres of other undeveloped lands would continue to not meet inventory criteria as potential wilderness areas and would continue to not be an inventoried roadless area or a designated wilderness area. Table 66 is a summary showing the changes in acres for other undeveloped lands by alternative. Acres changed from undeveloped to developed include commercial harvest units, new road construction with a 600 foot road buffer and temporary road construction with a 200 foot buffer for any portion of these roads or buffers that lie outside of the commercial harvest units.

Table 66. Changes in other undeveloped lands in Galena Project planning area by alternative

Alternative	Other Undeveloped Acres After Implementation	Acres changed (includes commercial harvest & road construction	Percent of Project Area[1] Remaining Undeveloped or within PWA After Implementation	Developed Acres After Implementation
1	9,966	No change	50	18,538
2	6,743	(-3,223)	41	21,820
3	8,111	(-1,855)	45	20,393
4	6,309	(-3,657)	38	22,913

[1] *37,200 acres within the project planning area is 100 percent*

Timber harvest and associated activities in Alternative 2 would occur on approximately 3,223 acres of other undeveloped lands. Alternative 2 would also include approximately 8.7 miles of system road construction and an additional 1.3 miles of temporary road constructed in other undeveloped lands to facilitate haul. This would reduce the amount of other undeveloped lands in the project area to 6,743 acres.

Timber harvest and associated activities in Alternative 3 would occur on approximately 1,855 acres of other undeveloped lands. Alternative 3 would include no new miles of system road construction and no temporary roads constructed in other undeveloped lands.

Timber harvest and associated activities in Alternative 4 would occur on approximately 3,697 acres of other undeveloped lands. Alternative 4 would also include approximately 9.1 miles of system road construction and an additional 1.3 miles of temporary road constructed in other undeveloped lands to facilitate haul.

Cumulative Effects

For other undeveloped lands in which project activities would occur the cumulative effects to soil, water quality, air quality, plant and animal communities; habitat for threatened, endangered, and sensitive species; recreation, noxious weeds, and cultural resources are disclosed in previous sections of this chapter and are not reiterated here.

There are no projects being planned in the area which will provide for potential future effects to other undeveloped lands. Past and current management activities outside of the project will likely continue. Future wildfire management would cumulatively change composition and structure of vegetation which could affect some forest visitor’s sense of naturalness and remoteness. Apparent naturalness and solitude and remoteness will be cumulatively impacted by grazing, dispersed camping, and motorized ATV and vehicle use on roads.

Effects associated with recreational use, including noxious weed spread, hunting, fishing, erosion, litter, and evidence of fire rings are expected to remain cumulatively minor. Ongoing removal of danger trees and fire wood gathering along forest roads changes the vegetation but does not change the overall sense of naturalness or sense of solitude along an existing developed transportation corridor and are outside of other undeveloped lands. Overall, cumulative impacts from these activities on apparent naturalness, solitude and remoteness is very small (not measurable/indistinguishable) in proportion to the changes anticipated from the direct and indirect impacts of the alternatives disclosed above.

Other undeveloped lands with no proposed thinning or mechanized activity (6,743 acres in Alternative 2, 8,111 acres in Alternative 3, and 6,309 acres in Alternative 4) would retain their intrinsic physical, biological and social values as described in the affected environment (Table 64). They would remain free of developments such as forest roads or timber harvest stumps. All acres of other undeveloped lands within the project planning area would still not be a potential wilderness area, inventoried roadless area, or a designated wilderness area. This outcome is consistent with the intent of the land allocation decisions made in the forest plan.

Climate Change

The Forest Service does not have a national policy or guidance for managing carbon, and the tools for estimating carbon and sequestration are not fully developed. Current direction for addressing climate change issues in project planning and the NEPA process is provided in the document Climate Change Considerations in Project Level NEPA Analysis (USFS 2009). This document outlines the basic considerations for assessing climate change in relation to project-level planning.

Ongoing climate change research was summarized in reports by the United Nations Intergovernmental Panel on Climate Change (IPCC) (www.ipcc.ch), US Climate Change Science Program's Science Synthesis and Assessment Products and the US Global Change Research Program. These reports concluded that climate is already changing; that the change will accelerate, and that human greenhouse gas (GHG) emissions, primarily carbon dioxide emissions (CO2), are the main source of accelerated climate change.

Because greenhouse gases mix readily into the global pool of greenhouse gases, it is not currently possible to ascertain the indirect effects of emissions from single or multiple sources (projects). Also, because the large majority of Forest Service projects are extremely small in the global atmospheric CO2 context, it is not presently possible to conduct quantitative analysis of actual climate change effects based on individual or multiple projects.

This analysis considers two types of climate change effects. One is the effects of the proposed project on climate change. The second is the effect of climate change on the proposed project.

Effects of the Alternatives on Climate Change

Climate change, as measured by greenhouse gas emissions, primarily carbon dioxide, was assessed for this project. Proposed activities that would cause carbon emissions are prescribed burning and harvest operations. Proposed activities that would cause carbon sequestration are harvesting of forests and conversion of trees into long lived products or replacing fossil fuel use with biomass. The reduced risk of large scale stand replacement wildfires would lead to a reduction in carbon emissions from the forest both from the immediate consumption during the fire and later as unsalvaged wood decays and releases carbon.

Although it is possible to quantify a project's direct effects on carbon emissions, there is no certainty about the actual intensity of individual project indirect effects on global climate change. Uncertainty in climate change effects is expected because it is not possible to meaningfully link individual project actions to quantitative effects on climatic patterns.

Under the no action alternative, there would be an increased indirect risk of wildfire which could contribute carbon dioxide emissions. The fuels that have accumulated are prone to be released back into the atmosphere by combustion and decay.

Under Alternatives 2, 3, and 4, around 19,900 acres are proposed for underburning, however less than 5,000 acres would be burned in any one year. Underburning would release carbon dioxide into the air from the debris on the forest floor, but repeated underburns would produce substantially less emissions per acre than a wildfire which consumes material from both the forest floor and the standing trees. Restoration of the forest by moving toward the HRV, through thinning, would result in a low risk of uncharacteristically severe wildfire. This reduced risk has a direct beneficial effect of decreased carbon emissions from these acres because the risk of acres being burned by uncharacteristically severe wildfires would be reduced.

The action alternatives are not expected to have a measurable change in the ability of the forest to sequester carbon. Thinning will reduce the number of trees, but the number of remaining trees left will still utilize most of the growing potential of the site with net growth remaining about the same.

Harvesting wood and turning it into durable products such as lumber will sequester a portion of the carbon while retaining the capacity of the forest to absorb carbon from the atmosphere. Additionally, biomass utilization is itself a carbon neutral source of energy, but if it is replacing fossil fuel use there is a net reduction in atmospheric carbon.

Overall, the combined effects of the action alternatives are expected to be a net reduction in atmospheric carbon.

Effects of Climate Change on Galena

Eastern Oregon is likely to experience changes in temperature and rainfall patterns with rising greenhouse gas levels. The mean temperature at the end of this century is projected to increase several degrees Fahrenheit, with the largest increase occurring during the summer months (June-August), though each season has predicted higher average temperatures. Potential future average annual precipitation at the end of this century is projected to increase, though the summer (June-August) precipitation is to decrease. Most future climate scenarios show increased precipitation for the Pacific Northwest, but with longer periods of summer drought.

The higher average temperatures and increased summer drought predicted by climate change models may lead to vegetation changes in the analysis area. Evidence also shows that long drought periods can lead to increased insect and disease activity, as well as increased wildfire activity and intensity.

Under the no action alternative the species composition and stand density will remain the same or trend towards late seral species and increased stand density. This will intensify any effects from increased summer temperatures and drought, leading to increased stress to the trees and reduced ability to resist insects and disease in the forest. Increased fuel loadings and warmer, drier weather will increase the risk of large stand replacement wildfires.

Under the action alternatives there are varying levels of silvicultural treatments including returning the species composition to more early seral species, thinning, and pre-commercial thinning. Reducing the proportion of late seral species and increasing the percentage of early seral species will increase the ability of the forest to withstand increased levels of wildfire and other disturbances. Thinning will reduce forest density and improve the health and vigor of remaining trees, especially during periods of summer drought. A forest that is better adapted to handle disturbances, such as wildfire or disease, will be more resilient in the face of potential climate change in the future.

Additionally, complete quantifiable information about project effects on global climate change is not currently possible and is not essential to a reasoned choice among alternatives.

Cumulative Effects

As greenhouse gas emissions are integrated across the global atmosphere, it is not possible to determine the cumulative impact on global climate from emissions associated with any number of particular projects. Nor is it expected that such disclosure would provide a practical or meaningful effects analysis for the Galena project

Findings and Disclosures

Short-Term Use and Long Term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable 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 present and future generations of Americans (NEPA Section 101). Short-term uses are those that generally occur annually. Long-term productivity refers to the ability of the land to produce a continuous supply of a resource.

The project would result in short-term impacts, but maintains the long-term productivity of the area through the use of specific Forest Plan standards and guidelines, design measures built into the project design, and implementation measures. A description of impacts expected by alternative can be found by resource area in the above discussions. The project would result in a long-term yield of forest stands by reducing competition and improving growth of individual trees. Reforestation of harvest areas could change plant succession, stand development, and species composition. The project would also result in an economic return to the economy from wood products removed and jobs created.

Unavoidable Adverse Effects

Implementation of any alternative may result in some adverse environmental effects. The severity of the effects can be reduced or minimized by adhering to project design and implementation measures built into the alternatives. If management activities occur, however, some effects cannot be avoided. Even the no-action alternative has effects on the environment. A description of impacts expected by alternative can be found by resource area in the above discussions.

Some unavoidable impacts could include heritage resources, scenic resources, wildlife, and air quality. There is no assurance that every heritage site may be located in advance of all planned management activities. Some ground-disturbing activity may affect an undiscovered historic or pre-historic site. Sites discovered in this manner would immediately be protected from further disturbance. Timber harvest units would add a variety of line, form, color and texture to the landscape. Forest users may see a modified forest in the foreground, middle ground, and background, where harvest and prescribed burning are implemented. All action alternatives would move wildlife habitat towards historical ranges and would have an effect on cover to forage ratios. Changes in habitat quality and quantity can cause changes in local numbers of specific species. Action alternatives can also directly harm wildlife through timber harvest and associated activities. Temporary seasonal effects on air quality are unavoidable under the action alternatives due to prescribed fire treatments. Prescribed fire is an integral part of ecosystem management by treating fuels, however activities would be scheduled during times when air quality standards could be maintained.

Irreversible and Irretrievable Effects

An irreversible effect is a change in a natural resource that cannot be reversed. An irreversible commitment of resources refers primarily to the effects of use of non-renewable resources such as minerals or cultural resources, or to the extinction of a wildlife species. An irretrievable effect is a loss of production or use of a renewable natural resource for a period of time, but is reversible, such as soil productivity or loss in timber productivity where roads are constructed. Under the no-action alternative, the likelihood of an uncharacteristically severe wildfire taking place in or near the project area is high, due to the high levels of fuels. The resource damage resulting from a potential wildfire could be catastrophic and could result in an irreversible commitment of resources. See the discussion in the Fuels section for more details on fuel loads and related fire hazards by alternative.

Under all action alternatives, temporary roads, skid trails and landing zones are proposed and would constitute short-term impacts to soil productivity. There are numerous project design criteria in place that would allow for adherence to Forest Plan standards for soil disturbance. Under Alternatives 2 and 4, there are new roads proposed for construction. These roads would remove soil productivity for decades to hundreds of years. The new road construction would constitute an irretrievable commitment of a resource. See the discussions on Soils and Watershed for more details.

The loss or modification of habitat for specific fish and wildlife species could constitute an irretrievable commitment of resources since the time frame for the habitat to change could be decades. There are no anticipated losses of any fish or wildlife species populations or an effect that would lead toward Federal listing for any species not currently listed. See the discussion in the Aquatics and Wildlife sections for more details.

There are no irreversible effects expected to cultural resources since the 2004 programmatic agreement would be followed, which serves to mitigate effects. See the discussion on Heritage for more details.

The project as described in each of the alternatives would not result in any irreversible or irretrievable effects to the watershed resource. Thus this project is consistent with the standards and goals for watershed included in the Forest Plan. See the discussion on watershed for more details.

Threatened and Endangered Species

All alternatives are consistent with the Endangered Species Act (ESA) and the requirements of the USFS Regional Forester's Sensitive Species list. Effects to any threatened and endangered, and sensitive wildlife, fish, and plant species are discussed in the Wildlife, Fisheries, and Botany sections of this chapter. A Biological Assessment for fisheries will be prepared and submitted to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, for concurrence according to the ESA. Biological Evaluations have been prepared for both botany and wildlife and are located in the project record.

Prime Farmland, Rangeland, and Forestland

The alternatives presented are in compliance with the Federal Regulation for prime lands. The definition of prime forestland does not apply to lands within National Forests. The project area does not include areas of prime farmland or prime rangeland.

Clean Water Act, Floodplains and Wetlands

Floodplain areas constitute all of the wetlands in the project area and are protected by RHCA stream buffers. Floodplains would not receive measurable impact from upstream influences. Management activities designed to protect these resources conform to the Federal regulations for floodplains, Executive Order 11988, as amended. Wetlands may occur in the form of seeps, springs, and small bogs however, there are very few that may be present in the project area. Wetlands would be protected if identified and

all applicable regulations would be followed including the Clean Water Act, Forest Plan standards, including PACFISH, and Executive Order 11990 covering wetlands and riparian zones.

The Forest Service's responsibilities under the Clean Water Act are described in a May 2002 memorandum of understanding (MOU) between the Oregon Department of Environmental Quality and the Forest Service. The Forest Service is directed to comply with State requirements for protection of waters of the State of Oregon (OAR ch.34041) through application and monitoring of best management practices (BMPs), which are recognized as the primary means to control non-point source pollution on National Forest System lands. BMPs specific to this project can be found in the implementation measures listed in Chapter 2 as well as in the Watershed Specialist Report.

There are 303(d) listed streams within the project area. As shown in the Watershed section of this chapter, there are no expected effects that would raise stream temperatures or adversely affect other parameters for which the streams are listed.

See the Watershed resource section in this chapter and the Watershed Specialist Report in the project record, for more information.

Wilderness, Potential Wilderness, and Inventories Roadless Areas

There are no lands designated in the project area as wilderness, wilderness study areas, or national recreation areas, therefore there would be no impacts to any congressionally designated areas. There are portions of two inventoried roadless areas (IRA) within the project boundary: Dixie Butte and Greenhorn Mountain. These areas were identified in the Forest Plan, Appendix C as roadless areas (since changed terminology to IRAs) and were also included in the Forest Service Roadless Area Conservation Rule (RACR). Both of these areas are also considered potential wilderness areas due to their roadless and wilderness characteristics.

Inventoried Roadless Areas

The Dixie Butte IRA is 12,000 acres in size and there is around 5,300 acres within the project boundary. The Greenhorn Mountain IRA is 16,000 acres in size and there is around 3,100 acres within the project boundary. There are two proposed activities under all action alternatives that would occur within the IRAs, prescribed burning and aspen treatments. Under each action alternative there is around 24,000 acres of proposed prescribed burning and around 2,000 acres would be within the Dixie Butte IRA and around 590 acres would occur within the Greenhorn Mountain IRA. Of the 15 acres proposed for aspen restoration, around 2 acres would be in the Dixie Butte IRA and around 2 acres would be in the Greenhorn Mountain IRA.

The proposed prescribed burning and aspen restoration would not impact the criteria for eligibility as potential wilderness areas. The criteria found in FSH 1909.12 Chapter 70 Part 72.1 are as follows: natural, undeveloped, outstanding opportunity for solitude or primitive and unconfined recreation, special features and values, and manageability. There would be no cutting of trees or fire line construction, within the IRA from prescribed burning. There would be some cutting of conifers less than 21 inches dbh within the two aspen stands as a part of aspen restoration activities. The cut trees would not be removed from the IRA. There would also be no impact to roadless area characteristics as identified in 36 CFR 291.11.

The RACR Section 294.13(b)(1)(ii) exception applies because one of the purposes of this project is to reduce high wildfire hazard and restore aspen stand ecosystems. In April 2010, the USFS Region 6 Regional Forester, was briefed on these proposed activities and provided direction to proceed with the activities as planned (email documentation in project record).

Undeveloped Areas and Potential Wilderness

An inventory of the undeveloped roads in the project area was completed and can be found in the project record. The inventory is based on and consistent with criteria found at Forest Service Handbook (FSH)

1909.12 Chapter 71. Areas of potential wilderness identified using inventory procedures found in FSH 1909.12 Chapter 71 are called Potential Wilderness Areas (PWAs). The inventory is conducted with the expressed purpose of identifying all lands that meet the criteria for being evaluated for wilderness suitability.

PWAs are not a land designation decision, they do not imply or impart any particular level of management direction or protection, they are not an evaluation of potential wilderness (FSH 1909.12 Chapter 72) and lastly they are not preliminary administrative recommendations for wilderness designation (FSH 1909.12 Chapter 73). The inventory of PWAs does not change the administrative boundary of any inventoried roadless areas (IRAs) nor any congressionally established wilderness.

Typically, PWAs substantially overlap or are contiguous with IRAs. Some newly inventoried PWAs may be stand-alone areas that were not identified as 'roadless areas' in Appendix C of the 1990 Malheur Forest Plan and IRAs as identified in a set of maps in the 2001 Roadless Area Conservation Rule (RACR). PWAs overlap IRAs only where those acres of land are consistent with the inventory criteria (FSH 1909.12 Chapter 71) and may extend beyond IRA and wilderness boundaries consistent with inventory criteria.

Included in the Forest Plan Revision efforts that are underway for the Malheur National Forest, is a proposal of additional PWAs within this project area. This project is consistent with these newly proposed areas, as it does not propose any activities within the areas that may affect the eligibility for potential wilderness.

Research Natural Areas and Wild and Scenic Rivers

There are 45 acres of the proposed Dixie Butte Research Natural Area (RNA) within the project boundary. There are no proposed activities under any alternative that would be located within this area and thus no impacts would occur. There are 1,287 acres of the Vinegar Hill-Indian Rock scenic area within the project boundary however, there are no proposed activities within the scenic area and thus no impacts would occur. Additionally none of the activities in nearby lands are expected to adversely affect either the RNA or the scenic area. There are 1, 069 acres of the Dixie Butte wildlife emphasis area within the project boundary however, there are no activities planned within this area, thus there would be no impacts. There are no wild and scenic rivers within the project boundary and no impacts are expected to any wild and scenic rivers under any alternative.

American Indian Rights and Tribal Consultation

This proposal would not conflict with any inherent rights or treaty provisions of any Tribal Group. There are three Tribes with which the Malheur National Forest consults with: Burns Paiute Tribe, Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation.

Environmental Justice

As required by law and Executive Order 12898 from 1994, all Federal actions should consider potentially disproportionate effects on minority or low-income communities. Potential impacts or change to low-income or minority communities within the general project area should be considered. Where possible, measures should be taken to avoid negative impacts to these communities or to mitigate adverse effects.

The population of the area is predominately white, followed by American Indians. The region is sparsely populated and contains low populations of minorities (3.4% of the Grant County population, 3.7% of Baker County, 7.6% of Harney County (United States Census Bureau 2007). The primary American Indian tribes nearby are the Burns Paiute Tribe, Confederated Tribes of the Umatilla Reservation and Confederated Tribes of the Warm Springs.

Data regarding minorities or people with disabilities employed in the region in the timber, mining, ranching, road construction, forestry services, and recreation sectors is unavailable. Some contracts are

reserved for award to minority businesses under the USDA Office of Small and Disadvantaged Business Utilization and the Small Business Administration, although overall contract amounts to these groups has declined since 1998 (Kohrman 2003). Nearby low income communities would mainly be affected by economic impacts connected with contractors implementing harvest, road reconstruction, tree thinning, planting, and other fuels treatment activities, providing jobs associated with project activities.

With implementation of the action alternatives, there would not be disproportionately high and adverse human health or environmental effects on minority or low-income populations. The actions would occur in a remote area and nearby communities would mainly be affected by economic impacts as related to contractors implementing harvest and thinning activities. Racial and cultural minority groups are often well represented in the work force that would implement prescribed fire, tree planting, and thinning activities. Contracts contain clauses that address worker safety.

Effects on civil rights, including those of minorities and women, would be minimal. Activities associated with the action alternatives would be governed by Forest Service contracts, which are awarded to qualified purchasers regardless of race, color, sex, religion, etc. Such contracts also contain nondiscrimination requirements. While the proposed activities would create jobs and timber harvest would provide consumer goods, no quantitative output, lack of output, or timing of output associated with these projects would affect the civil rights, privileges, or status quo of consumers, minority groups, or women.

Required Licenses and Permits

All action alternatives propose work that would involve in-stream work (culvert placement for new roads and road decommissioning). In-stream work must be permitted by the State of Oregon and the Forest Service would obtain the necessary permits prior to implementing any projects that involve in-stream work.

Chapter 4 Consultation and Coordination

Preparers and Contributors

Forest Service Interdisciplinary Team

Resource	Name	Education Degree	Years' Experience
IDT Leader, Silviculture	Eric Wunz	BS	32
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Writer/Editor	Casey Gatz	MCRP	3
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Fisheries	Allen Taylor	BS	4
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Logging Systems	Charlotte McCumber		22
IRA/PWA/OUL	Casey Gatz	MCRP	3
Archeology	Mary Robertson	MS	15
Range and Weeds	Kelly Ware	BS	4
Botany	Joe Rausch	PhD	6
Recreations	Shannon Winegar	BS	25
GIS and Data Services	Teri Corning-Sevey	BS	25
Visuals	Roy Beal	BS	32

Consultation and Coordination

The following Federal, State and local agencies, Tribal governments, businesses, organizations, and individuals provided comments during the development of this FEIS. Most of the comments were received during scoping on the proposed action and comments on the NOI published in the Federal Register. A summary of the Galena Project public involvement effort is provided below.

Federal, State, and Local Agencies

U.S. Environmental Protection Agency (EPA)

Oregon State Historic Preservation Office (SHPO)

Oregon Department of Fish and Wildlife

Oregon Department of Forestry

Grant County Commissioners

Organizations and Businesses

Prairie Wood Products, Prairie City, OR

Gazelle Land and Timber LLC, Canyon City, OR

Grant County Public Forest Commission, Canyon City, OR

King Inc., Canyon City, OR

Oregon Chapter Sierra Club, Asante Riverwind, Sisters, OR

Columbia Helicopters Inc., Redding, OR

Oregon Wild, Chandra LeGue, Eugene, OR

Grant County Conservationists, John Day, OR

Tribes

Confederated Tribes of the Warm Springs Reservation

Confederated Tribes of the Umatilla Indian Reservation

Burns Paiute Tribe

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Mike and Diane Browning

Dave Traylor

George Meridith

Blue Mountain Forest Partners

Karen Coulter

Tim Lillebo

James Johnson

Jeff Fields

Mike Billman

Charlie O' Rorke

Dan Bishop

Irene Jerome

Emily Platt

Administrative Review (Appeal) Opportunities

This decision is subject to appeal pursuant to 36 CFR 215. The 45-day appeal period begins the day following the date the legal notice of this decision is published in the *Blue Mountain Eagle*, John Day, Oregon. Only individuals or organizations that submitted comments or otherwise expressed interest during the 45-day comment period, which ran from March 25, 2011 to May 9, 2011, may appeal this decision. Appeals may be:

1. Mailed to: *Appeal Deciding Officer, Pacific Northwest Region, USDA Forest Service, Attn. 1570 Appeals, PO Box 3623, Portland, OR 97208-3623*;
2. Emailed to: *appeals-pacificnorthwest-regional-office@fs.fed.us.* Please put APPEAL and the project name in the subject line. Electronic appeals must be submitted as part of an actual e-mail message or as an attachment in Microsoft Word (.doc), rich text format (.rtf), or portable document format (.pdf) only. Emails submitted to addresses other than the ones listed above or in formats other than those listed above or containing viruses will be rejected. It is the responsibility of the appellant to confirm receipt of appeals submitted by electronic mail. For electronically mailed appeals, the sender should normally receive an automated electronic acknowledgement from the agency as confirmation of receipt. If the sender does not receive an automated acknowledgement of the receipt of the appeal, it is the sender's responsibility to ensure timely receipt by other means;
3. Delivered to: Pacific Northwest Regional Office, 1220 SW 3rd Avenue, Portland, OR 97204. Hand deliveries can occur between 8:00 AM and 4:30 PM, Monday through Friday except legal holidays; or
4. Faxed to: *Regional Forester, Attn: 1570 APPEALS at* ***(541)575-3319***

Notices of appeal must meet the following appeal requirements outlined in 36 CFR 215.14:

1. State that the document is an appeal filed pursuant to 36 CFR 215;
2. List the name and address of the appellant, and if possible, a telephone number;
3. Identify the decision document being appealed by the title and subject, date of the decision, and name and title of the Responsible Official;
4. Identify the specific change(s) in the decision that the appellant seeks or the portion of the decision to which the appellant objects; and
5. State how the Responsible Official's decision fails to consider comments previously provided, either before or during the comment period in 36 CFR 215.6 and, if applicable, how the appellant believes the decision violates law, regulation, or policy.

Chapter 5 References, Glossary, and Index

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Glossary

Active crown fire – Continuous crown fire that burns the entire canopy fuel complex but depends on heat from surface fuel combustion for continued spread.

Age class - A group of trees that started growing (regenerated) within the same time frame, usually 20 years. A single age class would have trees that are within 20 years of the same age, such as 1-20 years or 21-40 years.

Airshed - A geographic area that, because of topography, meteorology, and climate, shares the same air.

Allotment (range allotment) **-** Area designated for use by a prescribed number of livestock for a prescribed time period.

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.

Aspect - The direction a surface faces. A hillside facing east has an eastern aspect.

Basal area - The area of the cross-section of a tree trunk near its base, usually 4 1/2 feet above the ground. Basal area is a way to measure how much of a site is occupied by trees. The term basal area is often used to describe the collective basal area of trees per acre.

Big game summer range – A range usually at higher elevations, used by deer and elk during the summer. Summer ranges are usually much more extensive than winter ranges.

Big game winter range – A range usually at lower elevation used by migratory deer and elk during the winter months; usually more clearly defined and smaller than summer range.

Biomass – The total quantity at a given time, of living organisms of one or more species per unit of space (species biomass), or of all the species in a biotic community (community biomass).

Biophysical Environments – PAG (Plant Association Groups) **-** Vegetation classification using similar moisture and temperature environments resulting in similar fire regimes.

Browse - Twigs, leaves, and young shoots of trees and shrubs that animals eat (such as deer and elk).

Buffer - A land area designated to block or absorb impacts to the area beyond the buffer. For example, a streamside buffer is often retained to reduce impacts of a harvest unit.

Burn window - a predetermined set of weather conditions that ensure resource objectives will be met, fires can be easily kept within the project areas, and that smoke would have a short duration impact to surrounding areas.

Canopy - In a forest, the branches of the uppermost layer of foliage. It can also be used to describe lower layers in a multistoried forest.

Canopy base height – The lowest height above the ground at which there is a sufficient amount of canopy fuel to propagate fire vertically into the canopy.

Canopy closure – The amount of ground surface shaded by tree canopies as seen from above. Used to describe how open or dense a stand of trees is, often expressed in 10 percent increments.

Canopy Fuels - the part of the canopy that can burn in the flaming front of a crown fire. The foliage and some branch wood, which is less than 0.25 inches (0.6 cm) in size, are usually considered available canopy fuel. Larger fuel pieces in the canopy do not burn quickly enough to contribute to crown fire spread and are not considered canopy fuels

Cavity - A hole in a tree often used by wildlife species, usually birds, for nesting, roosting, and reproduction.

Cold Dry Forest – Occupy high elevation sites, northerly aspects, and colder, relatively dry areas. Stands are composed of Englemann spruce, subalpine fir, whitebark pine, and lodgepole pine and the fire regime is high intensity, low frequency (50-275+ years) with noticeable susceptibility to torching and crown fires.

Commercial thinning – This prescription would thin small/medium size trees (7 to 20.9" dbh) in immature forest stands by thinning from below to reduce stocking levels. The goal is to reduce canopy fuels, enhance individual tree growth, and to allow for the reintroduction of fire. Thinning from below means the majority of the trees to be cut are in the smallest diameter sizes (9 to 14" dbh) and relatively few trees would be cut in the medium diameters (15 to 20.9" dbh).

Compaction – Making soil hard and dense, decreasing its ability to support vegetation. After compaction, it is difficult for roots to penetrate because the soil holds less oxygen and water.

Condition Class – (fire regime condition class) a classification of the amount of departure from the natural regime. There are three condition classes for each fire regime. The classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure results in changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and diseased mortality, grazing, and drought) (Hann et al. 2003).

Conifer - A tree that produces cones, such as a pine, spruce, or fir tree.

Conversion to early seral species – This prescription seeks to reduce the effects of fir ingrowth into stands that historically had a frequent fire return. These stands are presently in a condition where fire would most likely cause high mortality, the objective is to return it into a condition where fire can eventually be re-introduced and allowed to play its natural role. It would remove late seral species trees from the middle and understory, thin early seral species trees where they are over stocked, and reforest any resulting understocked areas to historic stocking levels. Where early seral species trees are not available, a minimum of 20 trees per acre would be left to provide structural variety and future large snag recruitment.

Cool Moist Forest – Occupy mid to higher elevations, northerly aspects and cooler areas that are relatively wet. Stands are composed of grand fir, western white pine, Englemann spruce, subalpine fir, and western larch. Fire regime is mixed, with low intensity, high frequency (10-15 years) regime overlaid with a high intensity, low frequency (100-200 years) regime. Patch size would range from 200 to 2,000 acres

Cool Wet Forest – Similar to warm dry, but located in areas of more moisture with more shrubs such as ninebark, shrub maples, and oceanspray in the understory. Fire regime is low intensity, high frequency (10-15 years) over most of the area, with small patches of mortality.

Corridor - Elements of the landscape that connect similar areas. Streamside vegetation may create a corridor of willows and hardwoods between meadows where wildlife feed.

Cover - Any feature that conceals wildlife or fish, sometimes referred to as "hiding cover." Cover may be dead or live vegetation, boulders, or undercut stream banks. Animals use cover to escape from predators, rest, or feed.

Cover forage ratio - The ratio of hiding cover to foraging areas for wildlife species. Necessary in determining the effectiveness of the habitat an area provides.

Critical habitat - Areas designated for the survival and recovery of federally listed threatened or endangered species.

Crown - The part of a tree containing life foliage; treetops.

Crown fire – A forest fire that advances through the crown fuel layer normally in direct conjunction with a surface fire.

Cull Trees – Tree or log that does not meet commercial merchantability specifications

Cultural resource - The remains of sites, structures, or objects used by people in the past (at least 50 years old); this can be prehistoric or historical.

Danger Tree – A hazard tree is considered to be any tree that is likely to fail within one and one-half tree lengths of an open class 3 or higher system road, any road designated for hauling, developed recreation or administrative site."

Decommission – Activity that results in the stabilization and restoration of unneeded roads to a more natural state. Removes the road segment from the Forest road inventory system. Decommissioning can involve: closing entrances; scarifying road surfaces, or decompacting (sub-soiling) to establish vegetation and reduce run-off.; seeding to control erosion; partial to full restoration of stream channel by removing culverts and fills; and removing unstable portions of embankments.

Desired future condition - A portrayal of the land or resource conditions that are expected to result if goals and objectives are fully achieved.

Disturbance - Any event, such as flood, wildfire, insect infestations, or timber harvest, that alters the structure, composition, or functions of terrestrial or aquatic habitats.

Diversity - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

DOG – Areas chosen to manage for old- growth characteristics for old-growth dependent species

Duff – Organic matter in various stages of decomposition on the floor of the forest.

Early seral Species – Early seral refers to plants that are present soon after a disturbance or at the beginning of a new successional process

Eastside Screens – Regional Foresters's Forest Plan Amendment (June 1995) designed to maintain options for old growth related and other species.

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.

Endangered species - A plant or animal that is in danger of extinction throughout all or a significant portion of its range. Endangered species are identified by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.

Ephemeral streams - Streams that flow only as the direct result of rainfall or snowmelt. They have no permanent flow.

Erosion - The wearing away of the land surface by wind, water, ice, gravity, or other geological activities. Erosion can be intensified by human activities (such as road building) that may reduce the stability of soils or slopes.

Even-aged management - Method of forest management in which trees, usually the same species, are maintained at the same age and size and harvested all at once so a new stand may grow.

Fine fuels – Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than ¼ -inch in diameter and have a time lag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

Fire behavior – How fire reacts to the influences of fuel, weather, and topography.

Fire hazard – the potential magnitude of fire behavior and effects as a function of fuel conditions for any particular forest stand or landscape.

Fire regime – A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention, but including the influence of aboriginal burning (Agee 1993). Coarse scale definitions for natural (historical) fire regimes have been developed and interpreted for fire and fuels management. The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation (Hann et al. 2003).

Fire return interval - The average number of years between successive fires in a designated area.

Fire risk – the chance of a fire starting from any ignition source, determined by using the frequency of past fire starts.

Fire severity or Burn severity –Severity describes the fire-caused damage to the soil. The severity ratings (high, moderate, and low) are based on standards in Forest Service Handbook 2509.13.

Fire-dependent - Forests, grasslands, and other ecosystems historically composed of species that evolved with and are maintained by periodic fire.

Fire-intolerant – Species of plants that do not grow well or die from the effects of too much fire. Generally these are shade-tolerant species.

Fire-tolerant – Species of plants that can withstand certain frequency and intensity of fire. Generally these are shade–intolerant species.

Forage - Vegetation (both woody and non-woody) eaten by animals, especially big game and livestock.

Foreground - The part of a scene or landscape that is nearest the viewer.

Forest health – The condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity while providing for human needs and values. It is a useful way to communicate about the current condition of the forest, especially with regard to resiliency, a part of forest health that describes the ability of the ecosystem to respond to disturbances. Forest health and resiliency can be described, in part, by species composition, density, and structure.

Fragmentation - The breakup of a large land area (such as a forest) into smaller patches that are isolated from the original area. Fragmentation can occur naturally (as by stand-replacing wildfire) or from human activities (such as road building).

Fuel ladder - Shrubs, small trees, and low growing branches that allow fire to move from the ground to the tree crowns.

Fuel(s) – Combustible material that includes vegetation such as grass, leaves, ground litter, plants, shrubs, and trees. Includes both living plants; dead, woody vegetative materials; and other vegetative materials which are capable of burning.

Ground fire - A fire that burns along the forest floor and does not affect trees with thick bark or high crowns.

Ground fuels – All combustible materials below the surface litter layer. These fuels may be partially decomposed, such as forest soil organic layers (duff), dead moss and lichen layers, punky wood and deep organic layers (peat), or may be living plant material, such as tree and shrub roots.

Habitat - The place where a plant or animal finds what it needs to survive, either year-round or seasonally.

Harvest – (1) Felling and removal of trees from the forest; (2) removal of game animals or fish from a population, typically by hunting or fishing.

Haul routes – Routes restricted to logging use only during the workweek and closed to all during weekends

Helicopter Landing zone – a landing area, just large enough (< .5 acre) for small helicopters to safely land and take off.

Hiding area/cover - Vegetation capable of hiding 90 percent of an adult elk from a human's view at a distance of 200 feet or less.

Historical Range of Variability (HRV) – The natural fluctuation of components of healthy ecosystems over time. In this EIS, it refers to the range of conditions and processes that are likely to have occurred prior to settlement of the project area by people of European descent (approximately the mid 1800s), which would have varied within certain limits over time.

Hot Dry Forest – Occupies low to mid elevations and mainly south slopes. Stands are composed primarily of ponderosa pine. Fire regime is low intensity, high frequency (10-15 years) over most of the area, with small patches of mortality.

Intensity (fire intensity) - The rate of heat release for an entire fire at a specific time.

Intermittent stream - A stream that flows only at certain times of the year when it receives water from streams or some surface source, such as melting snow.

Inventoried Roadless Area (IRA) – Areas identified in a set of inventoried roadless area maps, contained in the Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000, and any subsequent update or revision of those maps through the land management planning process

Irretrievable – A category of impacts that applies to losses of production or commitment of renewable natural resources.

Irreversible – A category of impacts that applies to non-renewable resources, such as minerals. 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 of time, such as the loss of soil productivity.

Issue – A matter of controversy, dispute, or general concern over resource management activities or land uses. To be considered a “significant “ EIS issue, it must be well defined, relevant to the proposed action, and within the ability of the agency to address through alternative management strategies.

Ladder fuels – Fuels which provide vertical continuity between strata. Fire is able to carry from the surface fuels by convection into the crowns with relative ease.

Landing zone- Any place where cut timber is collected before further transport from the timber sale area.

Late Seral Species – Late or old seral refers to plant present during a later stage of plan community succession (mature and old-growth forest).

Logging systems – Tractor Logging – A system of log transportation in which logs are pulled from the woods to a landing by means of a crawler tractor, skidder, or similar ground-based equipment

High-Lead logging – A system of cable logging in which the working lines are elevated at the landing areas by a rigged wooden tree or portable steel spar.

Skyline Logging – A system of cable logging in which all or part of the weight of the logs is supported during yarding by a suspended cable.

Balloon Logging – A system of cable logging in which the weight of the logs is counteracted by the lift provided by a lighter-than-air balloon.

Helicopter Logging – A system of transportation logs from the woods to a landing as an external load on a helicopter

Maintenance burning - maintenance burns are designed to reduce fuel on the surface: grass, pine needles, and dead and down wood to reduce the potential for rapid fire spread. Usually follows 2-3 years after an initial prescribe burn reduces the fuel loading to the desired levels to allow for low intensity frequent fires.

Marginal cover – A stand of coniferous trees 10 or more feet tall with an average canopy closure equal to or more than 40 percent but less than 70 percent and generally capable of obscuring at least 90 percent of a standing elk from the view of humans at a distance of 200 feet..

Mechanical Treatments – Vegetation changes done by mechanical cutting methods instead of by other means, such as prescribed burning.

Merchantable timber - Timber that can be bought or sold.

Middleground – A term used in visual management to describe the portions of a view extending from the foreground zone out to 3 to 5 miles from the observer.

MIS (management indicator species) - A wildlife species selected by a land management agency to indicate the health of the ecosystem in which it lives and, consequently, the effects of forest management activities on that ecosystem (see "indicator species").

Mitigation - Measures designed to counteract environmental impacts or make impacts less severe.

Mixed stand - A stand consisting of two or more tree species.

Monitoring - A process of collecting information to evaluate whether or not objectives of a project and its mitigation activities are being realized.

Mortality - The loss of a population due to all lethal causes, often referring to the rate of death of a species in a given population or community.

Mosaic - A pattern of vegetation in which two or more kinds of plant communities are interspersed in patches, such as a meadow between stands of old growth.

Multiple-use management – The management of public lands and their various resource values so they are used in the combination that best meets the present and future needs of the American people.

National Forest System Road - A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority.

Noxious weed - A weed that causes disease or has other adverse effects on man or his environment and, therefore, is detrimental to public health and the agriculture and commerce of the United States. Noxiousweeds are often aggressive and difficult to manage and non-native, new, or not common to the United States.

Old Forest Multi Strata (OFMS) – Large trees are frequent, has multiple canopies.

Old Forest Single Strata (OFSS) – Large trees are frequent, limited understory and one canopy level.

Old growth - Old forests often containing several canopy layers, variety in tree sizes and species, decadent old trees, and standing and dead woody material.

Open Road Density – Miles of open road per square mile

Overstory - The upper canopy layer; the plants below comprise the understory.

PACFISH – Interim strategies for managing Pacific anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California.

Park-like structure - Stands with large scattered trees, few or no understory trees, and open growing conditions, usually maintained by frequent ground fires.

Passive Crown Fire – Fire that kills individual trees or small groups of trees (torching).

Perennial stream - A stream that flows throughout the year from its source to mouth.

Pile burning - Cut material piled either by hand or mechanical – resulting from logging or fuel management activities – are burned during the wetter months to reduce damage to residual stand and to confine fire to the size of the pile. Piling allows for the material to cure, producing less smoke and rapid consumption when burned.

Pre-commercial thinning – Thinning in tree stands where the trees to be cut are not merchantable saw log sized material (1" to 9" dbh). The objective is to reduce ladder fuels, reduce the amount of live and dead fuels, and increase tree growth.

Prescribed fire - The intentional use of fire under specified conditions to achieve specific management objectives.

Prescription – Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, and environmental, geographic, administrative, social, or legal considerations.

PWA – Potential Wilderness Area; an area that qualifies for placement on the potential wilderness inventory if they meet criteria as outlined in Forest Service Handbook 1909.12, Chapter 71.

PWFA – Pileated Woodpecker Feeding Area

Rangeland (range) - Land on which the principle natural plant cover is composed of native grasses, forbs, and shrubs that are valuable as forage for livestock and big game.

Redd –Spawning nest made by salmon or steelhead in the gravel bed of a river.

Reforestation - The restocking of an area with forest trees by either natural or artificial means such as planting.

Regeneration harvest - A silvicultural treatment intended to regenerate a stand of trees. Shelterwood and seed tree harvests are forms of regeneration treatments.

Resident fish – Fish that spend their entire life in freshwater: examples include bull trout and westslope cutthroat trout.

Resiliency - The capacity of a plant community or ecosystem to maintain or regain normal function and development following disturbance.

b- Establishing or reestablishing desirable plants on a site where they are absent or in few numbers. Revegetation can be accomplished through natural or artificial reseeding or transplanting.

Riparian area - The interface between aquatic and terrestrial ecosystems that is identified by the presence of vegetation that requires or tolerates free or unbound water or conditions that are more moist than normal.

Riparian Habitat Conservation Area (RHCA) – Portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of the stream's water, sediment, woody debris and nutrient delivery systems. RHCAs are further defined into four categories.

Category 1 – Fish-bearing streams: Interim RHCAs consist of the stream and the area on either 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, including both sides of the stream channel), whichever is greatest

Category 2 – Permanently flowing non-fish-bearing streams: Interim RHCAs consist of the stream and the area on either 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 flood plain, 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, including both sides of the stream channel), whichever is greatest.

Category 3 – Ponds, lakes, reservoirs, and wetlands greater than 1 acre: Interim RHCAs consist of the body of water or wetland and the area to the outer edge of the riparian vegetation, or to the extent of the seasonally saturated soil, or to 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.

Category 4 – Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslide-prone areas: This category includes features with high variability in size and site-specific characteristics. At a minimum the interim RHCAs must include:

1. The extent of landslides and landslide-prone areas
2. The intermittent stream channel and the area to the top of the inner gorge,
3. The intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation, and
4. For Key Watershed, 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;
5. For watersheds not identified as Key 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

In non-forested rangeland ecosystems, the interim RHCA width for permanently flowing streams in category 1 and 2 is the extent of the 100 year flood plain.

Road – A motor vehicle route over 50 inches wide, unless identified and managed as a trail.

Road Decommissioning – Road decommissioning would eliminate future use of the road with the objective of restoring hydrological function. This can include subsoiling and seeding as necessary.

Road Maintenance – Road maintenance activities include blading and shaping road surfaces, repairing a damaged ditch-relief culvert, rocking existing drain dips and grade sags where needed, rocking wet areas of road, brushing, removal of danger trees, and dust abatement.

Road Reconstruction – Road reconstruction can consist of constructing new drainage dips and waterbars, constructing new outlet ditches, placing geotextile material on existing road surfaces, repair or replacement of existing cattle guards, and tree and stump removal.

ROG – Replacement Old-Growth areas (ROGs) are chosen to provide future old-growth habitat if current designated stands no longer meet old-growth characteristics

Satisfactory cover – A stand of coniferous trees 40 or more feet tall with an average canopy closure equal to or more than 70 percent. Umatilla Forest Plan defines it as cover used by animals to ameliorate the effect of weather.

Scoping - The early stages of preparation of an environmental analysis to determine public opinion, receive comments and suggestions, and determine issues during the environmental analysis process. It may involve public meetings, telephone conversations, or letters.

Sensitive species - A sensitive species is one that has been designated by the Regional Forester because of concern for population viability. Indications for concern include significant current or predicted downward trends in population numbers or density or in habitat capability that would reduce an existing species distribution.

Seral - Refers to the sequence of transitional plant communities during succession. Early seral refers to plants that are present soon after a disturbance or at the beginning of a new successional process (such as seedling or sapling growth stages in a forest); mid-seral in a forest would refer to pole or medium saw timber growth stages; late or old seral refers to plants present during a later stage of plant community succession (such as mature or old forest stages).

Shade-intolerant species - Species of plants that do not grow well in the shade of others. They are species that develop on a site soon after a major disturbance. Ponderosa pine and western larch are shade-intolerant tree species.

Shade-tolerant species - Species of plants that grow well in the shade of others. Douglas-fir is a relatively shade-tolerant tree.

Shelterwood harvest - A regeneration cut designed to establish a new crop of trees under the protection of the old. This type of harvest typically occurs in stages with a second entry following the first after regeneration has occurred.

Silviculture - The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

Skyline – A cableway stretched tautly between two spars and used as a track for log carriers

Slash - The residue left on the ground after timber cutting or after a storm, fire, or other event. Slash includes unused logs, uprooted stumps, broken or uprooted stems, branches, bark, etc.

Smolt – Young salmon or trout migrating to the ocean and undergoing biological changes to enable them to move from freshwater streams to saltwater.

Snag - A standing dead tree.

Soil compaction - The reduction of soil volume. For instance, the weight of heavy equipment on soils can compact the soil and thereby change it in some ways, such as in its ability to absorb water.

Soil productivity - The capacity of a soil to produce a specific crop. Productivity depends on adequate moisture and soil nutrients as well as favorable climate.

Spawning habitat – Areas used by adult fish for laying and fertilizing eggs.

Special use permit - A permit issued to an individual or group by the USDA Forest Service for use of National Forest land for a special purpose. Examples might be a special use permit for the Boy Scout Jamboree or a mountain bike race.

Stand - A group of trees in a specific area that are sufficiently alike in composition, age, arrangement, and condition so as to be distinguishable from the forest in adjoining areas.

Stand density – Refers to the number of trees growing in a given area, usually expressed in trees per acre.

Stand Initiation (SI) – A single canopy stratum of seedlings and saplings established after a stand replacing disturbance.

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 (multistory).

Stem Exclusion Closed Canopy (SECC) – A single canopy stratum of pole to small saw sized timber that excludes an understory by shade.

Stem Exclusion Open Canopy (SEOC) – A single canopy stratum of pole to small saw sized timber that excludes an understory by lack of water.

Structural Stage – Classification of forest stands by developmental stage and size.

Subsoiling – a treatment to loosen compacted soil at the compacted layer without inversion and with a minimum of mixing with the tilled zone.

Subwatershed – A drainage area of approximately 20,000 acres, equivalent to a 6th-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6th-field HUC) are contained within a watershed (5th-field HUC), which in turn is contained within a subbasin (4th-field HUC).

Surface Fire – Fire that remains on the ground surface.

Sustainability – (1) Meeting the needs of the present without compromising the abilities of future generations to meet their needs; emphasizing and maintaining the underlying ecological processes that ensure long-term productivity of goods, services, and values without impairing productivity of the land. (2) In commodity production, refers to the yield of a natural resource that can be produced continually at a given intensity of management.

Thermal cover - Cover used by animals against weather. For example, thermal cover for elk can be found in a stand of coniferous trees at least 40 feet tall with a crown closure of at least 70 percent.

Thinning - An intermediate cutting method designed to reduce stand density in order to improve growth of the residual trees, enhance forest health, or recover potential mortality resulting from inter-tree competition.

Threatened species - Those plant or animal species likely to become endangered throughout all or a specific portion of their range within the foreseeable future as designated by the US Fish and Wildlife Service under the Endangered Species Act of 1973.

Tiering – In an EIS, refers to incorporating by reference the analyses in an EIS of a broader scope. For example, a Forest Service project-level EIS could tier to the analysis in a Forest Plan EIS; a Forest Plan EIS could tier to a Regional Guide EIS.

Torching Index – an indicator of crown fire hazard, it is the 20-foot wind speed in miles per hour at which a surface fire is expected to ignite the crown layer dependent on surface fuels, surface fuel moisture, canopy base height, slope steepness, and wind reduction by the canopy. As surface fire intensity increases (with increasing fuel loads, drier fuels, or steeper slopes), or canopy base height decreases, it takes less wind to cause a surface fire to become a crown fire.

Total cover – All coniferous tree cover 10 or more feet tall and with a canopy closure of equal to or greater than 40 percent (i.e. satisfactory cover plus marginal cover),

Tractor logging - A logging method that uses tractors to carry or drag logs from the stump to a landing.

Underburn - A burn by a surface fire that can consume ground vegetation and ladder fuels.

Understory - The trees and woody shrubs growing beneath the overstory.

Understory Reinitiation (UR) – The overstory has been opened up by natural mortality or thinning, allowing an understory to become established.

Understory removal - A thinning from below that removes both commercial and precommercial sized trees (1” to 20.9” dbh) from multi-storied stands. The result is a thinning from below to reduce ladder and canopy fuels and to enhance the survivability of the larger trees in the stand from fire and insect attack.

Uneven-aged management - Method of forest management in which trees of different species in a given stand are maintained at many ages and sizes to permit continuous natural regeneration. Selective cutting is one example of an uneven-aged management method.

Unsuitable lands - Forest land that is not managed for timber production. Reasons may be matters of policy, ecology, technology, silviculture, or economics.

Vegetation management - Activities designed primarily to promote the health of forest vegetation for multiple-use purposes.

Vertical diversity - The diversity in a stand that results from the different layers or tiers of vegetation.

Visual quality objective (VQO) - A set of measurable goals for the management of forest visual resources.

Warm Dry Forest – Occupy low to mid elevations and south slopes at higher elevations. Stands are composed of ponderosa pine, Douglas-fir, lodgepole, grand fir, and western larch. Fire regime is low intensity, high frequency (10-15 years) over most of the area, with small patches of mortality.

Watershed - The entire region drained by a waterway (or into a lake or reservoir). More specifically, a watershed is an area of land above a given point on a stream that contributes water to the stream flow at that point.

Wetlands - Areas that are permanently wet or intermittently covered with water. Wetlands generally include swamps, bogs, seeps, wet meadows, and natural ponds.

Wildfire - A human or naturally caused wildland fire that does not meet land management objectives.

Winter range - That portion of big game's range where animals congregate for the winter.

Yarding – Hauling timber from the stump to a collection point.

Young Forest Multi Strata (YFMS) – Multiple canopy layers provide vertical and horizontal diversity with a mix of tree sizes. Large trees are absent or at low stocking levels.

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Acronyms

ACHP	Advisory Council on Historic Preservation
AIRFA	American Indian Religious Freedom Act
ARBO	Aquatic Restoration Programmatic Biological Opinion
ARPA	Archaeological Resource Protection Act
BA/BE	Biological Assessment/Evaluation
BMFP	Blue Mountain Forest Partners
BMP	Best Management Practices
BMRD	Blue Mountain Ranger District
BO	Biological Opinion
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
DBH	Diameter Breast Height
DecAID	Decayed Wood Advisor
DEIS	Draft Environmental Impact Statement
DFC	Desired Future Condition
DOG	Dedicated Old Growth
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EUI	Ecological Unit Inventory
FEIS	Final Environmental Impact Statement
FFE-FVS	Fuels and Fire Extension for FVS
FM	Fuel Model
FRCC	Fire Regieme Condition Class
FSH	Forest Service Handbook
FSM	Forest Service Manual
FVS	Forest Vegetation Simulation
FWS	US Fish and Wildlife Service
GIS	Geographic Information System
Hecsrf	Overall Habitat Effectiveness
HEI	Habitat Effectiveness Index
HRV	Historic Range of Variability
IDT	Interdisciplinary Team
INFORMS	Integrated Forest Resource Management Systems
IRA	Inventoried Roadless Area
LRMP	Land and Resource Management Plan
LWD	Large Woody Debris
MA	Management Area
MCR	Mid-Columbia River
MFJD	Middle Fork John Day
MIS	Management Indicator Species
MMBF	Million Board Feet
MNF	Malheur National Forest
MO	Management Objective
MOU	Memorandum of Understanding
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSN	Most Similar Neighbor
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries System
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NRHP	National Register of Historic Places
ODEQ	Oregon Department of Environmental Quality
OFMS	Old Forest Multi-Strata
OFSS	Old Forest Single-Stratum
ORV	Off Road Vehicles
OSMP	Oregon Smoke Management Plan
PACFISH	Interim Strategies of Managing Anadromous Fish Producing Watersheds
PAG	Plant Association Group
PFA	Goshawk Post-Fledgling Area
PWA	Potential Wilderness Area
PWFAs	Pileated Woodpecker Feeding Areas
RHCA	Riparian Habitat Conservation Area
RMO	Riparian Management objective
RNA	Research Natural Area
ROD	Record of Decision
ROG	Replacement Old Growth

LOS	Late old Structure	**ROS**	Recreation opportunity Spectrum
SECC	Stem Exclusion Closed Canopy	**TES**	Threatened, Endangered and Sensitive Species
SEOC	Stem Exclusion Open Canopy	**TEVI**	Terrestrial Ecological Unit Inventory
SHPO	State Historic Preservation Office	**UR**	Understory Reinitiation
SI	Stand Initiation	**USDA**	United States Department of Agriculture
SIP	State Implementation Plans	**VQO**	Visual Quality Objective
SOPA	Schedule Of Proposed Actions	**WA**	Watershed Assessment
		YFMS	Young Forest Multi-Strata