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Final Environmental Impact Statement

Jackson Vegetation Management Project

Paulina Ranger District, Ochoco National Forest
Crook and Wheeler Counties, Oregon

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Jackson Vegetation Management Project
Final Environmental Impact Statement
Crook and Wheeler Counties, Oregon

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Abstract: This Environmental Impact Statement (FEIS) describes the effects of implementing vegetation management strategies and fuel reduction in the Jackson project area. The Jackson project area is located on the Paulina Ranger District of the Ochoco National Forest, approximately 60 miles east of Prineville, Oregon, and encompasses about 54,609 acres. Proposed vegetation and fuels treatments reduce the risk of stand loss due to overly dense stand conditions, increase the resistance of forest stands to insects and diseases, and change the distribution of fire regimes.

This EIS assesses the effects of three different alternatives: Alternative 1 No Action; Alternative 2 Proposed Action; and Alternative 3. Alternative 1 is the no action alternative and would not treat any acres. Alternative 2 would treat fuels and vegetation through the use of harvest (5,744 acres), noncommercial thinning (7,779 acres), juniper removal (893 acres) aspen treatment (295 acres), and underburning (7,485 acres). Alternative 3 would harvest (5,545 acres), noncommercial thin (6,564 acres), remove juniper (863 acres), treat aspen (293 acres) and underburn (6,697 acres). The Responsible Official has identified Alternative 2 as the preferred alternative.

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1. Appellant's name and address (§ 215.2), with a telephone number, if available;
2. Signature or other verification of authorship upon request (a scanned\ signature for electronic mail may be filed with the appeal);
3. When multiple names are listed on an appeal, identification of the lead appellant (§ 215.2) and verification of the identity of the lead appellant upon request;
4. The name of the project or activity for which the decision was made, the name and title of the Responsible Official, and the date of the decision;
5. The regulation under which the appeal is being filed, when there is an option to appeal under either this part or part 251, subpart C (§ 215.11(d));
6. Any specific change(s) in the decision that the appellant seeks and rationale for those changes;
7. Any portion(s) of the decision with which the appellant disagrees, and explanation for the disagreement;
8. Why the appellant believes the Responsible Official’s decision failed to consider the comments and;
9. How the appellant believes the decision specifically violates law, regulation, or policy.

SUMMARY

The Forest Service has prepared this Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. This EIS analyzes a proposal to use commercial timber harvest, noncommercial thinning, grapple piling, hand piling, and prescribed fire in the Deep Creek watershed for vegetation management and treatment of fuels. This EIS analyzes two additional alternatives (including the No Action Alternative); the significant issues associated with the proposal; and the direct, indirect, and cumulative effects of implementing any of the alternatives.

The Jackson project area is located on the Paulina Ranger District of the Ochoco National Forest, approximately 60 miles east of Prineville, Oregon. The approximately 54,609-acre project area falls within the Deep Creek watershed. Elevations range from 4,500 feet to 6,314 feet above sea level.

Why is the action being proposed?

The purpose and need for this proposal was derived from evaluating the Ochoco National Forest Land and Resource Management Plan (Forest Plan) (USDA Forest Service, 1989), identifying desired future conditions, and comparing them to the existing conditions in the project area. The purposes of this proposal are to:

- Move the seral and structural conditions of forest stands toward their historic ranges of variability, maintain and increase, over time, late and old structured stands, increase the resistance of forest stands to insects and disease, restore and enhance aspen stands, increase riparian vegetation and large tree structure in Riparian Habitat Conservation Areas (RHCAs) and maintain and increase broadleaf and shrub communities; and
- Move the distribution of fire regimes toward their historic ranges of variability, increase the amount of low-intensity fire conditions, decrease the amount of high-intensity fire conditions and maintain low-intensity fire conditions where they already exist.
- Provide wood products to meet public needs and contribute to the health of local and regional economies;
- Reduce the abundance of western juniper.

In 2010, the Ochoco National Forest conducted an analysis of the Deep Creek watershed. The Watershed Analysis included an extensive look at forest fuels and vegetation conditions, the relationship between those conditions and changes in fire hazard, insect and disease dynamics, wildlife habitat, and riparian health. The watershed analysis determined that almost all of the plant communities in the area have changed in the last 100 years and that many conditions are outside of the historic range of variability. Today, forest stands are denser and contain more shade-tolerant species than they have historically. Large trees are susceptible to mortality related to competition stress with understory trees. Fire suppression has allowed the amount of fuels to increase.

What action is proposed?

1. Alternative 2 in the Jackson Vegetation Management Project EIS was developed to respond to the purpose and need for the action. Alternative 2 includes commercial harvest (5,744 acres), noncommercial thinning (7,779 acres), and underburn (natural and activity fuels) (7,485). The treatment objectives are to reduce stand densities, reduce surface and ladder fuels, and reduce the risk of stand loss due to high fuel loadings. This alternative also includes objectives to maintain existing desired fuel levels, increase forest stand resilience to

insects and disease, move forested stands toward late and old structured stand conditions and enhance aspen stands and other hardwood communities.

Treatments would reduce the abundance of late seral, fire intolerant species and increase the amount of early seral, fire tolerant species such as ponderosa pine. In addition, vegetation management would occur within Riparian Habitat Conservation Areas to promote the growth and development of desired deciduous vegetation to enhance shading and riparian dependent species habitat. No trees over 21 inches in diameter would be harvested unless removal is necessary for safety or road construction.

Actions connected to the proposed action would include:

- Constructing 10 miles of new temporary roads, reestablishing 15 miles of temporary roads on existing disturbance, and reconstructing 0.3 miles of the existing road system to support project activities. Temporary roads on existing disturbance are roads constructed on previously disturbed ground where a remnant road bed remains.

What would it mean not to meet the need?

Forest Vegetation

Stands in the project area would continue growing. The amount of Late and Old Structure (LOS) would increase; however, the rate at which stands develop large tree characteristics would be hampered by over-stocked conditions. On drier sites, such as the ponderosa pine and Douglas-fir plant association groups, stand stagnation may preclude the attainment of additional large trees. Existing large trees would continue to be susceptible to mortality from competition with understory trees and the accompanying increase in risk of loss due to insect, disease, and wildfire. Acres dominated by ponderosa pine and western larch (early-seral species) would steadily decrease.

Upland shrub communities would continue to decline in vigor and abundance. Juniper dominance and conifer cover would increase with a resulting decrease in grass and shrub cover. The proportion of juniper on ponderosa pine, Douglas-fir and grand fir sites would continue to increase. Mountain mahogany and other shrubs would continue to decline in abundance.

No treatments to maintain or increase aspen stands and riparian plant communities would occur. Some aspen stands would continue to decline as conifer encroachment within these stands continues.

Fuels

Stands that are currently in low fire condition as a result of being thinned and burned in the 1980s and 1990s would not be maintained; instead these stands would transition into mixed fire conditions over time. The amount of forested acres within the mixed and high-intensity fire regimes would increase as fuel accumulates faster than it decomposes and the number of trees per acre in the understory increases. Limited vegetation management, aggressive wildfire suppression, and insect and disease mortality would continue the trend of fuel loadings accumulating in the form of dead and down trees, small diameter trees growing into the overstory, and dense crown conditions. These changes would increase the risk of landscape-scale crown fire, and the associated harmful effects to fish and wildlife habitat, soil productivity, late and old structural habitat, and air quality.

Are there other alternatives that would meet the need?

One other alternative was identified that would meet the need for the project.

Alternative 3 was developed to respond to the significant issue discussed in Chapter 1, while also meeting the stated purpose and need. This alternative focuses activities in forest stands with the objective to reduce stand densities, reduce hazardous fuels, reduce the risk of stand loss due to high

fuel loadings, enhance aspen stands, and reduce impacts associated with commercial thinning, noncommercial thinning and prescribed burning in RHCAs. Objectives also include maintaining desired fuel levels where they exist, increasing forest stand resiliency to insects and disease, and moving towards late and old structured stand conditions.

As a result of no commercial thinning and a decrease in noncommercial thinning and burning in RHCAs, commercial harvest would occur on approximately 199 fewer acres, noncommercial thinning would be reduced by 1,215 acres and underburning would decrease by 788 acres. The amount of noncommercial aspen stand treatments would increase by 30 acres and the amount of temporary road construction and reconstruction would remain the same.

What are the effects of the alternatives?

Forest Vegetation

Historic Range of Variability, Late and Old Structure and Stand Vigor

Under all alternatives, the amount of LOS would increase over time; however, the progression toward HRV would occur at dissimilar rates. Activities in each of the action alternatives would remove understory trees to reduce stand density, to maintain existing large trees, and to enhance the development of additional large trees. Harvest and noncommercial thinning would encourage the development of large structure at an accelerated rate. No live trees 21 inches in diameter or larger would be cut, except those trees considered hazardous to the logging/hauling operation. Activities would generally move stands from multi-strata conditions towards single-stratum conditions. The abundance of early-seral, fire tolerant species would be maintained and enhanced in the long-term; however, late-seral species would continue to be present in stands where they exist prior to treatment. In addition, reducing stocking density would increase tree vigor and reduce insect and disease hazard.

Alternative 2 would result in the greatest increase of single-strata LOS over time. The projections indicate that both Alternatives 2 and 3 would result in a 47 percent increase in total LOS in 20 years. These projections do not include any future management such as continued underburning, thinning, or other stand-tending activities that may occur in the future. Thus, the predicted amounts of multi-strata LOS tend to increase with time as succession and stand growth continue without future management activities other than continued fire suppression.

The proposed activities (commercial harvest and noncommercial thinning) included in each of the action alternatives are designed to reduce tree density and improve growth and vigor of the residual trees and reduce susceptibility to insects and disease. These activities would more quickly restore historic seral/structural stage conditions and improve growing conditions for larger trees than either no action or prescribed fire alone.

Aspen Stands

Harvest and noncommercial thinning in and around aspen stands would improve aspen vigor and allow aspen stands to expand. Immediately after treatment, the aspen sites would have reduced cover until the aspen and other broadleaf shrubs can respond. Response time and amount would vary by current aspen condition, post treatment fencing and intensity of treatment. About 295 acres of aspen treatments are proposed in Alternative 2 and 293 acres in Alternative 3.

Upland Grass and Shrub Communities

Proposed treatments in the uplands would open the tree canopy and allow increased grass and shrub development. Better overall forage conditions would encourage more dispersed grazing and browsing with potentially less pressure in riparian areas. Furthermore, the removal of slash and thinning of

thickets would allow more access for livestock into the uplands and potentially lower grazing pressure in riparian areas.

Juniper cutting would occur on 893 acres in Alternative 2 and 863 acres in Alternative 3. Old junipers and trees larger than 21 inches in diameter would remain.

Prescribed fire treatments would reduce stocking of seedling and sapling junipers. As a result of decreased stand density, shrub and grass cover would increase from recruitment of new plants and growth of existing plants.

It is anticipated that the proposed treatments in this project would also rejuvenate mountain mahogany. Survival of mountain mahogany seedlings would increase in treated stands in response to reduced conifer cover and exposed mineral soil. Other types of shrubs would increase from more vigorous sprouting and from recruitment of new seedlings.

Fuels

Alternative 2 would use commercial harvest, noncommercial thinning, and prescribed fire to move 4,091 acres from condition class 2 and 3 to condition class 1. Alternative 3 would use commercial harvest, non-commercial thinning, and prescribed fire to move 3,865 acres from condition Class 2 and 3 to condition class 1.

Alternatives 2 would reduce areas of medium/high fuel hazard in LOS by 386 acres and reduce areas that support medium/high fuel hazard in RHCAs by 776 acres. Alternative 3 would reduce areas of medium/high fuel hazard in LOS by 324 acres and reduce areas of medium/high fuel hazard in RHCAs by 224 acres.

What factors would be used in making the decision between alternatives?

The Responsible Official for this proposal is the Forest Supervisor of the Ochoco National Forest. The Responsible Official will decide whether to:

- Select the proposed action;
- Select an action alternative that has been considered in detail;
- Modify an action alternative;
- Select the no action alternative;
- Amend the Forest Plan;
- Identify what mitigation measures and monitoring would apply.

The Responsible Official will decide whether to conduct commercial harvest, noncommercial thinning, aspen treatments, and fuels reduction activities in the Jackson project area. The decision will be determined by how well each alternative provides the best mix of prospective results in regard to the purpose and need, the significant issues, and public comments.

What monitoring is necessary?

Implementation monitoring is necessary to assure the selected alternative and mitigation measures are implemented as designed and achieve the desired results. Monitoring that is necessary includes:

- Post-project surveys and monitoring of noxious weed infestations, including material sources, would be conducted to evaluate the effects of the project on noxious weeds and to continue

eradication treatments. Post-project surveys would identify new noxious weed infestations while they are small.

- Occupancy and reproduction in mapped raptor territories would be monitored during and after project implementation.
- Snag levels would be surveyed in selected areas during project preparation and after implementation.
- Temperature monitoring would be accomplished in identified stream reaches using temperature recorders. In addition, temperature and pre and post shade monitoring would be accomplished on selected aspen/hardwood stand improvement projects on units that include 303d listed streams to verify that the activities are not resulting in a measurable increase in water temperature and to determine the effects on shade or to determine if shade was affected.
- Post-project road closure/temporary road decommissioning would be evaluated for effectiveness and compliance with Best Management Practices (BMPs).

Which alternative is preferred?

Alternative 2 has been selected by the Responsible Official as the preferred alternative.

Changes between Draft and Final EIS

Chapter 1

Added Background Section

Chapter 2

Updated description of Alternatives 2 and 3

Updated and clarified Forest Plan Amendments

Updated and clarified project design criteria

Based on public comments, 2 new Alternatives Considered but Eliminated were added.

Chapter 3

Forested Vegetation- added PAG treatment table

Fire and Fuels- updated existing condition

Geology and Soils- updated cumulative effects

Hydrology- added skid trail and temporary road crossing tables and clarified RER analysis

Aquatic Species- updated and clarified analysis of red-band trout and Columbia spotted frog

Wildlife- updated and clarified snag analysis, TES, and MIS sections

Wilderness, Potential Wilderness Areas, Inventoried Roadless Areas and Other Undeveloped Lands section – reorganized and clarified

Air Quality- updated

Climate Change and Carbon Cycling- updated

Cumulative Effects- table updated

Appendices

Added a new Appendix that contains the response to comments received from 45 day comment period

Added table C-3- Programmatic Design Criteria for Columbia spotted frog table

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Structure

The Forest Service has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

Chapter 1. Purpose and Need for Action: The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2. Alternatives, including the Proposed Action: This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource topic.

Chapter 4. Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.

Index: The index provides page numbers by document topic.

Appendices: The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Paulina Ranger District, Prineville, Oregon.

Project Background

Deep Creek Vegetation Project (1999-2008)

In October 1999, based on the results of the Deep Creek Watershed Analysis, the Forest Service initiated the NEPA documentation process for the Deep Creek Watershed Vegetation Project. In April 2001, the Forest Service published a draft Environmental Impact Statement (EIS) and, after receiving public comments and making adjustments, issued a final EIS and Record of Decision (ROD) in September 2001. In response to an administrative appeal, the Forest Service withdrew the original ROD to perform additional analyses on the Project's effects. However, 8,980 acres of prescribed fire and 5,080 acres of noncommercial thinning were approved (See Chapter 3, Cumulative Effects). In July 2002, the Forest Service issued a draft Supplemental EIS (SEIS) for the Project. After receiving and considering public comments, the Forest Service issued a Final SEIS in January 2004. In January 2004, the Forest Service issued another ROD and selected modified Alternative C, which included commercial thinning on 6,261 acres, noncommercial thinning on 9,957 acres and fuel-reduction treatments on 5,379 acres. The ROD concluded that selected alternative presented "the best balance of activities suited for meeting the identified needs of the Deep Watershed at this time" and "balances water quality issues while improving uplands and riparian vegetation conditions and reducing susceptibility to moderate and high severity fires."

Following issuance of the 2004 ROD, an administrative appeal was filed and denied by the Forest Service. Shortly thereafter, a complaint was filed in the District Court of Oregon pursuant to the APA, alleging that the Forest Service's approval of the Project violated NEPA, NFMA, and the applicable Ochoco LRMP. In 2007, the District Court upheld the FSEIS and dismissed the action. The case was appealed to the 9th District Court and remanded back to the Forest Service in 2008. The Court concluded that FSEIS improperly tiered to the non-NEPA Watershed Analysis in considering the aggregate cumulative effects of past timber sales. However, the court concluded, based on direction provided by the Council of Environmental Quality in 2005, that the Forest Service is free to consider cumulative effects in the aggregate when considering past actions. In addition, like the district court, the 9th Circuit dismissed all of the appellant's other assertions and agreed that, in the case of the Deep project FSEIS, the Forest Service complied with all NFMA and Ochoco LRMP requirements.

Deep Creek Restoration Project (2004)

In 2004, the Forest Service authorized the Deep Creek Watershed Restoration Project Environmental Analysis (EA). The project proposed activities in RHCAs to replace culverts to allow passage of flood flows and improve upstream access for redband trout; create water developments, exclosures, and place large wood to better distribute livestock; repair headcuts and exposed cutbanks; close and decommission roads and reconstruct channel reaches to reduce instream sedimentation. The project was designed to move the watershed towards meeting interim Riparian Management Objectives (RMOs). See Chapter 3, Cumulative Effects for more details on the progress of the Deep Creek Restoration project.

Deep Creek Watershed Analysis (2010)

In October 2010, the Forest Service published an updated Deep Creek Watershed Analysis. The Watershed Analysis evaluated the existing condition and the desired future condition of the Deep Creek Watershed. In developing the Purpose and Need of the Jackson project, the Forest Service compared the existing condition; including the restoration work completed and/or planned in the Deep Restoration EA, and determined that additional vegetation management is necessary to meet the desired condition as described in the Forest Plan and defined in the Watershed Analysis.

Purpose and Need for Action

The Jackson Project area (54,609 acres) is contained within the Deep Creek watershed. The project area is located on the south slope of the eastern Ochoco Mountains and incorporates three subwatersheds; Jackson Creek (24,252 acres), Crazy/Deep Creek (14,572 acres), and Little Summit Prairie Creek (16,608 acres), on the Paulina District, Ochoco National Forest. The project area lies within Crook and Wheeler Counties. There are 822 acres of private land within the Jackson Planning Area. (See Map 1, Appendix D).

Legal Description

The legal description of the Deep Creek Project area is:

- **Crook County:**
  T.13S., R.22E., Sections 23 through 26, 35, and 36;
  T.14S., R.22E., Sections 1,2,11 through 14, 23 through 27, 35 and 36;
  T.14S., R.23E., Sections 1 through 36;
  T.15S., R.22E., Sections 1 and 2;
  T.15S., R.23E., Section 6; Willamette Meridian.

- **Wheeler County:**
  T.13S., R.22E., Sections 11, 13 and 14;
  T.13S., R.23E., Sections 7 through 36;
  T.13S., R.24E., Sections 7, 18, 19, 29 through 32;
  T.14S., R.24E., Sections 5 through 8, 16 through 21, 28 through 32; Willamette Meridian.

The Purpose and Need for this proposal was derived from evaluating current planning direction identified in the Forest Plan, identifying desired future conditions, and comparing them to the existing conditions in the project area. The 2010 Deep Creek Watershed Analysis was used as a basis for the existing condition. The purposes of this proposal are to:

1. Maintain and increase the abundance, over time, of late and old structure (LOS) stands, especially single-strata LOS;
2. Reduce the potential for high-intensity wildfires and maintain conditions that currently support low-intensity fires;
3. Reduce the susceptibility of the landscape to large-scale infestation by insects and disease;
4. Restore and enhance aspen stands. Reduce conifer competition and encroachment within aspen stands, provide protection for aspen regeneration, and supplement aspen restoration through planting.
5. Increase riparian vegetation and large tree structure in Riparian Habitat Conservation Areas (RHCAs);
6. Maintain and increase the abundance of early-seral, fire tolerant species composition (ponderosa pine and western larch);
7. Provide wood products to meet public needs and contribute to the health of local and regional economies;
8. Reduce the abundance of western juniper.

This action responds to the goals and objectives outlined in the Ochoco National Forest Land and Resource Management Plan as amended (Forest Plan), and helps move the project area towards desired conditions described in that plan.

Late and Old Structure (LOS), Early-seral Species Composition, and Infestations by Insects and Disease

The Forest Plan (p. 4-12) identifies a goal of maintaining forest health for present and future uses. The Forest Plan (p. 4-3) also has a goal to "maintain or enhance ecosystem functions to provide long-term productivity of forest resources and biological communities." The objective associated with this goal is to provide for all seral stages of plant associations, with a distribution that is ecologically sound. The Interim Ecosystem Standard in the Eastside Screens (Appendix B, p. 4) states "characterize … [the] watershed for patterns of stand structure … and compare to the historic range of variability." The Ochoco National Forest Viable Ecosystems Management Guide (Simpson et al. 1994) is a tool for analyzing each seral/structural stage for the plant associations found on the Ochoco National Forest. Managing an ecosystem within its range of natural (or historic) variability is a scientifically defensible way to maintain diverse, resilient, productive, and healthy systems (Simpson et al. 1994).

The vegetative conditions in the Jackson project area were characterized with the Viable Ecosystems Model (Simpson et al. 1994). This model was used to compare existing seral structural conditions to the historic range of variability (HRV). The model focuses on relationships between combinations of vegetation structure and species composition. Based on the comparison of seral structural conditions,

there are too many areas dominated by trees from 5 to 20.9 inches in diameter at breast height (dbh) and not enough areas dominated by large trees (greater than 21 inches dbh). Many areas have dense tree stocking in the understory and the abundance of species such as Douglas-fir and grand fir (late-seral species) has increased.

Late and old structure (LOS) is the vegetative stage in which large trees are common. Large trees are 21 inches dbh or larger. Historically, the amount of LOS within the project area would have ranged from approximately 13,200 to 25,910 acres. Today, the amount of area classified as LOS is approximately 4,490 acres, which is far below the HRV.

LOS is classified into two types, multi- or single-strata. Multi-strata LOS have two or more strata of trees present. Single-strata LOS is more open and have a single stratum of large trees; young trees are absent or exist sparsely in the understory. Historically, the single-strata condition was the most common type of LOS in the Jackson project area, and was distributed across approximately 10,750 to 20,235 acres. Currently, about 1,200 acres of single-strata LOS exists within the project area. Historically, multi-strata LOS ranged from 2,449 acres to 5,676 acres in the project area. Currently, there are approximately 3,289 acres classified as multi-strata LOS in the project area. About 73 percent of the existing LOS is multi-strata; historically, multi-strata LOS would have made up approximately 18 percent of the total amount.

The current departure from historic LOS conditions is primarily a result of past timber harvest, which removed large trees from the landscape. Fire exclusion over the past 90 years has encouraged the establishment and development of late-seral, shade-tolerant understory trees such as grand fir within what were once open stands of predominantly early-seral large trees. Historically, stands were less dense, contained a higher percentage of fire-tolerant species such as ponderosa pine and western larch, and had more open understory conditions. When stands become denser, additional competitive stress is placed on the remaining large trees. Trees under competitive stress are less vigorous, grow slower, and are more prone to being killed by insects and disease. Dense multi-strata stands are also more prone to stand replacement wildfire due to the presence of ladder fuels and increased canopy density.

Given the relatively small number of early-seral large trees and the time and growth needed to develop large trees, it is important to take action now to increase the resiliency of large trees and increase growth rates in smaller trees by reducing competition. Competition from intermediate and suppressed trees in ponderosa pine stands reduces growth of the large dominant and codominant trees (Cochran 1993). Overstocked stands are slow growing because of competition and are less resistant to insects and disease. Based on the low levels of LOS in the project area, there is a need for (1) increasing the abundance of LOS within the Jackson project area, especially single-strata LOS; (2) maintaining the existing amount of LOS; (3) maintaining existing large trees and encouraging the development of additional large trees; and (4) reducing competition among trees and reducing susceptibility to infestations by insects and disease.

Removing understory trees (less than 21” dbh) would:

1. ***Maintain and increase the future abundance of LOS by reducing competition.*** Noncommercial and commercial thinning would reduce stand densities to recommended stocking levels. This would encourage increased growth rates on the remaining trees allowing them to become large trees more rapidly. Noncommercial and commercial thinning would also remove trees with damage or disease and those weakest trees unlikely to ever become large trees. Reducing stand densities, removing ladder fuels, and reducing fuel loadings would also improve the likelihood of younger/smaller trees reaching large tree size without being killed in a wildfire. Noncommercial and commercial thinning would remove understories that have developed in the absence of frequent, low-intensity wildfire, which would move stands from a multi-strata condition toward a single-strata condition.

Noncommercial thinning and underburning would maintain stands that are currently single-strata by removing small trees before they develop into a full canopy stratum.

2. ***Maintain LOS by reducing the likelihood of a stand replacement wildfire.*** Removing ladder fuels and reducing crown densities through noncommercial and commercial thinning would raise canopy base height, reduce canopy bulk density, and reduce the potential for a high-intensity wildfire. Treatment of activity-generated and natural fuels would reduce surface fire intensity, lower flame heights, and reduce the potential for large trees to be killed.
3. ***Improve stand health by increasing vigor and reducing susceptibility to insect and disease related mortality.*** Reducing competition would allow the large trees to maintain or increase vigor, thus reducing their susceptibility to being killed by insects and disease. Noncommercial and commercial thinning would reduce the number of smaller trees, thus increasing the growing space available for the remaining large trees. Underburning would also reduce the number of small trees, although it is mostly effective on only the smallest trees or fire-intolerant species, such as grand fir.
4. ***Increase early-seral species composition.*** Noncommercial and commercial thinning, as well as underburning, would favor the retention of species which were more abundant historically. Fire-tolerant, early-seral species such as ponderosa pine and western larch would be favored for retention while fire-intolerant species such as grand fir would be targeted for removal. Stands of predominately fire-tolerant species would be more likely to survive a future wildfire.

Fuels

The Forest Plan (p. 4-9) identifies a goal to "Provide for the ecologically sound use of prescribed fire as a cost-effective management tool for achieving resource management objectives." The Forest Plan (p. 4-10) also identifies objectives related to prescribed burning. These objectives relate to reducing wildfire intensities to support a cost-efficient fire protection organization, and emulating the natural role of fire in maintaining environmental diversity and site productivity.

Since the Forest Plan was developed, there have been several efforts that stress the importance of reducing hazardous fuels and restoring healthy ecosystems. In April 1999, the General Accounting Office (GAO) concluded in a report to Congress that "the most extensive and serious problem related to the health of national forests in the interior West is the over-accumulation of vegetation." The GAO report criticized the Forest Service for not having "clear goals, objectives, direction, and budgets that adequately address ecosystem restoration and maintenance needs."

In April 2000, the Forest Service responded with "A Cohesive Strategy for Protecting People and Sustaining Resources in Fire-Adapted Ecosystems" (Cohesive Strategy). This strategy addresses the hazards and risks from unnatural over-accumulations of fuels in high-frequency, low-intensity fire regimes, and the wildfires in these regimes that can burn at high levels of severity. The purpose of the Cohesive Strategy is to restore and maintain health in fire-adapted ecosystems across the interior West (Cohesive Strategy, p. 10). The Cohesive Strategy outlines prescribed fire and mechanical fuels treatments to reduce the hazards and risks.

Later that same year, the National Fire Plan was developed with the intent of actively responding to severe wildland fires and their impacts to communities. The National Fire Plan recognizes that wildland fires play an integral role in many forest and rangeland ecosystems; however, decades of fire exclusion efforts have disrupted the natural fire regimes.

In August 2001, a 10-Year Comprehensive Strategy for reducing wildland fire risks was issued. The Comprehensive Strategy outlines an approach to "reduce the risks of wildfire to communities and the environment."

In August 2002, the President announced the Healthy Forests Initiative (HFI). The HFI recognized that "forest and rangelands of the West have become unnaturally dense, and ecosystem health has suffered" and that "these unhealthy forests, overloaded with fuels, are vulnerable to unnaturally severe wildfires." Congress responded in part to the HFI by passing the Healthy Forest Restoration Act to help reduce hazardous fuels and restore healthy forest and rangeland conditions.

Historically, the dominant disturbance factor in the project area was frequent, low-intensity fire that eliminated the majority of seedlings and saplings. Frequent, low-intensity fires helped to maintain open stands of large trees, dominated by ponderosa pine. These frequent fires resulted in low levels of surface fuels. In the absence of frequent, low-intensity fires, forest stands in the project area have developed multi-canopy conditions, stocking levels have increased, ladder fuels have increased, surface fuels have increased, and the abundance of late-seral, fire-intolerant species (such as grand fir) has increased. These changes from historic conditions have left forested stands susceptible to high-intensity wildfire, with an increased potential for the unwanted loss of trees, water quality, soil productivity, wildlife habitat, and other forest resources. High-intensity wildfires caused by these conditions also limit the suppression options available to firefighters, decreasing the safety, efficiency, and economy of fire suppression.

Aspen Stands

The Forest Plan (p. 4-3) identifies a goal of maintaining "native, historic, and desirable introduced plant and animal species and communities." The Forest Plan (p. 4-32) identifies a desired future condition in which hardwoods such as aspen, cottonwood, alder, and willow will be more common along streams, meadows, and wet areas. In other words, the desired future conditions is to have well distributed and vigorous hardwood communities across the project area. More specifically, the Forest Plan standards and guidelines (p. 4-121) state "manage aspen stands to produce a vigorous population, forest-wide."

Aspen grow in areas of locally high moisture such as meadows, seeps, and adjacent to streams. Conifer trees are encroaching into aspen stands in the project area. These conifers compete with the aspen trees for light, moisture, and growing space. Since the aspen trees are not shade tolerant, they can be shaded out by the encroaching conifers, which results in loss of vigor for the aspens in the short term, and can lead to loss of the clone(s) in the long term. There is a need for more vigorous aspen and other hardwood stands.

Removing conifer trees within and adjacent to aspen stands would reduce competition for light, moisture, and growing space. Reducing competition would also improve the vigor of aspen stands and prevent a decline in the abundance, distribution, and extent of aspen stands within the project area.

Riparian Habitat Conservation Areas

In 1995, the Decision Notice for the Inland Native Fish Strategy (INFISH) amended the Ochoco Forest Plan. INFISH established Interim Riparian Management Objectives (RMOs) for several fish habitat features.

The Forest Plan emphasis for riparian areas is to manage streamside vegetation and habitat to maintain or improve water quality. Forest Plan goals for riparian vegetation includes providing "an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems; and habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities" (INFISH, pp. A-1 to 2).

The amount and type of vegetation in riparian areas plays an important role in the maintaining and improving both water quality and fish habitat. The increasing amount of conifers in Riparian Habitat

Conservation Areas (RHCAs) prevents woody vegetation such as alder, willow, aspen, and shrubs from expanding. Conifers within RHCAs compete with these species for nutrients. Many of these broadleaf species are shade-intolerant; throughout the project area conifers are shading these brushy, shrubby species which are losing vigor. The roots of woody vegetation helps to stabilize streambanks and the stems act as a roughness element that reduces the velocity and erosive energy of over bank flow during high water events. Conifers do not provide the same bank stabilizing function as riparian hardwood species.

Based on stream surveys, the project area is deficient in the amount of large woody material in streams. Large woody material provides aquatic habitats and shade for streams. Redband trout, like many other salmonids, have evolved in stream systems in which large woody material helps retain organic and inorganic particulate matter that is important for channel stability, biological diversity, and productivity (Nakamura and Swanson 1993). Large wood influences habitat for fish and other aquatic organisms by serving as energy dissipaters, flow deflectors, and dams. Large woody material in streams and the adjacent flood plain provides streambank stability, decreases flow velocities, increases storage time (decreases downstream flood risk), and stores sediment. Large trees are needed in RHCAs because they become large woody material when they fall.

There is a need for fewer conifers within RHCAs. Reducing the amount of conifers within RHCAs would (1) encourage alder, willow, aspen, and other broadleaf species to expand, and (2) increase the growth rates of remaining conifers in RHCAs so they grow larger and can eventually provide future large wood to streams.

Forest Plan Direction and Other Guidance

The Ochoco National Forest Land and Resource Management Plan (Forest Plan) was approved in 1989, and has since been amended by several decisions. The Forest Plan, as amended, provides guidance for management activities on the Ochoco National Forest. The Forest Plan establishes goals, objectives, and desired future conditions, identifies management areas within the Forest, and provides standards and guidelines for each management area as well as Forest-wide standards and guidelines. In 1995, the Inland Native Fish Strategy (INFISH) Decision Notice amended the Forest Plan. INFISH added goals and objectives for inland native fish habitat condition and function, and identified Riparian Habitat Conservation Areas (RHCAs) where management activities will meet interim standards and guidelines. This proposal is tiered to the Final Environmental Impact Statement (FEIS) for the Forest Plan, as amended.

Forest Plan Management Areas

The major Ochoco National Forest management areas in the project area include (see Map 2, Appendix D):

Old Growth (MA-F6) 1,267 acres - Habitat will be provided for wildlife species dependent upon old-growth stands with pileated woodpecker as the management indicator species. The desired conditions for these areas are stands of mixed conifer and ponderosa pine with multi-layered canopy with shaded conditions and a large number of snags. Prescribed fire may be evident if natural fuels accumulate to dangerous levels, threatening the existence of the old-growth stand, or where vegetation manipulation is needed to maintain stand structure and species composition (Forest Plan, p. 4-58). Under standards and guidelines for the practice of Habitat Management, vegetative management will not be allowed, until further research is available on the needs of the dependent species (Forest Plan, p. 4-251). Under the standards and guidelines for the practice of Treatment of Natural Fuels, prescribed fire will normally not be applied in old growth, but where it can be supported by research, directives, and desired future condition, it might be utilized following

appropriate analysis and NFMA/NEPA procedures (Forest Plan, p. 4-136). The Forest Plan (p. 4-58) also identifies that additional acres of pileated woodpecker "feeding areas" averaging 300 acres in size be located in areas adjacent to allocated old-growth stands.

Summit Trail Visual Retention Corridor (MA-F7) 1,643 acres – The Summit Trail is a historic resource, and was found eligible for nomination to the National Register of Historic Places in January 1987. The emphasis of this management area is to protect the existing integrity of the Summit Trail and enhance and interpret significant segments for public enjoyment and education. Pristine segments of the trail will be managed to protect, interpret and preserve their historic qualities (Forest Plan, p. 4-61).

Developed Recreation (**MA-F13) 63 acres -** The objective of this area is to provide safe, healthful, and aesthetic facilities for people to utilize while they are pursuing a variety of recreational experiences within a relatively natural outdoor setting (Forest Plan, p. 4-71).

Dispersed Recreation (MA-F14) 30 acres- The emphasis of this area is to provide and maintain a near-natural setting for people to utilize while pursuing outdoor recreation experiences (Forest Plan, p. 4-72).

Riparian (MA-F15)- Manage streamside vegetation and habitat to improve water quality and meet temperature and turbidity levels as required by state standards under the Clean Water Act (see RHCA Riparian Habitat Conservation Area).

Deep Creek Recreation Area (MA-F19) 873 acres- The emphasis is to provide a near natural setting for recreational pursuits within the area where management activities are not visually evident (Forest Plan, p. 4-81).

General Forest (MA-F22) 48,684 acres - The emphasis for this area is to produce timber and forage while meeting the Forest-wide standards and guidelines for all resources. In ponderosa pine stands, management will emphasize production of high-value (quality) timber (Forest Plan, p. 4-86).

North Fork Crooked River Scenic Corridor (MA-F24) 46 acres- Management will maintain and enhance the natural appearing landscape and protect the scenic river designation. Several stands have been designated for old growth within the scenic river corridor. In cases where old growth restrictions are more restrictive than scenic river prescriptions, the old growth prescriptions will apply (Forest Plan, p. 4-91).

Visual Management Corridors (MA-F26) 1,987 acres - The emphasis in this area is to maintain the natural-appearing character of the forest along major travel routes. Forest Roads 2630, 12, and 30 have been allocated as visual management corridors with a visual quality objective of retention. The outer boundary of this area will generally not exceed 600 feet on each side of the road. Vegetation will be manipulated but will reflect a natural forest setting where stands of trees exist in multiple age classes (Forest Plan, p. 4-95).

Riparian Habitat Conservation Areas (RHCAs) 6,332 acres- RHCAs are portions of watersheds that have been delineated through the Inland Native Fish Strategy and overlap with some of the Forest Plan Management Areas listed above. Riparian-dependent resources receive primary emphasis in these areas. RHCAs include riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems. They have been delineated because of their influence on (1) the delivery of coarse sediment, organic matter, and woody material to streams; (2) root strength for channel stability; (3) shading of streams; and (4) the protection of water quality.

Eastside Screens

The Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales amended the Ochoco National Forest Land and Resource Management Plan in 1995. The direction only applies to the design and preparation of timber sales on eastside Forests and is often referred to as "Regional Forester's Forest Plan Amendment #2" or as the "Eastside Screens." The Eastside Screens contain guidelines for management of timber sales in late and old structured stands relative to the historical range of variability (ecosystem screen), wildlife corridors, snags, coarse woody debris, and goshawk management. All other noncommercial vegetative management treatments are exempt from the Eastside Screens. On June 11, 2003, the Regional Forester issued supplemental guidance for implementing Eastside Screens. The Regional Forester encouraged the consideration of Land and Resource Management Plan amendments in cases where the proposed treatments would move landscape conditions towards historic range of variability and provide single story late and old structure in the drier ponderosa pine and larch stands.

Inland Native Fish Strategy

The Inland Native Fish Strategy (INFISH) was intended to be interim direction to protect habitat and populations of resident native fish and to provide for options for management. The INFISH delineated RHCAs where riparian-dependent resources receive primary emphasis. These RHCAs include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems. These areas will be managed to maintain or restore water quality, stream channel integrity, channel processes, sediment regimes, instream flows, diversity and productivity of plant communities in riparian zones, and riparian and aquatic habitats to foster unique genetic fish stocks that evolved within the specific region. RHCAs run through and overlay other allocations (See Map 3, Appendix D, for RHCAs and distribution of redband trout).

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to implement commercial thinning on 5,744 acres, noncommercial thinning on 7,779 acres, juniper cutting on 893 acres, aspen treatments on 295 acres, and underburning (natural and activities fuel) on 7,485 acres. Commercial harvest would be accomplished by ground-based tractor systems with winter harvest required on 531 acres. An estimated 14.3 million board feet (mmbf) of timber would be harvested. Actions connected to the proposed action would include constructing 10 miles of new temporary roads; re-establishing 15 miles of temporary roads on existing disturbance, and reconstructing .3 miles of existing system road. Temporary roads on existing disturbance are roads constructed on previously disturbed ground where a remnant road bed remains. Temporary roads would closed and blocked following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly.

Decision Framework

The responsible official for this proposal is the Forest Supervisor of the Ochoco National Forest. The responsible official will decide whether to:

1. Select the proposed action, or
2. Select an action alternative that has been considered in detail, or
3. Modify an action alternative, or
4. Select the no-action alternative, and

5. Identify what mitigation measures and monitoring will apply, and
6. Determine whether to amend the Forest Plan.

The responsible official will decide whether to conduct commercial timber harvest, noncommercial thinning, aspen treatment, and fuels reduction activities in the Jackson project area. The decision will be determined by how well each alternative provides the best mix of prospective results in regard to the purpose and need, the issues, types and levels of effects, and public comments. The responsible official will consider:

1. Would LOS be maintained and increased? Would the amount of single-strata LOS be increased? Would stand density be reduced to remove competitive stress on large trees? Would the management activities result in more large trees being maintained over time, as well as encourage the development of additional large trees?
2. Would the density and species composition of forested stands be modified towards a balance of seral/structural stages as described by the historic range of variability? Would the susceptibility of the landscape to large-scale infestation by insects and disease be reduced? Would forested stands shift toward dominance by early-seral, fire-tolerant species such as ponderosa pine and western larch?
3. Would surface fuels, ladder fuels, and stand density be reduced to decrease the susceptibility to high-intensity wildfire? Would the abundance of late-seral, fire-intolerant species (such as grand fir) be reduced? Would fire regimes move toward those that occurred historically?
4. Would maintenance underburning occur to maintain conditions that currently support low-intensity fires?
5. Would the vigor of aspen stands be improved? Would the competition with conifers be reduced? Would the abundance, distribution, and extent of aspen stands within the project area be maintained or increased?
6. Would the proposed activities contribute toward meeting the interim Riparian Management Objectives contained in INFISH? Would the proposed activities in RHCAs encourage alder, willow, aspen, and other broadleaf species to expand? Would the proposed activities accelerate the development of large trees so they provide future large wood to streams?
7. Do the management requirements and design elements meet Forest Plan standards and guidelines for all resources?
8. Would the project provide wood products to meet public needs and contribute to the health of local and regional economies?

Public Involvement

The Notice of Intent (NOI) was published in the Federal Register on Friday, November 5th, 2010 (Vol. 75, No. 214). The NOI asked for public comment on the proposal from November 5th, 2010 to December 19th, 2010. Comments were received from twelve individuals or organizations. The agency held a public field trip to the project area on November 19, 2010. The field trip was attended by 7 members of the public. Using the comments from the public, as well as comments generated internally (see *Issues* section), the interdisciplinary team developed a list of issues to address.

A 45-day comment period for the Draft EIS was provided for interested parties and affected publics, including appropriate local, state and federal agencies and Tribes. The comment period began on January 14th 2012 and ended on February 27th, 2012. Eight comment letters were received during the comment period; a range of concerns and questions were expressed. All comments were reviewed and substantive comments received focus during the comment analysis (see Appendix D of this EIS).

Government to Government Consultation

Government-to-government notification of proposed action was submitted by mail to 4 tribes on November 26, 2010. The tribes included the Confederated Tribes of The Warm Springs Reservation, The Burns Paiute, The Klamath Tribes and the Confederated Tribes of the Umatilla Indian Reservation. The Forest Service did not receive any comments on the proposed action or the DEIS from the tribes.

Issues

Issues are points of discussion, debate, or dispute about environmental effects or competing uses of the resources that may occur as a result of the proposed action. Issues provide focus and influence alternative development, including development of mitigation measures to address potential environmental effects, particularly potential negative effects. Issues are also used to display differing effects between the proposed action and the alternatives regarding a specific resource element.

The project Interdisciplinary Team (IDT) sorted the comments received during initial scoping into categories to help issue tracking and response. The issues are categorized as follows:

Key issues: These are issues that cannot be resolved without some consideration of the trade-offs involved and so are used to develop alternatives and design elements. Trade-offs can be more clearly understood by developing alternatives and displaying the relative effects of these alternatives.

Analysis issues: Some issues were not used to develop alternatives and design elements, but nonetheless relate to environmental components that are considered in the analysis in Chapter 3. These issues are important for providing the Responsible Official with complete information about the effects of the project.

Key Issue

The Proposed Action includes 107 acres of commercial thinning and 1,465 acres of noncommercial thinning and fuels treatment activities in RHCAs. Proposed activities are intended to improve habitat conditions in the RHCAs by reducing stand density, to encourage growth of larger trees and maintaining or improving habitat for shade-producing species.

The Forest Service identified one key issue from the scoping comments that led to the development of Alternative 3. Comments suggested that the proposed riparian habitat restoration could be accomplished without allowing commercial harvesting or the use of heavy equipment in RHCAs. Other comments suggested that there should be no removal of trees providing primary or secondary shading of streams within INFISH buffers.

Management activities in RHCAs have the potential to demonstrate some positive or negative effects on water quality (as measured by stream temperature, flow and sediment delivery to streams), wildlife habitat, fish habitat and the percentage of riparian shade. Alternative 3 was developed with an emphasis on minimizing disturbances within RHCAs through the exclusion of commercial thinning and decreasing the acreage of noncommercial thinning, and burning. Alternative 3 does include 113 acres of noncommercial aspen treatment and associated prescribed burning in RHCAs.

Analysis Issues

Other issues and concerns were raised during scoping that did not result in different alternatives or design elements, but are considered during the analysis process and discussed in Chapter 3. These issues are generally less focused on the elements of Purpose and Need, than are the Significant Issues.

Soils - The long-term sustainability of forest ecosystems depends on the productivity and hydrologic function of soils. Ground-disturbing management activities directly affect soil properties, which may adversely change the natural capability of soils and their potential responses to natural processes and management. A detrimental soil condition often occurs where heavy equipment or logs displace soil surface layers or reduce soil porosity through compaction. Effects from these actions can potentially increase runoff and accelerate soil erosion. Detrimental disturbances reduce the soil's ability to supply nutrients, moisture, and air that support soil microorganisms and the growth of vegetation. The biological productivity of soils relates to the amount of surface organic matter and coarse woody debris retained or removed from affected sites.

Wildlife – The effects to the following resources are analyzed and compared by alternative:

- Threatened, Endangered, Candidate and Sensitive Species
- Management Indicator Species
- Resident and Migratory Landbirds

Water Quality and Fish Habitat – Deep Creek, Jackson Creek and Little Summit Prairie Creeks are listed on the 303(d) list as "Water Quality Limited" by the Oregon Department of Environmental Quality for temperatures exceeding State guidelines. Effects to water quality and fish habitat are analyzed and compared by alternative.

Botany –

- Potential effects to Threatened, Endangered, Candidate, and Sensitive, and plant species were analyzed.
- Proposed management activities have the potential to introduce or spread existing populations of invasive plants. Potential spread of invasive plants is a concern across the project area and this analysis incorporates prevention measures into the project design, as required by the Forest Plan and as described in the Deschutes/Ochoco Prevention Practices.

Cultural Resources – Proposed ground-disturbing activities may have an effect on cultural resources. The Ochoco National Forest is rich in cultural resources. Avoidance of potential sites was incorporated into activity unit design and Chapter 3 includes a discussion on the potential effects associated with no action, and active management.

Recreation – The Jackson project area contains the Deep Creek Recreation Area, Big Springs Campground, trails and trailheads, and a variety of dispersed camping opportunities. Chapter 3 discloses the effects to recreational use of the project area of the no action and action alternatives.

Economic and Social well-being – The communities of Central Oregon are tied to forest management through employment, income and recreation. Chapter 3 discloses the effects of the project on the society and economics of the Central Oregon area.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the alternatives considered for the Jackson project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

Alternatives Considered in Detail

The Forest Service developed three alternatives, including the No Action and Proposed Action alternatives, in response to issues raised by the public.

Alternative 1 – No Action

Alternative 1 is the No Action alternative. No vegetation or fuel management activities would be implemented to accomplish project goals as defined by the purpose and need. This alternative serves as a baseline for comparison of the effects of all of the alternatives.

Routine activities such as road maintenance and suppression of unplanned fires would continue. Activities authorized under separate decisions would also continue. These activities include livestock grazing, riparian restoration projects, and noxious weed treatments. Recreational use of the area, including camping, hunting and motorized and non-motorized use, would continue.

There would be no stand density management treatments. Stands would continue to incur mortality and large diameter trees would continue to be at risk of loss due to competition among trees. LOS stands would remain multi-strata with dense stand conditions causing competition for resources among trees. Large diameter trees, such as ponderosa pine, would remain at a high risk of mortality. Aspen stands, riparian and upland grass and shrub communities would continue to decline.

There would be no fuels reduction treatments. Areas would continue to accumulate fuels with the potential for a wildfire causing unwanted disturbance to forested stands, wildlife habitat, soils, and water quality.

Alternative 2 - The Proposed Action

Alternative 2 is the proposed action. This alternative was developed to respond to the purpose and need. The proposed action includes approximately 5744 acres of commercial thinning, with associated noncommercial thinning and fuels treatments. Commercial harvest would all be accomplished by ground-based tractor systems with winter harvest required on 531 acres. Areas identified as tractor logging are areas where heavy equipment, such as logging tractors/skidders, would be used to remove a commercial product. Noncommercial thinning (thinning of small diameter trees without associated commercial, juniper and aspen thinning) would occur on an additional 7,779 acres. Juniper cutting with associated fuels treatments would occur on 893 acres. Activities to promote the maintenance and restoration of aspen, such as conifer thinning, placement of protective fencing and supplemental aspen planting, would take place on 295 acres. Underburning (natural and activities fuels) not associated with other vegetation management activities would take place on 7,485

acres. Grapple piling would occur on 1021 acres within harvest units and hand piling would take place on 569 acres within harvest and non-harvest units. An estimated 14.3 mmbf of timber would be harvested.

Connected Actions

Activities necessary for the implementation of the proposed action would include construction of 10 miles of new temporary roads; re-establishment of 15 miles of temporary roads on existing disturbance and the reconstruction of .3 miles of existing road. Temporary roads on existing disturbance are roads constructed on previously disturbed ground where a remnant road bed remains. Temporary roads would be closed and blocked following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly.

No trees greater than 21 inches diameter at breast height (dbh), live or dead would be cut except those necessary to be removed for safety reasons or road construction. Trees that need to be cut down for safety reasons in RHCAs would be left on site or used for stream restoration projects.

Map 5 displays commercial thinning and proposed roads in Alternative 2. Map 6 shows noncommercial thinning, juniper thinning, and hardwood treatments. Map 7 shows fuel treatments. Maps are located in Appendix D of this document.

Forest Plan Amendment

During the evaluation of the proposed action against current management direction, it was found that certain areas and treatments were not consistent with the Forest Plan, as amended. The Eastside Screens (Regional Forester's Forest Plan Amendment No. 2) contain standards that indicate there should be no net loss of LOS if single-stratum LOS and/or multi-strata LOS stages are below historic range of variability (HRV).

The Jackson project area is below HRV for both multi-strata and single-stratum LOS within the Douglas-fir plant association group (PAG). A Forest Plan amendment is required because Alternative 2 proposes to convert, through timber harvest, 31 acres of multi-strata LOS within the Douglas-fir PAG to single stratum. Within the dry grand fir PAG, the Jackson project area is within the historic range of variability for multi-strata LOS and below the historic range of variability for single-strata LOS. Alternative 2 proposes to harvest 524 acres of multi-strata LOS in the dry grand for PAG. A Forest Plan amendment is required because this treatment would reduce the dry grand fir PAG 84 acres below HRV for multi-strata LOS.

Timber harvest treatments in multi-strata LOS are designed to convert these stands to single-stratum LOS. These treatments would reduce stand density and competition, improve growth of residual trees, and reduce potential mortality resulting from inter-tree competition. Commercial harvest would more quickly restore historic seral/structural stage conditions and improve growing conditions for larger trees than no action, noncommercial thinning alone, or prescribed fire alone. Commercial harvest combined with noncommercial thinning and prescribed fire would also decrease the probability of wildfires and potentially reduce the severity of wildfire impacts within treatments. No trees greater than 21 inches diameter at breast height (DBH) would be cut and removed in any area except where required for safety reasons or for road construction.

The Jackson project area contains about 4,190 acres of LOS distributed in stands five acres or greater. Alternative 2 would treat 1,696 acres, 733 acres of which would be treated using commercial harvest. The acres that are treated would remain LOS, but would change from multi-strata LOS to single-stratum LOS.
This amendment is consistent with the Regional Forester's guidance for implementing Eastside Screens. In a letter dated June 11, 2003, the Regional Forester encouraged Forest Supervisors to

consider site-specific Forest Plan amendments associated with increasing the number of large trees and LOS on the landscape. The commercial harvest proposed in multi-strata LOS is consistent with the intent of the Eastside Screens to maintain and/or enhance LOS. There would be no change in the long-term relationships between the levels of goods and services projected by the Forest Plan Final EIS and the impacts of implementing Alternative 2 because of the small number of acres treated within the Douglas-fir and Dry Grand Fir PAGs and the objectives of the treatments (to maintain LOS in the long term).

This amendment applies only to this project area and would not apply to future decisions within the project area. The amendment does not alter the desired future condition of the land or resources or the anticipated goods and services to be produced. Only a small acreage will be treated and options for future management of LOS will be maintained.

Alternative 3

Alternative 3 was developed to respond to the significant issue discussed in Chapter 1, while also meeting the stated purpose and need. This alternative focuses activities in stands with the objective to reduce stand densities, reduce hazardous fuels, reduce the risk of stand loss due to high fuel loadings, restore/enhance aspen stands and minimize potential impacts associated with commercial, noncommercial and prescribed fire treatment activities in RHCAs. Objectives also include maintaining desired fuel levels where they exist, increasing forested stands resiliency to insects and disease, and moving towards late and old structured stand conditions.

Alternative 3 includes approximately 5,545 acres of commercial thinning, with associated noncommercial thinning and fuels treatments. Commercial harvest would be accomplished by ground-based tractor systems with winter harvest required on 447 acres. Areas identified as tractor logging are areas where heavy equipment, such as logging tractors/skidders, would be used to remove a commercial product. Noncommercial thinning (thinning of small diameter trees without associated commercial, juniper and aspen thinning) would occur on an additional 6,564 acres. Juniper cutting with associated fuels treatments would occur on 863 acres. Activities to promote the maintenance and restoration of aspens such as conifer thinning, placement of protective fencing and supplemental aspen planting would take place on 293 acres. Underburning (natural and activities fuels) would take place on 6,697 acres. Grapple piling would occur on 999 acres within harvest units and hand piling would take place on 575 acres within harvest and non-harvest units. An estimated 13.7 mmbf of timber would be harvested.

The Forest Service identified one key issue from the scoping comments that led to the development of this alternative. Comments suggested that riparian hardwood development could be accomplished without allowing commercial harvesting or the use of heavy equipment in RHCAs. Other comments suggested that the project exclude the removal of trees which provide primary or secondary shading of streams within INFISH buffers.

Management activities in RHCAs have the potential to demonstrate some positive or negative effects on water quality (as measured by stream temperature, flow, and sediment delivery to streams), wildlife habitat, fish habitat and the percentage of riparian shade. Alternative 3 was developed with an emphasis on minimizing disturbance in RHCAs through the exclusion of commercial thinning and decreasing the acreage of noncommercial thinning, and burning. Alternative 3 does include 113 acres of noncommercial aspen treatment and associated prescribed burning in RHCAs.

Connected Actions

Activities necessary for the implementation of the proposed action would include construction of about 10 miles of new temporary roads; reuse of 15 miles of temporary roads on existing disturbance and the reconstruction of 0.3 miles of the existing road system. Temporary roads on existing

disturbance are roads constructed on previously disturbed ground where a remnant road bed remains. Temporary roads would closed and blocked following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly.

No trees greater than 21 inches dbh, live or dead would be cut except those necessary to be removed for safety reasons or road construction. Trees that need to be cut down for safety reasons in RHCAs would be left on site or used for stream restoration projects. Map 8 displays commercial thinning and proposed roads in Alternative 3. Map 9 shows noncommercial thinning, juniper thinning, and aspen treatments. Map 10 shows fuel treatments. Maps are located in Appendix D of this document.

Forest Plan Amendment

During the evaluation of the proposed action against current management direction, it was found that certain areas and treatments were not consistent with the Forest Plan, as amended. The Eastside Screens (Regional Forester's Forest Plan Amendment No. 2) contain standards that indicate there should be no net loss of LOS if single-stratum LOS and/or multi-strata LOS stages are below historic range of variability (HRV).

The Jackson project area is below HRV for both multi-strata and single-stratum LOS within the Douglas-fir plant association group (PAG). A Forest Plan amendment is required because Alternative 3 proposes to convert, through timber harvest, 31 acres of multi-strata LOS within the Douglas-fir PAG to single stratum. Within the dry grand fir PAG, the Jackson project area is within the historic range of variability for multi-strata LOS and below the historic range of variability for single-strata LOS. Alternative 2 proposes to harvest 524 acres of multi-strata LOS in the dry grand fir PAG. A Forest Plan amendment is required because these treatments would reduce the dry grand fir PAG 71 acres below HRV for multi-strata LOS.

Timber harvest treatments in multi-strata LOS are designed to convert these stands to single-stratum LOS. These treatments would reduce stand density and competition, improve growth of residual trees, and reduce potential mortality resulting from inter-tree competition. Commercial harvest would more quickly restore historic seral/structural stage conditions and improve growing conditions for larger trees than no action, noncommercial thinning alone, or prescribed fire alone. Commercial harvest combined with noncommercial thinning and prescribed fire would also decrease the probability of wildfires and potentially reduce the severity of wildfire impacts within treatments. No trees greater than 21 inches diameter at breast height (DBH) would be cut and removed in any area except where required for safety reasons or for road construction.

The Jackson project area contains about 4,190 acres of LOS distributed in stands five acres or greater. Alternative 2 would treat 1,696 acres, 733 acres of which would be treated using commercial harvest. The acres that are treated would remain LOS, but would change from multi-strata LOS to single-stratum LOS.
This amendment is consistent with the Regional Forester's guidance for implementing Eastside Screens. In a letter dated June 11, 2003, the Regional Forester encouraged Forest Supervisors to consider site-specific Forest Plan amendments associated with increasing the number of large trees and LOS on the landscape. The commercial harvest proposed in multi-strata LOS is consistent with the intent of the Eastside Screens to maintain and/or enhance LOS. There would be no change in the long-term relationships between the levels of goods and services projected by the Forest Plan Final EIS and the impacts of implementing Alternative 3 because of the small number of acres treated within the Douglas-fir and dry grand fir PAGs and the objectives of the treatments (to maintain LOS in the long term).

This amendment applies only to this project area and would not apply to future decisions within the project area. The amendment does not alter the desired future condition of the land or resources or the

anticipated goods and services to be produced. Only a small acreage will be treated and options for future management of LOS would be maintained.

Project Design Features

The Forest Service developed the following design features to be used as part of all of the action alternatives. These design elements were developed to reduce the environmental effects of the proposed activities or to comply with the standards and guidelines in the Forest Plan. Design elements that pertain to specific units are identified in Appendix C. Many of the design elements for Water Quality/Fisheries are intended to meet the requirements for protection of water quality in the State of Oregon through planning, application, and monitoring of Best Management Practices (BMPs).

Activities in Riparian Habitat Conservation Areas (RHCAs)

Refer to Appendix C for specific units within RHCAs.

Table 1. INFISH RHCA Category and Boundaries

RHCA Category	Description	Width Each Side (feet)
I	Fish-bearing streams	300
II	Permanently flowing non-fish bearing streams	150
III	Ponds, lakes, reservoirs, and wetlands greater than 1 acre	150
IV	Intermittent streams, wetlands less than 1 acre, landslides	50

The following design criteria have been developed to help avoid adverse impacts to inland native fish while performing silvicultural treatments:

Table 2. Category I and II RHCA Design Elements

Distance From Channel (Feet)	Treatment
0 – 5	No Treatment
6 – 12	Hand cutting (drop and leave) of conifers up to 15” to remove competition from existing hardwoods or to provide growing space for hardwood plantings.
13 – 28	Noncommercial thinning of conifers up to 6” dbh using hand tools
29 - 50	Noncommercial thinning of conifers up to 9” dbh using hand tools
0-100	No ground based equipment allowed except on existing roads or crossings.
50 – 100	Reduce density to a minimum of 60 sq. ft. basal area per acre or the upper limit of the management zone based on plant association (Powell, 1999), whichever is greater.
(Category I) 100-300 (Category II) 100-150	Equipment allowed only on existing roads, trails and landings. Reduce density to be within the management zone based on plant association (Powell, 1999).
*Exceptions may be possible after review by Fisheries Biologist and/or Hydrologist.	

Figure 1. Proposed activities in Category I and II RHCAs under Alternative 2.

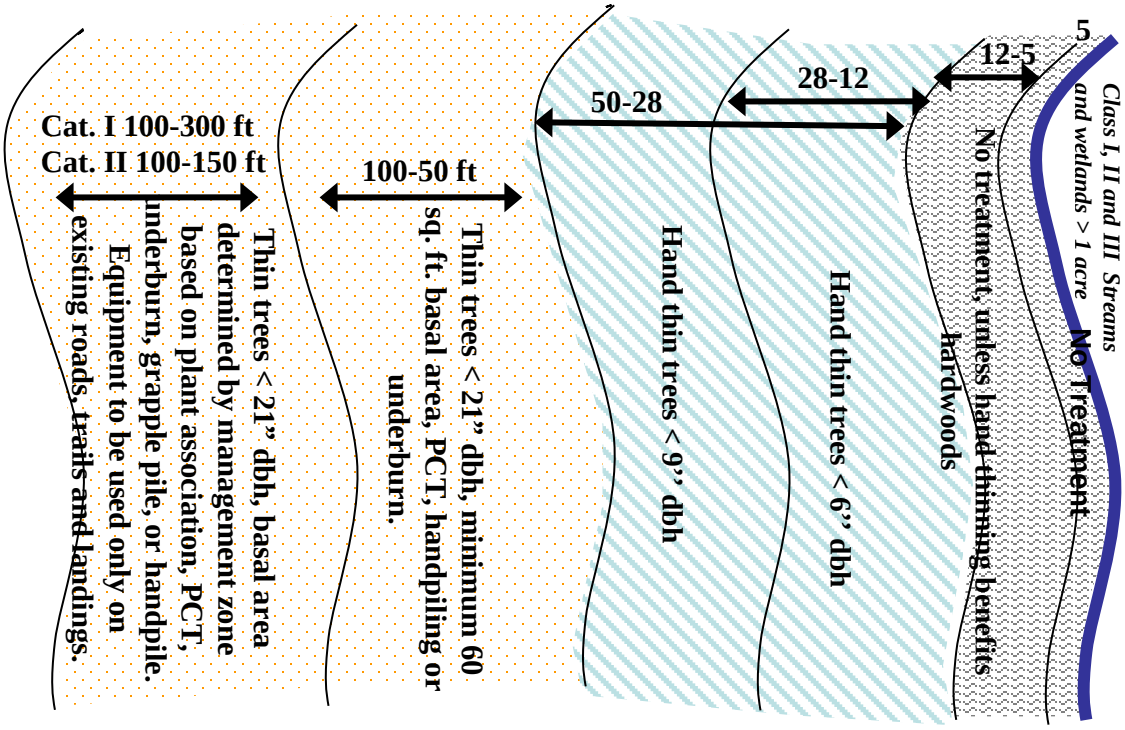
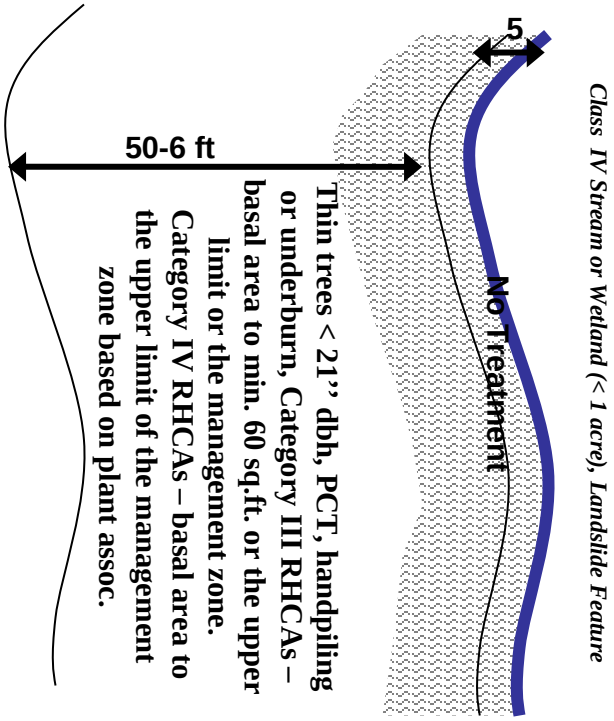


Table 3. Category III, IV RHCA Design Elements

Distance From Channel/Feature (Feet)	Treatment
0 – 5	No Treatment
0-20	No ground based equipment allowed except at crossings.
6 – 50	Category III RHCA - reduce density to 60 sq. ft. basal area per acre or the upper limit of the management zone; whichever is greater. Category IV RHCA - reduce density to the upper limit of the management zone based on plant association (Powell, 1999).
Exceptions may be possible after review by Fishery Biologist and/or Hydrologist.	

Figure 2. Proposed activities in Category IV RHCAs under Alternative 2.



Commercial Thinning in RHCAs

- Live trees 21 inches DBH or larger would not be cut in any prescription except when necessary to provide safe working conditions. In Riparian Habitat Conservation Areas, hazardous trees (live or dead) that are felled would be left on site or used for in-stream habitat improvement.
- No whole-tree yarding in RHCAs for the purpose of ensuring soil roughness and meeting RMOs. Exceptions may be possible after review by Fishery Biologist and/or Hydrologist (For example, whole-tree yarding to an existing road on the upslope portion of the unit > 100 feet from a Category I stream).
- Do not mark trees for tractor skid on slopes greater than 35%.
- Flag existing skid trails and disturbances within RHCAs and restrict skidding activities to these areas.
- Avoid new landings within RHCAs (Existing landings may be reused after review by Fishery Biologist and/or Hydrologist).
- Do not place landings or slash piles in the bottom of ephemeral draws and swales.
- Pull back/flatten out skid trail berms to reestablish drainage and reseed disturbed skid trails.
- Commercial and noncommercial thinning in RHCAs would be performed to meet the following objectives:

1. Maintain existing large structure (21”+ dbh trees) and accelerate the development of additional large structure to provide potential large woody recruitment over time.
2. Reduce stand densities and ladder fuels to reduce susceptibility to disturbance agents (insects, disease, and fire).
3. Select for species compositions that are appropriate for the site and are closer to what occurred historically, especially riparian associated hardwood species
4. Maintain existing shade to stream channels in Category I and II RHCAs. Where achievable, increase shade provided by hardwood species.
5. Maintain bank stability provided by conifer and hardwood roots.

- Activities requiring work in the stream will be implemented in accordance with the *Oregon guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources* (June, 2008). For the Jackson project area, the in-water work time is July 1 through October 31.
- Industrial camps would not be located in RHCAs.
- In stream reaches that are deficient in LWD (e.g. Deep R1-4, Little Summit R1-3, Jackson R3 and 4, and Crazy R2), trees that are currently of a large enough size and located such that they contribute large wood (6” + dbh) to stream channel would be retained during commercial harvest activities.

Noncommercial Thinning in Riparian Conservation Areas

- Noncommercial thinning is prescribed to reduce conifer competition in hardwood/riparian stands of alder, willow, cottonwood, dogwood, and various shrub species. In general, conifers up to 9” dbh would be cut, following the guidelines prescribed in tables 2 and 3 which are organized by RHCA category.
- Noncommercial thinning is prescribed to reduce conifer competition in aspen stands. In general, conifers up to 15 inch dbh could be cut or girdled, as determined through a site specific silvicultural prescription written by the Silviculturist, Fisheries Biologist and Hydrologist.
- Slash generated from these activities would be lopped or hand-piled. In Class I, and II streams, hand-piles within 50 feet of a stream would not be burned unless field review by the fisheries biologist and/or hydrologist reveals that burning would help meet RHCA objectives; hand-piles greater than 50 feet from the stream may be burned. When consistent with other management actions, noncommercial thinning slash would be placed on skid trails, temporary roads, and roads to be closed.
- Trees 6” dbh or greater cut during noncommercial thinning would be felled toward stream channels, where available, to increase woody structure and roughness and to reduce livestock access.
- In stream reaches that are deficient in LWD (e.g. Deep R1-4, Little Summit R1-3, Jackson R3 and 4, and Crazy R2), trees that are currently of a large enough size and located such that they contribute large wood (6” + dbh) to stream channel would be retained during noncommercial harvest activities.

Prescribed Fire Activities in RHCAs

The assumption is that where these criteria are applied, retention of in-stream down wood would be at about 80% or greater throughout the project area; percent shade and sediment delivery to streams would not be measurably changed. The intent of INFISH and Forest Plan standards would be met.

- Burn plans (unit-specific prescriptions) would be developed as an on-the-ground, interdisciplinary process; team should include (at a minimum) a fuels specialist, a fisheries biologist, a hydrologist, wildlife biologist, and silviculturist.
- Burn plans would incorporate the following guidelines:
    - Generally in RHCAs, there would be no intentional ignition within 100' of stream channels. Fire would be allowed to back into the RHCAs and burn in a mosaic pattern. This criterion may be modified on a site-specific basis if:
        - There is a road or other existing fuel break within 100' of the stream channel that would provide a logical boundary to the burn unit; in this case, ignition may take place up to the fuel break, but not between the fuel break and the stream channel.
        - Site-specific conditions exist such that intentional ignition within 100' of the stream channel would be desirable.
            - EXAMPLE: Excessive amounts of conifer seedlings within 100' of a stream channel are detrimental to the development of riparian hardwoods and fire is determined to be the tool of choice to remove them.
            - EXAMPLE: Large fuels accumulations within 100' of the stream channel exist and fire is determined to be the tool of choice to reduce them.
    - Where necessary, fireline would be constructed within RHCAs.
        - Fireline would be dug by hand or with a garden plow pulled by a four-wheeler or a small rubber-tired farm tractor.
        - Fireline would be a fuel break to mineral soil, 12-24 inches wide.
        - Fireline in RHCAs would not be constructed within 25' of streambanks.
        - The end of the line would fishhook away from the stream channel and stop on the contour.
        - Fireline would be rehabilitated following completion of activities; waterbars would be constructed on hand line, and sod would be replaced on plow line.
    - Sensitive areas within each RHCA would be identified and site-specific plans to protect each area during burn operations would be developed; site-specific plans would become part of each burn plan, and would be completed prior to approval of the burn plan.
        - EXAMPLE: A particular reach may contain down wood that is acting to prevent the progress of a headcut; site-specific plan would be developed to ensure retention of that piece of wood.
        - EXAMPLE: A given stream might be so deficient in down wood that the retention of all in-channel down wood in a unit might be necessary.
    - Post-activity effectiveness monitoring would be conducted whenever site-specific plans are implemented.

General Prescribed Fire Activities

- Prescribed burning operations would be coordinated with the Department of Environmental Quality through the State of Oregon smoke management program.
- Private landowners within the project area would be notified approximately 5 days in advance of any burning activities adjacent to their lands.
- Enclosures, exposed water lines, and other improvements would be protected during implementation.

Soils and Geology

Refer to Appendix B, Soil Condition Analysis for specific units with mitigations.

- For tractor logging units, the leading end of logs would be suspended during skidding to limit soil displacement. Ground-based equipment would not be operated on slopes greater than 35 percent in tractor units. Winch lining will be required on slopes greater than 35 percent to minimize detrimental impacts.
- Skid trails would be designated and approved prior to logging by the timber sale administrator and would be located on already disturbed areas where available. Where practical, skid trails would avoid ephemeral draws. Crossings would be perpendicular to ephemeral draws.
- In units where detrimental soil conditions occur on less than 20 percent of the area, plan activities so that detrimental soil conditions do not exceed 20 percent. This includes designating skid trails, landings, and roads.
- In units where detrimental soil conditions exceed 20 percent of the area, if tillable, allow no more than 5 percent increase over existing conditions and then till so that there is no net increase in the percentage of detrimental soil conditions. If tillage is not feasible, stay on existing disturbed areas and allow no increase in detrimental soil conditions.
- Grapple piling equipment would remain on existing disturbed area to limit the amount of detrimental soil conditions. In undisturbed areas, grapple pile equipment would be allowed to make 1 or 2 passes to move between skid trails and other disturbed areas. Equipment would be limited to slopes less than 35 percent.
- Waterbars (waterdrains) on skid trails would be installed at regular intervals (varies by slope class), preferably with a crawler type tractor with an angled blade. On slopes where erosion in fire lines could occur, waterbars would be dug into the fireline. On slopes from 0 to 30 percent, waterbars would be placed at a minimum of every 60 feet. On slopes over 30 percent, waterbars would be placed at a minimum of every 25 feet.
- Infiltration buffering is required along the scab/forest interface to mitigate alteration of sensitive hydrologic conditions. Maintain a buffer of 50-66 feet in which the number of crossings, landings and road impacts would be kept to a minimum.
- In Winter Harvest units where mechanized equipment is used, ground conditions shall meet at least one of the following criteria. 1) Six inches of frozen ground, 2) Four inches of frozen ground with one foot of snow and 3) over two feet (>24 inches) of snow.

Water Quality/Fisheries

- Skid trails and temporary roads would be designed to reduce the concentration of flows and to encourage the flow of water off of them.

- Landings and main skid trails within 300 feet of landings would be scarified and seeded to increase infiltration and prevent surface erosion. Landings that are located on a gravel road or at turnouts that will remain open to traffic use would be exempt from the scarification and seeding requirements.
- Dust abatement on haul roads within RHCAs would occur to reduce sediment (i.e. dust) entering streams. Water used for dust abatement would be obtained from sources identified in the May 1996 Ochoco National Forest Water Conservation Plan. Stream flow requirements are specified in the Plan. Exception may occur on rock/gravel surfaces.
- In channel work on Class I-III streams would be accomplished in accordance with "Oregon Guidelines for Timing of in-Water Work to protect Fish and Wildlife Resources, June 2000." For the Jackson project area, the timing for in-water work is July 1 to October 31.
- Temporary roads with stream crossings would have adequate relief drainage installed prior to runoff reaching the stream channel. Filter strips below drainage structures would be of sufficient size to catch sediment before runoff enters streams. If adequate filter strips are not available, slash, rock aprons, or other filtering structures would be installed. Stream crossings structures (culverts and fords) on Class IV streams would be installed when the channel is dry. The fisheries biologist or hydrologist would coordinate specifications and locations.
- Suspension of use would occur when road use is contributing to sediment detachment and transport (i.e. rutting 2 inches or deeper) or muddy ditch water to prevent siltation outside of the roadway.
- Springs, wetlands and landslide-prone area less than 1 acre would be protected by a slope distance of 50 feet (INFISH, 1995). Unstable terrain springs and wetlands greater than 1 acre would be protected by a buffer of 150 feet (INFISH, 1995). If there is any indication of recent landslide activity, the area would be evaluated by the geologist and the buffer may be increased.

Wildlife

Refer to Appendix C for specific units with wildlife design features.

Goshawk

- A 400-acre post fledging area has been established around each known nest site. No management activities, including underburning activities, would occur inside the 30-acre nest stand. Burning activities within the post fledging areas would be designed to protect overstory trees, large down wood and large snags. For example, burning would occur during the lower end of the prescription window.
- Total treatment activities, including commercial, noncommercial thinning and burning would be limited to 50% of the PFA. Commercial treatments will leave 10% of the treatment area in un-thinned patches. Noncommercial thinning will leave 15% of the treatment area in un-thinned patches unevenly distributed.
- There would be a seasonal restriction (March 1 to August 31) on commercial harvest, noncommercial thinning, and underburning within 0.5-mile of an active nest. This seasonal restriction may be waived on an annual basis if a nest inventory determines that breeding is not active.
- A seasonal restriction (March 1 to August 31) would also apply (within 0.25 mile of active nests) to temp road construction and road reconstruction.

- Seasonal restrictions (March 1 to August 31) on hauling would be applied within 0.25 mile of known nests. Haul restrictions would not apply to arterial or collector roads.

Bald Eagle, Golden Eagle and Osprey Nests

- If active eagle or osprey nests are discovered during implementation, efforts would be made to avoid any further disturbance. Site-specific measures would be determined by the wildlife biologist. These would include:
    - Activities would be restricted within 0.5 mile of nest sites from March 1 to August 15 for golden eagles.
    - Activities would be restricted within 0.25 mile of nest sites (0.5 mile line of sight, 1 mile for blasting) from January 1 to August 31 for bald eagles.
    - Activities would be restricted within 0.25 mile of active osprey nests from March 1 to August 1.
    - Restrictions on haul would not apply to arterial and collector roads but site specific measures would be developed to reduce disturbance; for example restrict compression braking or avoid parking near nest site.

Other Raptors

- No management activities (including underburning) would occur within 330 feet of nest sites (primary zone). Between 330 and 660 feet around a nest site (secondary zone), habitat-modifying treatments are permitted. Modified treatments are intermediate treatments between that required in the primary zone and that normally prescribed outside the whole protection zone. Operations would be restricted for both primary and secondary zones between March 1 and August 1. Exceptions would be evaluated on a case by case basis by the wildlife biologist.

Lewis' and White-headed Woodpeckers

- Active nest trees (or snags) located during layout or project implementation would be designated with a wildlife tree marker and protected. If the nest tree is determined to be a safety hazard, coordination with the wildlife biologist would occur to determine if the hazard can be mitigated. Safety hazards would be identified by a qualified person, as defined by, and using the procedures provided in the interagency Field Guide for Danger Tree Identification and Response (Toupin et. al., 2005).
- If the hazard cannot be mitigated, felling of the tree would occur outside of the nesting season after the young have fledged. No felling would occur from April 1 to August 15.

Pileated Woodpeckers

- Prescriptions will retain 10% of commercial units in an untreated condition and 15% of noncommercial units in an untreated condition maintaining additional within stand diversity

Deer and Elk

- Activities within elk calving areas would be seasonally restricted from May 15 to June 30.
- Activities within 0.25 mile of known elk wallows would be seasonally restricted from September 1 to October 15. This restriction would not apply to log haul on arterial or collector roads.

Snags/Down Logs

- Snags that pose a safety hazard which cannot be mitigated would be felled. Safety hazards would be identified by a qualified person, as defined by, and using the procedures provided in the interagency Field Guide for Danger Tree Identification and Response (Toupin et. al., 2005)
- Harvest activities would not remove existing down logs. Burn crews would be briefed to avoid direct ignition of large snags and down wood. Down logs are defined as logs that are 12 inches in diameter or greater at the small end and greater than 6 feet in length.
- Burning within goshawk post-fledging areas, pileated feeding habitat, and connective corridors would be designed to minimize impacts to mid and overstory cover, snags and large down wood by avoiding the hot end of the prescription. The wildlife biologist would be notified when prescribed burning is scheduled in these habitat areas so that implementation and effectiveness monitoring can be coordinated.

Connectivity Corridors

- Commercial Harvest – Retain 10% of treatment units in unharvested clumps unevenly distributed.
- Noncommercial Thinning – Retain 15% of treatment units in non-thinned clumps unevenly distributed.
- Canopy closures would be maintained within top 1/3 of site potential with medium to larger trees common.

Sensitive Plants and Non-native Invasive Plants (noxious weeds)

The following design elements are included as part of all of the action alternatives. These design elements were developed to reduce the environmental effects of the proposed activities or to comply with the standards and guidelines in the Forest Plan and amendments. Refer to Appendix C for units with sensitive plants and invasive plant-related design features.

Sensitive Plants and Scablands

- No slash piling or ground-based equipment would be used within 100 feet of areas identified as containing Peck's mariposa lily (*Calochortus longebarbatus* var. *peckii*) and moonwort (*Botrychium spp.*) populations or habitat. Exceptions would be reviewed by the botanist and hydrologist or fisheries biologist. Exceptions may include:
    - Pulling cable (winch lining) from an existing road;
    - Using existing roads as landings;
    - Constructing spur roads to access landings within units
    - Aspen treatments
- Fifty commercial timber harvest units in or near Peck's lily (*Calochortus longebarbatus* var. *peckii*) populations are listed in Appendix C. Layout of 43 would be coordinated with the district botanist. The other seven commercial harvest units are mitigated through winter logging and no further coordination is necessary.
- Commercial harvest unit #336 is adjacent to a documented population of a sensitive moonwort population (*Botrychium crenulatum)* and lay out would be coordinated with the botanist.

- Noncommercial thinning in units within or adjacent to rare plant populations or habitat would occur after the growing season when the plants are dormant. (Sept-March) those units are listed in Appendix C.
- Noncommercial thinning in units 21, 397a, 473, 645 and 733 have sensitive Botrychium spp. populations within or adjacent to them, and would require coordination with the botanist before implementation.
- Fuel treatments within or adjacent to rare plant populations would occur in the fall when the plants are dormant, there would be no prescribed fire in sensitive plant habitat in the spring.
- Units with proposed hand piling or grapple piling in or adjacent to rare plant populations or habitat are listed in Appendix C and pile placement would be coordinated with the botanist before treatment.
- Vehicles, including off-highway or all-terrain vehicles, would not be operated within areas identified as Peck's lily populations or habitat, except on existing roads.
- To reduce impacts to unique scabland habitat (lithosol soils), and associated sensitive needlegrass (Achnatherum hendersonii and A. wallowaensis) habitat, avoid ground-disturbing activities, including piling of slash, on scablands. Exceptions can occur on existing roads, temporary roads and landings on existing disturbance or other areas that have been reviewed by the District botanist. Units potentially affecting scabland habitat include 3, 13, 14, 39, 66, 69, 107, 223b, 236, 253, 299, 300, 302, 305, 320, 326a, 334a, 371, 390, 454a, and 455.
- There is contruction of 3.4 miles of temporary road on existing disturbance on scabland with needlegrass habitat. Any disturbance of scabland habitats would be reviewed by the district botanist. The area affected by construction of a temporary road would be erosion proofed through appropriate methods.
- If any new species or populations of sensitive plants are found during project implementation, these species would be considered as described in the policy guidelines found in FSM 2670, regardless of the date of sale or other contract.

Non-native Invasive Plants (Noxious Weeds)

- To meet required prevention standards (USDA 2005) we will treat all high risk weed infestations for two consecutive years prior to management activities. This includes units 134,152, 240, 291, 315, 322, 324, 350, 351, 353, 354, 355, 356, 397, 471, 475.
- To meet required prevention standards (USDA 2005) we will monitor and treat all remaining high risk weed infestations for 5 years post-activity for units 134,152, 240, 291, 315, 322, 324, 350, 351, 353, 354, 355, 356, 397, 471, 475.
- To reduce the potential for transport or spread of noxious weeds by road construction or logging equipment, the timber sale contract would require the following provisions: (1) certification that equipment be clean of all plant or soil material that may result in the establishment or spread of noxious weeds; and (2) notification of location where equipment was most recently used. The Forest Service Timber Sale Administrator would certify that equipment is clean of plant and soil material before the equipment enters the project area. Cleaning shall occur off of Federal lands.
- To reduce the potential for weed spread through mineral material (i.e. gravel and rock) used on roads and landings, Ochoco NF material sources would be inspected by the Forest Service to ensure materials are weed free. Additionally, the sale contract would include provisions

requiring any material from other sources is inspected by the Forest Service and determined to be weed free.

- All off-road equipment used at mineral material sites would be cleaned and certified free of all plant or soil material that could contain invasive plant seed or plant parts prior to entrance onto the National Forest.
- Re-use of landings infested with non-native invasive weeds would not occur, until reviewed by the district weed coordinator. Where weeds persist, shade would be retained, and burning would be avoided within 100 feet of infestation. Avoid these areas for camps staging, and parking areas. The district botanist will be consulted for landing locations, skid roads, temp roads, parking and fueling areas to avoid infestations in or adjacent to commercial harvest units 134, 214, 214c, 215, 207, 353, 354, 355 and 356.
- New temporary road construction would not occur through existing weed infestations. The proposed temporary road to access unit 354 will be located 100 feet away from the existing hound's tongue infestation. The District botanist would be involved in designating the new road location to avoid spread and introduction of noxious weeds.
- Re-vegetate all new roads (temporary and system), primary skid trails, and log landing areas as part of the final sale contract work with native species of grass seed. Seed from grass species could include pinegrass (Calamagrostis rubescens), squirreltail (Elymus elymoides), Sandberg's bluegrass (Poa secunda), blue wildrye (Elymus glaucus), and bluebunch wheatgrass (Psuedoroegneria spicata), or native cultivars including red fescue (Festuca rubra), seeded as a mixture at approximately 10lbs/acre. Seed used to revegetate areas would be certified as "All States Noxious Weed Free" by an approved testing laboratory, such as the Oregon State University Seed Lab and be from the appropriate genetic seed zone. If available, use locally collected native species.
- If straw bales are used for sediment traps or seeding mulch, they would be certified weed-free.
- To prevent seed bank disturbance and spread of noxious weeds, no prescribed fire ignition will occur within 100 feet of known weed infestations in units listed in table 108.
- Water for prescribed fire control, watering roads, or other activities would be obtained from weed free sites or by methods that reduce the risk of spreading invasive plant parts or seeds from infested areas near water sources. Fire engines and water tenders would avoid driving over noxious weeds on the banks of water sources, or other measures taken, such as covering with clean mineral material, to reduce risk.

Range

- Proposed activities (such as harvest, thinning, and prescribed fire) would not damage or negatively impact existing range improvements (i.e. fences, spring developments, ponds, etc.) or if unable to avoid damage/negative impacts, activity operators would repair/replace impacted improvements. Cattleguards filled in by proposed activities would be cleaned out during the grazing season prior to cattle having access to the road the cattleguard is in, or prior to the next grazing season. Proposed activities would not cut fence line trees.
- Proposed activities would be designed to not negatively influence livestock management on the allotment; the following activities would not occur:
    - Leaving gates open while cattle are in the vicinity of activities.

  - Cutting and leaving fences down when not attended, to conduct activities when cattle are in or near the area of operations. Where cattle are not going to be in the area of operations fences may remain down until the operations are complete or until cattle are moved into or near the operating area. If operations will be occurring during the grazing season, coordinate with the range specialist prior to cutting fences to determine if cattle are or will be in or near to the area of operations.

- Exclosure fencing will fit the site and type of ungulate use on riparian species. If site has riparian species incurring significant and detrimental use by wildlife, big game fence will be installed. Determined by resource specialist knowledge of sites and type of use (wildlife/livestock) occurring in the past, as well as a pre grazing season assessment of riparian species use. All exclosures will include a gate to allow removal of any livestock or game that inadvertently enters the exclosure.
- Exclosure fencing, installed for aspen protection, would be planned with range management specialists and permitees prior to implementation. Alternate water developments would be provided if significant stock water sources are fenced off.
- Exclosure fence maintenance would be assigned prior to implementation, outlining who will maintain the exclosure fence and how often it will be maintained.
- Exclosure fence and/or riparian cages, installed for aspen protection, would have a removal plan for when riparian objectives have been met in place prior to implementation. The removal plan would be designed by the team lead for aspen planting efforts with consultation from the range specialist and other interested biologists.

Recreation

Refer to Appendix C for specific units with recreation-related design features.

- Restrict commercial timber haul on holiday weekends (i.e., Memorial Day, 4th of July, Labor Day) and during the weekends of deer rifle hunting season. Restriction applies from Friday noon through Sunday noon, or Monday noon to include the holiday.
- Activities adjacent to dispersed recreation sites identified in the Forest Plan will be designed to retain visual screening and would be coordinated with the District recreation specialist. Activity-generated slash within 25 feet of these dispersed sites that is useable as firewood will be stacked.
- Forest Plan designated dispersed recreation sites that are located on existing landings may be reused for log decks, piling slash, storing road rock, etc. Reuse would be coordinated with the recreation specialist and the site would be rehabilitated after use.
- Disallow industrial (contractor) camps at Forest Plan designated dispersed campsites.
- After activities are complete, disturbed sections of system trails would be reconstructed to the existing (pre-harvest) condition. This includes replacing any trail markers that are removed as a result of activities.
- Commercial harvest, thinning, and burning activities would be coordinated with special use permit holders or their representatives and the District recreation specialist, as needed to reduce conflicts between these activities.

Transportation

- When consistent with other management actions, noncommercial thinning slash would be placed on skid trails, temporary roads, and roads to be closed.

- Stream crossings would be installed when channel is dry, either naturally or by diverting and dewatering the site. Exceptions may be made for winter harvest activity.
- Riparian associated vegetation would be planted or seeded at new and reconstructed stream crossings.
- Dust abatement on haul roads within RHCAs would occur to reduce sediment (i.e. dust) entering streams. Water used for dust abatement would be obtained from sources identified in the May 1996 Ochoco National Forest Water Conservation Plan.
- Log haul on paved roads would be closely monitored during periods of freeze-thaw and suspended when appropriate to minimize surfacing damage. Thermistor installations would be used when available to determine when haul on paved roads needs to be suspended.
- Dry season/frozen haul conditions would be required on native surface roads to prevent rutting and muddy road surfaces that may interfere with drainage and contribute to sedimentation outside of the traveled way. Suspension of use would occur when rutting in road surface is 2 inches or deeper or ditch water is muddy.
- Reconstructed roads would have adequate road drainage designed to reduce the concentration of flow.
- Reconstructed roads with stream crossings would have adequate relief drainage installed prior to runoff reaching the stream channel. Vegetated or rocked buffer strips of sufficient size to catch sediment will exist between road drainage features (i.e. relief structures or road ditches) and stream channels.
- Reconstructed stream crossings should be constructed to accommodate a 100-year flood if the crossing structure is anticipated to remain in place during the winter or spring.
- Locate stream crossings where the channel is (non-complex) narrow, straight, and uniform, and has stable soils and relatively flat terrain to the extent practicable. Select a site where erosion potential is low. Orient the stream crossing perpendicular to the channel to the extent practicable. Keep approaches to stream crossings to as gentle a slope as practicable.

Road Closure

- At the completion of harvest and post-harvest activities requiring their use, temporary roads closed by this project would be blocked to eliminate motor vehicle access, hydrologically stabilized, and sub-soiled/tilled or otherwise de-compacted (as soil conditions allow) to facilitate their return to proper hydrologic function and vegetative productivity .
- Maintenance level 1 roads (see Chapter 3, Transportation) used for project implementation shall be hydrologically stabilized and physically closed to vehicular traffic upon project completion.
- When feasible, maintenance level 1 closed roads, utilized during implementation as haul roads within 200 feet of Class I-IV streams, are specified to be subsoiled/tilled, ripped or otherwise de-compacted (as soil conditions allow) and waterbarred after harvest and post-harvest activities. If subsoiling or tillage is not possible or feasible, large slash or woody debris is specified to be used. At road crossings, remove culverts, fill material, and other structures that present an unacceptable risk of failure or diversion.

Temporary Roads

- Temporary road construction would be limited to sustained grades of 20% of less, allowing shorter lengths of no more than 100 feet which would not exceed sustained grades of greater than 30%.
- New construction of cut and fill template greater than 3 feet would be permitted.
- Temporary culvert installation would be allowed at non-complex stream crossings.
- Temporary roads would be blocked to eliminate motor vehicle access, hydrologically stabilized, and sub-soiled or otherwise de-compacted (as soil conditions allow) to facilitate their return to proper hydrological function and vegetative productivity.
- All temp roads (new, existing, and reconstructed) and closed roads within 200 feet of a stream would not receive large vehicular use in support of noncommercial or fuels activities. Exception may be made in support of these management activities on a short-term basis through the use of smaller vehicles such as ATVs, UTVs, and small farm tractors.

Temporary Road Crossing

- To protect morphology of Class IV stream channels and banks, temporary road crossings (either summer or winter haul) would be constructed by laying logs in the channel and covering with a layer of geotextile cloth (to prevent migration of soil/mud to the channel bed) prior to placement of soil to create a drivable travel surface. These “log culvert” crossing structures would be removed at the end of hauling activities.
- When approved by the hydrologist at Class IV stream crossing locations (either summer or winter haul) where low bank height (less than 1 foot) and broad channel width would make a “log culvert” structure an impracticable choice, rock fords will be constructed to protect the bank and channel from damage by hauling equipment. All temporary road crossings would be removed unless they determined to be hydrologically beneficial.
- Locate stream crossings where the channel is (non-complex) narrow, straight, and uniform, and has stable soils and relatively flat terrain to the extent practicable. Select a site where erosion potential is low. Orient the stream crossing perpendicular to the channel to the extent practicable. Keep approaches to stream crossings to as gentle a slope as practicable.

Skid Trail Crossing

- Approaches to crossings would be protected for a distance of 30 feet on either side of the channel, or the width of the floodplain, whichever is greater. The decision to use slash mat, corduroy or comparable structure/design would be based on the predominant soil moisture regime for the site and would be determined by a soil scientist or hydrologist. Corduroy would be the preferred alternative for relatively wet areas and winter harvest units as it distributes the weight of machinery more broadly and decreases the potential for rutting. The objective is to distribute the weight of machinery over a broader area, thus decreasing the potential for compaction, as well as providing an operating surface that would reduce the potential for soil displacement.
- Channel crossings would utilize a Humboldt crossing, temporary metal culvert, log culvert or other comparable structure or design. While crossing design would be selected to best convey the highest potential flows during the period of use, preferred crossing sites for summer time operations would be dry. The objective of the design is to reduce to potential for disturbance to the bed and banks of streams. If a culvert and earthen material is used to cross a stream,

geo textile fabric would be installed underneath the culvert and fill material, overlapping the bank for a distance greater than the introduced fill material.

- For dry streams whose bed and banks are well armored by large cobble, boulders and/or bedrock, and whose bank angle and bank height are low enough to provide a smooth transition through the channel, skidding may proceed without a constructed crossing.

Scablands

- Temporary roads or trails would not be constructed across scablands unless there is no other feasible alternative (LRMP 4-227). The area affected by construction of a temporary road would be erosion proofed through the use of crushed rock or other appropriate methods.
- Any disturbance of scabland habitats would be reviewed by the district botanist.
- Provide a 50-66 foot infiltration buffer (limited or reduced ground-disturbing equipment) along the scabland/forest interface.
- The number of crossings, landings, and roads would be kept to a minimum.
- Roads across scablands would not be through-cut or trenched to prevent concentrating overland water flows. This would require a rounded road crown and french drains or pipes that allow natural drainage. Waterbars and drains should be located to allow the water to disperse on rocky apron areas before flowing downhill through deeper sideslope soils.
- Drainage structures and leadoff ditches would be located to allow surface water to disperse on rocky areas, natural or constructed (rock or brush apron).

Landslide Terrain

- All roads located on dormant landslide terrain would be reviewed by the geologist to check for stability. If unstable areas are identified, stabilization designs such as spot rock, geo-textile, realignment, or other engineered structures would be required.

Heritage

- Coordination with the project archaeologist would take place for implementation of activities that overlap with known sensitive cultural sites. Coordination would occur with the relevant specialists to ensure the protection of cultural sites and features to accomplish heritage objectives. Activities include road construction, maintenance and road closures, commercial harvest, noncommercial thinning, prescribed fire, and aspen treatments.
- If a new cultural site is discovered during project implementation, the project archaeologist would be notified and site specific mitigation would be determined prior to resuming ground disturbing activities.
- If historic stock driveway signs, General Land Office bearing trees, or physical remains of other historic features are found within treatment units, their location would be made known to the project archaeologist for recording. After recording, project implementation would continue.
- Staging areas for vehicles and use of all-terrain vehicles would not be permitted within known ground-based cultural sites.

Historic Summit Trail (Forest Road 2630)

- This National Register of Historic Places-identified travel route is managed as a scenic corridor within a general border of six hundred feet (three hundred feet from the center of the road on both sides) with emphasis on foreground visuals. Coordination with the project

archaeologist would take place on a unit by unit basis for all proposed treatments within the Summit Trail corridor.

- Noncommercial treatments: Stumps would not exceed eight inches in foreground areas. Piles would be no larger than eight feet in diameter and height and would be burned within two years. Thinning unit boundary tags visible from Road 2630 would be removed when treatment is completed.
- Commercial treatments: The reuse of established log landings within foreground areas would be permitted. Stumps would not exceed twelve inches in foreground areas. Slash will be handpiled no closer one hundred and fifty feet of the road. Piles would be no larger than eight feet in diameter and height and would be burned within two years. Hazard trees may be felled along portions of Road 2630 used for timber haul routes. If a hazard tree contains a historic blaze, the project archaeologist would be notified for verification; the tree may be cut above the blaze. Painting of leave trees within units would only take place on the side of the tree facing away from the road. Unit boundary tags visible from Road 2630 would be removed when treatment is completed.

Monitoring

- Post-project surveys and monitoring of noxious weed infestations, including material sources, would be conducted to evaluate the effects of the project on noxious weeds and to continue eradication treatments. Post-project surveys would identify new noxious weed infestations while they are small.
- Occupancy and reproduction in mapped raptor territories would be monitored during and after project implementation.
- Snag levels would be surveyed in selected areas during project preparation and after implementation.
- Temperature monitoring would be accomplished in identified stream reaches using temperature recorders. In addition, temperature and pre and post shade monitoring would be accomplished on selected aspen/hardwood stand improvement projects on units that include 303d listed streams to verify that the activities are not resulting in a measurable increase in water temperature and to determine the effects on shade or to determine if shade was affected.
- After harvest and grapple piling activities are completed, soil monitoring would evaluate the need for soil rehabilitation, such as tilling.
- Post-project road closure/temporary road decommissioning would be evaluated for effectiveness and compliance with Best Management Practices (BMPs).
- If monitoring indicates the BMPs, Standards and Guidelines, and design elements are not meeting management objectives, modifications would be made and monitoring would continue to verify the changes are effective
- PIBO monitoring would continue (every 5 years), COFMS (Central Oregon Fire Management Service) Riparian Fire Effects Monitoring and Region 6 Level II stream surveys would be conducted (w/in 10-15 years).

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 the proposed action, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Four alternatives were considered, but were dismissed from detailed consideration for reasons summarized below.

1. Based on public comments, a “no commercial harvest” or “restoration only” alternative was considered for the Jackson Vegetation Management project. Such an alternative has been considered during several previous environmental analyses, which analyzed similar stand conditions to those in the Jackson project area, on the Ochoco National Forest (see West Maury Fuels and Vegetation Management EIS and Spears Vegetation Management EIS for examples). Previous analyses have determined that the “no commercial harvest” alternative would do little to increase the amount of LOS stands within the project area and would not accelerate the restoration of seral structures toward HRV because the level of treatment would not maintain a sufficient amount of open, single-stratum stands. Treated stands would return to dense, stagnated conditions sooner. As a result of no commercial thinning, this alternative would limit our ability to restore aspen and other broadleaf trees and shrubs. This alternative would not produce forest wood products and the jobs associated with commercial harvest. Small tree thinning by itself would not move the project area towards the desired condition in a meaningful manner and would not meet the purpose and need of the project.
2. Based on public comments, a “no temporary road construction” alternative was considered for the Jackson Vegetation Management project. A Jackson project IDT analysis determined that, because of reduced access to only the existing road system, this alternative would reduce the commercial thinning acreage to one-third that of the proposed action. As a result, this alternative would not appreciably increase the abundance of late and old structure (LOS) stands within the project area, nor move seral structures towards HRV because the level of treatment would not maintain a sufficient amount of single-stratum stands; especially early, fire tolerant seral species such as ponderosa pine and western larch. Under this alternative, untreated stands would continue to be vulnerable to mortality from competition with understory trees and the accompanying increase in risk to loss owing to insect, disease and stand replacing wildfire. This alternative would decrease the restoration of some aspen stands and other hardwood communities. This alternative would considerably reduce merchantable forest wood products and the jobs associated with commercial thinning. In summary, this alternative would not demonstrably move the project area towards the future desired condition and would not meet the purpose and need.
3. Based on public comments submitted during the 45 day comment for the Jackson DEIS, an alternative with decreased diameter limits on commercial thinning was considered (commenters proposed a range of diameter limits from 8 inches to 15 inches). Removal of trees with an upper diameter limit of 15 inches would not demonstrably change the outcomes determined for smaller diameter treatments. Development of LOS and maintenance and enhancement of existing large trees and LOS requires the reduction of density in treated stands to the recommended stocking level for a given site. In some locations, stocking level recommendations may be met by removing smaller-diameter commercial-sized material, while in other areas site objectives may require removing some larger trees. In stands with

dwarf mistletoe, small upper diameter limits inhibit reduction of disease problems. Species composition objectives would not be met in some stands if lower diameter limits are required. This would impede the maintenance and restoration of early seral species such as ponderosa pine. Treatments with 8 - 15 inch upper diameter limits cannot be relied upon to move the project area towards the desired condition, and therefore would not meet the Purpose and Need of the project.

4. Based on public comments submitted during the 45 day comment for the Jackson DEIS, an alternative that would maximize the total acreage of commercial harvest was considered. This alternative would increase the acreage on which forest health was improved, risk of stand-replacement wildfire was reduced, and late and old structure was enhanced (consistent with the effects disclosed in the Forested Vegetation section in Chapter 3 of this document). However, such an alternative would require construction of new system roads and harvest on slopes that are steep enough to preclude ground-based logging systems. The timber market in Central Oregon does not currently support skyline or helicopter logging systems. While the market may support the costs associated with road construction, additional system roads would not be desirable within the Jackson project area from the standpoint of resource protection. Although this alternative would meet the Purpose and Need, the Responsible Official did not choose to fully develop such an alternative due to economic unfeasibility.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 4. Comparison of alternatives.

Comparison Point	Alt. 1	Alt. 2	Alt. 3
Commercial Thinning (acres)	0	5,744	5545
Noncommercial Thinning (outside harvest, aspen and juniper units)	0	7,779	6,564
Juniper Removal (acres)	0	893	863
Aspen Treatments (acres)	0	Commercial: 126 Noncommercial: 169	Commercial: 94 Noncommercial: 199
Underburning only	0	7,485	6,697
Grapple piling (acres) **Hand piling (acres)**	0 0	1,021 597	999 575
Volume	0	14.3 mmbf	13.8 mmbf
Temporary Road Construction (mi)	0	10	10
Reuse of Existing Temporary Roads (mi)	0	15	15
Total Late and Old Structure (LOS) projections at Year 0, 20, 30 and 50 (Acres)	0: 4,490 20: 8,252 30: 9,818 50: 12,462	0: 4,463 20: 8,499 30: 10,173 50: 12,980	0: 4,464 20: 8,484 30: 10,151 50: 12,948

Comparison Point	Alt. 1	Alt. 2	Alt. 3
Single-Strata LOS projections at Year 0, 20, 30 and 50 (Acres)	0: 1,200 20: 2,373 30: 2,756 50: 3,223	0: 1,827 20: 3,162 30: 3,599 50: 4,124	0: 1,806 20: 3,130 30: 3,562 50: 4,082
Multi-Strata LOS projections at Year 0, 20, 30 and 50 (Acres)	0: 3,289 20: 5,879 30: 7,062 50: 9,239	0: 2,636 20: 5,337 30: 6,575 50: 8,856	0: 2,658 20: 5,354 30: 6,589 50: 8,867
High Risk to Insects and Disease projections at Year 0, 20, and 50 (Acres)	0: 10,163 20: 17,156 30: 19,900 50: 24,156	0: 8,085 20: 15,218 30: 18,040 50: 22,464	0: 8,233 20: 15,347 30: 18,161 50: 22,572
Condition Class (acres)	CC 1: 23,736 CC 2: 10,940 CC 3: 6,326	CC 1: 27,827 CC 2: 8,061 CC 3: 5,116	CC 1: 27,601 CC 2: 8,223 CC 3: 5,175
Aspen Restoration	Aspens are currently being shaded out and out-competed by conifers; no treatments would occur to change this. Aspen stand would continue to decline.	Aspen treatment would take place on 295 acres; reduction in competition and access to light would improve aspen vigor.	Aspen treatment would take place on 293 acres; reduction in competition and access to light would improve aspen vigor.
RHCA Treatments (acres)	Commercial thinning: 0 Noncommercial thinning: 0 Juniper removal: 0 Com. Aspen treatment: 0 Noncom. Aspen treatment: 0 Prescribed Burn: 0	Commercial thinning: 107 Noncommercial thinning: 1,358 Juniper removal: 25 Com. Aspen treatment: 24 Noncom. Aspen treatment: 89 Prescribed Burn: 1,358 Natural Fuels: 115	Commercial thinning: 0 Noncommercial thinning: 113 Prescribed Burn: 113 Natural Fuels:115
Activities in Connective Corridors	No activities would occur in connective corridors.	602 acres of treatment would occur in connective corridors	416 acres of treatment would occur in connective corridors
Goshawk Post-fledging Areas (PFAs)	No activities would occur in PFAs.	1,151 acres of treatments would occur in PFAs.	832 acres of treatments would occur in PFAs.
Goshawk Habitat	Existing condition includes 27,653 acres of goshawk habitat. No activities would occur in goshawk habitat.	Treatments would result in about a 928-acre increase in goshawk habitat.	Treatments would result in about a 868-acre increase in goshawk habitat.
Reduction in Pileated Woodpecker Primary Nesting Habitat	No reduction Primary nesting habitat would remain within HRV.	820 acres Primary nesting habitat would remain within HRV.	793 acres Primary nesting habitat would remain within HRV.
Elk (Habitat Effectiveness Index)	General Forest: 46	General Forest: 20	General Forest: 20

CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2.

Transportation

The following information is summarized from the Transportation Report for the Jackson project. The full report is located in the project file at the Paulina Ranger District, Prineville, Oregon.

Existing data were reviewed in the Travel Routes database (INFRA) and ground-truthed whereas Geographical Information System (GIS) was used for display. Analysis was completed using GIS, INFRA, and some manual calculations. All road miles shown are based on INFRA logged miles as opposed to arc or map miles. Roads Analysis was completed in January 2002. Road miles contained in this document may differ slightly (less than 5%) from those miles in the Roads Analysis report. INFRA database is continually updated to reflect changed conditions as they are found.

Road Maintenance Levels

Maintenance Levels define the degree of maintenance required for a specific road and the level of service which that road provides, consistent with road management objectives and maintenance criteria (FSH 7709.58, Transportation System Maintenance Handbook). The five maintenance levels are defined as:

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

Maintenance Level 2: Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either (1) discourage or prohibit passenger cars or (2) accept or discourage high clearance vehicles.

Maintenance Level 3: Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either "encourage" or "accept" passenger cars. "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users; unless otherwise specifically authorized, non-street-legal OHV use is prohibited.

Maintenance Level 4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However,

some roads may be single lane. Some roads may be paved and/or dust abated. The most appropriate traffic management strategy is "encourage" passenger cars. However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times; unless otherwise specifically authorized, non-street-legal OHV use is prohibited.

Maintenance Level 5: Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-lane, paved facilities. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is "encourage", except that, unless otherwise specifically authorized, non-street-legal OHV use is prohibited

The majority of roads within the analysis area (55%) are native surface roads. Those under Forest Service jurisdiction are variously managed as either being open for high clearance vehicle traffic (Maintenance Level 2) or as being physically closed so that traffic is eliminated and the roads are in a basic custodial status (Maintenance Level 1) but not prohibited (by Order). The native surface roads in Maintenance Level 2 status are not maintained on a recurring basis but are instead periodically reviewed to determine whether maintenance needs to protect adjacent resource values are present. Many of the native surface roads in the analysis area are on private land and are variably open to public access depending on the wishes of individual landowners or existence of public rights of way.

An additional 44% of the roads are categorized as aggregate-surfaced. Most are not specifically maintained for passenger car use but are generally readily traversed by such vehicles under most circumstances. The remaining 1% of roads are asphalt or bituminous-surfaced facilities, with the most notable examples being Highway 42 and 12. Within the planning area, there are approximately 37 miles of operational maintenance level 1 roads, as shown in Table 5, that are open and drivable owing to breached closure devices.

Table 5. Miles of Road by Maintenance Level

Operational Maintenance Level	Miles
Unclassified Other Jurisdiction	56.98
M/L 1 (Closed)	106.59
M/L 1 (Open)	37.41
M/L 2 (High Clearance Vehicles Allowed)	137.61
M/L 3 (Passenger Car Allowed; Low Speed)	21.90
M/L 4 (Passenger Car Accepted; Moderate Speed)	2.78
M/L 5 (Passenger Car Encouraged; High Speed)	1.40

Affected Environment

Location and Distribution

Within the Jackson analysis area there are approximately 307.7 miles of roads under Forest Service jurisdiction. The existing road system is evenly distributed throughout the analysis area. The majority of roads within the analysis area are located on moderate terrain, with ground slopes rarely exceeding 30%. Scattered roads can be found in midslope positions on slopes at or beyond 30%.

Age and Development History of the Transportation System

The majority of roads within the analysis area have been in existence for more than 40 years, with some additions having been constructed in the recent past. With few exceptions, the roads in this analysis area have been constructed for access to timber harvest areas.

Road Use Patterns

The roads within the analysis area generally have a pattern of use common to low-standard roads in the Ochoco Forest. The use is moderate in the spring after snow melt with various recreational users and wood cutters clearing trees that fell on roads over winter. With the exception of major through routes such as 42, 30, 12, and roads that access popular recreation areas, most roads receive moderate public and administrative traffic through the spring with recreational traffic increasing through the summer. Peak use occurs in the late summer and fall with the commencement of deer and elk hunting seasons. Timber sale activity can contribute substantially to daily traffic values, but the pattern of such activity is usually isolated to one particular area at any given time. Permittees on grazing allotments located within the analysis area contribute a minor usage component and isolated short term higher usage during spring and fall for transport of cattle in and out of the forest.

The anticipated future use patterns will most likely reflect current trends, with the majority of summer usage being comprised of recreational traffic with occasional isolated increases resulting from timber sale and cattle ranching activity, followed by large increases in late summer/fall traffic due to hunting activity.

Road Densities

Open road densities within the analysis area can be expressed as either objective or operational owing to the difference between previously made access management decisions and the degree to which those decisions have been implemented. In essence, the objective open road density is the desired density that would be achieved if all roads were in their desired opened or closed status; the operational road density is a reflection of the current opened or closed status of roads within a given sixth field subwatershed. The current road density represents the actual status on the ground. There are a number of roads that, while being classified as M/L 1, are open to motor vehicle for a variety of reasons. Table 6 shows the effect on density.

The analysis area covers three separate subwatersheds. The following table displays the overall road densities within those subwatersheds- all roads are under Forest Service jurisdiction.

Table 6. Road density (miles/square mile) by subwatershed

Subwatershed	Operational Open Road Density	Objective Open Road Density	Total Road Density
Crazy Creek-Deep Creek	1.91	1.49	3.06
Jackson Creek	2.61	2.16	3.68
Little Summit Prairie Creek	2.27	1.85	3.79

Environmental Effects

Alternative 1

Under Alternative 1, the existing road system would experience no changes in its current status and condition. Roads that are currently in custodial status (Maintenance Level 1) would remain functionally closed and open roads would continue to provide access for recreational, commercial, and administrative functions in the same manner that they currently do. Open roads would receive no maintenance beyond that which is normally scheduled, which is generally devoted to the higher standard roads within the Analysis Area.

Effects Common to All Alternatives

RECONSTRUCTION

The investment in reconstruction activities would result in the improvement, restoration, or realignment of a road. These activities would provide for protection of the sub-grade, a travel way that can be maintained, reduced long term maintenance costs, and other resource protection or mitigation. Road 3000112 would require reconstruction in order to reach proposed harvest units. This would include reestablishing the road prism for approximately 0.30 miles, and would be accomplished by blading, clearing, and establishing drainage. Estimated cost for moderate reconstruction would be approximately $8K/mi., which would mean a cost of approximately $2640 for 0.30 miles. Road 3000650 would require an armored drain dip to accommodate log haul at the jct. of roads 30 and 3000650. Estimated reconstruction costs for the drain dip and pitrun rock to armor the drain dip would be approximately $500 for reconstruction.

TEMPORARY ROADS

Temporary road construction is sometimes required to facilitate the economical harvest of trees from a particular harvest unit. Within the Jackson analysis area, implementation of either Alternative 2 or 3 would result in the construction of temporary roads to aid in completing some silviculture treatments and would result in the temporary commitment of acreage to use as road beds. Mileage and acres per alternative are shown in the table below.

Table 7. Temporary Road Estimate, By Alternative

Alternative	Estimated Mileage	Estimated Acres
Alternative 2	25.0	42.0
Alternative 3	25.0	42.0

Temporary roads would be constructed primarily on flat ground (slopes less than 10%) and excavation and construction of embankments would be negligible. These temporary roads would be built to low construction standards, with constraints of grade, curve radius, compaction, surfacing, and width being tailored to the minimum capabilities of the intended user vehicles. By doing so, they would be constructed in a manner that would minimize disturbance and impacts to adjacent resources.

Temporary roads, by their nature, are not intended for mixed vehicle use, nor are they intended to remain as identifiable facilities after the administrative need for their use has ended. At the completion of harvest and post-harvest activities, all temporary roads would be barricaded to eliminate motor vehicle access and would be subsoiled depending on soil type as part of post-harvest soil remediation activities to facilitate their return to vegetative productivity.

Road Maintenance

As a function of use during harvest activities, road maintenance activities would be conducted on roads designated for use. The types of work that would be expected to be performed as maintenance in timber sale contracts includes: brushing for improved sight distances; removal of hazard trees; blading and shaping of traveled way; restoring existing surface drainage features, such as drain dips or outlet ditches; cleaning culverts and ditches and installing water bars after periods of haul.

Some roads that do not receive recurring maintenance, primarily low standard roads in the Maintenance Level (M/L) 2 category, would see some improvements in both safe drivability and in their ability to handle surface runoff and the resultant sediment. Native surface M/L 2 roads, as a result of use and infrequent blade maintenance, tend to develop shallow ruts in their wheel tracks, which can concentrate shallow flow and lead to increased sediment rates (Foltz, 1991). Post-haul maintenance that would occur on these roads would restore flat road surfaces (without ruts) that

would be capable of producing less sediment than their rutted counterparts; post-haul waterbarring would also remove surface runoff from the erosive road surfaces.

Dust abatement, primarily using water as the dust palliative, would be performed as necessary to maintain safe driving conditions. This would have a secondary effect of maintaining a relatively well-bonded road surface free of the highly erosive pulverized ash "flour" that can occur on native surface roads under heavy use conditions.

Alternative 2

Commercial haul activities and other vegetative treatments proposed in this alternative would result in the use of approximately 181 miles of system roads under U.S. Forest Service jurisdiction. Temporary road construction of 25.0 miles is proposed in this alternative. During the course of treatment activities, 63.9 miles of roads currently closed and in custodial status as M/L 1 roads would be opened. While this would result in some short-term increase in open-road densities, the exact magnitude of the increase would be impossible to predict because not all roads would be open at any given time. The majority of maintenance work; in particular blading and brushing would be performed on the 160.2 miles of M/L 1 and 2 roads used for commercial activities.

Table 8. Haul Road Miles (Forest Service Jurisdiction) by Maintenance Level (Alternative 2)

Operational Maintenance Level	Length
1- Basic Custodial Care (Closed)	63.96
2- High Clearance Vehicles	96.31
3- Suitable For Passenger Cars	20.64
4- Moderate Degree of User Comfort	0.77

Table 9. Road Construction Activity (Alternative 2)

Activity	Length
Reconstruction	0.3
New Specified Road	0
Temporary Road on Existing Disturbance	15
New Temporary Road	10

Alternative 3

Under this alternative, 169.9 miles of system roads would be used for commercial haul activities and other vegetative treatment proposals. The amount of temporary road construction would be 25.0 miles in Alternative 3. Treatment activities would result in the opening of 53.8 miles of M/L 1 roads, resulting in a short-term increase in open road density, but not all roads would be opened at the same time and all would be closed at the end of treatment activities. Under this alternative, approximately 147.1 miles of M/L 1 and M/L 2 roads, in particular the native surface roads, would receive the majority of maintenance effort.

Table 10. Haul Road Miles (Forest Service Jurisdiction) by Maintenance Level (Alternative 3)

Operational Maintenance Level	Length
1- Basic Custodial Care (Closed)	58.87
2- High Clearance Vehicles	93.24
3- Suitable For Passenger Cars	20.66
4- Moderate Degree of User Comfort	0.77
5- High Degree of Comfort	1.40

Table 11. Road Construction Activity (Alternative 3)

Activity	Length
Reconstruction	0.3
New Specified Road	0
Temporary Road on Existing Disturbance	15
New Temporary Road	10

Cumulative Effects

Temporary Roads

The relatively moderate topography within the analysis area has led to a tradition of employing ground-based yarding systems to remove logs to landings. Temporary roads have customarily been constructed to provide access to those landings that were within the interior of units or otherwise not immediately adjacent to existing portions of the transportation system. Older temporary roads that had not revegetated were added to the transportation system in the late 1970s in response to a directive that all existing wheeltracks be inventoried. With the advent of the requirements in the National Forest Management Act that temporary roads be revegetated within 10 years, more attention has been paid to improving circumstances for revegetation on compacted temporary road surfaces, and within the last decade they have been aggressively treated by decompaction with tractor-mounted winged subsoiling tools.

Ochoco Summit OHV EIS trail

The proposed Ochoco Summit OHV EIS is currently in the analysis phase and no timeline for a decision has been established as of the writing of this report. This analysis is currently addressing three action alternatives, each of which has some portion of its proposed trail mileage within the Jackson analysis area. As shown in Table 12, the implementation of any of the three action alternatives would add mileage of open designated motor vehicle routes (primarily for non-highway legal vehicles) to portions of the Deep watershed in the Jackson analysis area.

Table 12. Proposed OHV Trail Miles, Ochoco Summit EIS

Alternatives	Total Miles within the Deep Creek Subwatershed
#2	65.94
#3	42.97
#4	83.09

Forested Vegetation

Plant Association Groups

The upland forest areas within the Jackson Planning Area have been characterized using the plant association concept. Plant associations are a method of land classification which is based on the probable, or projected, plant community which will occupy a site given enough time and an absence of disturbance influences. The plant associations for the entire Ochoco National Forest have been mapped using the classifications described in “Plant Associations of the Blue and Ochoco Mountains” (Johnson and Clausnitzer 1992). The mapping was based on 1:12000 aerial photography and intensive fieldwork.

The Ochoco National Forest has defined eight plant association groups (PAGs) for upland forest and woodland sites. These groups contain plant associations of similar biophysical environments, productivity, and disturbance regimes. Seven PAGs of upland forest and woodlands occur within the Jackson planning area, as well as areas described as non-forest which includes meadows, shrublands, and rock.

There are no distinct elevation zones that predict where a plant association may be found in the planning area. Plant associations are highly related to the soil type as they have been sculptured by water and air across the landscape. This patchwork of vegetation types is quite common in scabland stringer country that is prevalent on the Paulina Ranger District, and found across much of the Jackson planning area. Brief description of the PAGs and more common plant associations found in the Jackson area follows.

Moist grand fir PAG sites support the most diverse flora and are the most productive sites having deep soils. Very little of this PAG is present in the Jackson, with most of it found in the northwest corner of the planning area. In this PAG, grand fir and Douglas-fir are most common, and Engelmann spruce can be found. Ponderosa pine, western larch and lodgepole pine are common early seral species following disturbance.

Dry grand fir is the most common PAG in the Jackson planning area at 43. These sites occur on moderately deep soils, with or without volcanic ash deposits. This PAG is found throughout the planning area in large contiguous blocks. The grand fir/pinegrass plant association has the most mapped acres of any of the plant association at over 21,000 acres mapped. Historically, low intensity fires maintained these stands with ponderosa pine, western larch and to a lesser degree Douglas in an open park-like condition. When these three species are large in diameter, their bark thickness protects them from the heat of a ground fire. In the absence of fire these stands have developed more shade tolerant species – grand fir and Douglas-fir. Lodgepole pine also expanded its range in the absence of fire since its thin bark cannot tolerate the heat that a fire produces. However, around 550 acres are mapped as the lodgepole pine/pinegrass plant association, and it is here where a fair amount of the lodgepole can be found due to the cold, frost prone environment.

The Douglas-fir PAG occurs on soils with depths less than those in the dry and moist grand fir groups. In the southwest corner of the planning area this PAG is found on the slopes above Deep Creek. Douglas-fir/pinegrass (ash soils) and Douglas-fir/elk sedge (residual soils) are the two most prevalent plant associations for this PAG in the Jackson area. Historically, ponderosa pine was the major species in the PAG, and was maintained in an open park-like condition by fire.

Mesic ponderosa pine PAG is the second most common PAG and occurs mainly in the southern half of the planning area. Ponderosa pine/pinegrass (ash soils) and ponderosa pine/elk sedge (residual soils) are the two most common prevalent plant associations for this PAG in the Jackson area. Ponderosa pine is the major species and was maintained in open park-like stands by frequent ground fires (Johnson and Clausnitzer 1992).

Xeric ponderosa pine PAG sites are found on shallow soils and border sagebrush scablands or juniper PAGs. Usually ponderosa pine and western juniper are the only trees. In the Jackson planning area these sites tend to be on broad ridges, interspersed with sagebrush scabland and mesic pine PAGs. These stands help form the forest stringer-scabland mosaic in the southwest corner of the planning area. Like the Douglas-fir and Mesic Pine PAGs, ponderosa pine was the major species and was maintained in an open park-like condition by fire.

Western juniper steppe and western juniper woodland PAGs also occur in the planning area, however they are fairly uncommon and the two combined amount to less than 2 percent of the planning area. Juniper is the only tree species on these sites and it too occurs on very shallow soils, often adjacent to shrub scablands and xeric ponderosa pine PAG. Historically, tree densities were kept quite low by

frequent fires and much of these areas were dominated by grasses, forbs, and shrubs (see Map- 4 Plant Association Groups).

Table 13. Plant Association Group & Non-Forested Lands -Jackson Project Area

Plant Association Group	Total Acres	Percent of the Watershed
Moist Grand fir	363	0.65%
Dry Grand fir	23,859	43.04%
Douglas-fir	5,321	9.60%
Mesic Ponderosa Pine	7,675	13.85%
Xeric Ponderosa Pine	3,063	5.52%
Western Juniper Woodland	37	0.06%
Western Juniper Steppe	745	1.34%
Non-Forested Lands	14,372	25.93%

*Included in these figures are 822 acres of private land.

Existing Forest Vegetation

The Ochoco National Forest's Viable Ecosystem Management Guide (VEMG) (Simpson et al 1994) describes a seral/structural matrix for characterizing forest vegetation within each of the plant association groups. This matrix is a departure from the classic linear succession models, which typically describe succession as a progression through different stages, i.e. early, mid, late, climax. The Ochoco NF matrix has three seral stages based on species composition (early, mid, late), and each of these is subdivided into five size/structural conditions (grass/forb/shrub, seedling/sapling, pole, small trees, large trees). Thus, the matrix can accommodate up to fifteen cells, each represents a different seral (E, M, L) and size/structural (1-5) condition. The grass/forb/shrub condition is only reflected in the early seral condition. Matrix cells can be further subdivided to reflect relative differences in tree density. Subscripts "a" and "b" are used to denote high and low density respectively. For example, L4a describes a late-seral species composition, small-sized trees, at a high-density level. An example matrix is shown below:

Table 14. Viable Ecosystem Seral/Structural Matrix

Structure Class	Species Composition		
	Early	Mid	Late
Grass, forb, shrub (trees may be present but not dominant)	E1		
Seedling, sapling (less than 4.9 inches DBH)	E2	M2	L2
Pole (between 5 and 8.9 inches DBH), high density	E3a	M3a	L3a
Pole, low density	E3b	M3b	L3b
Small (between 9 and 20.9 inches DBH), high density	E4a	M4a	L4a
Small, low density	E4b	M4b	L4b
Medium/large (21 inches DBH and larger), high density	E5a	M5a	L5a
Medium/large, low density	E5b	M5b	L5b

The VEMG describes the array of conditions, which may exist within each matrix cell, as well as descriptions of predominant natural processes such as insects/disease and fire. The seral/structural matrix is applied to each PAG for consideration of existing and historic condition.

Satellite imagery from 2004 has been used to determine the current distribution of seral structural stages. The resolution of the satellite imagery is approximately 1/6th of an acre. Each 1/6 acre is assigned to one of the VEMG matrix classifications depending upon species composition, structure, and density. Stand growth and disturbance since 2004 that changed vegetative stages has not been included. These changes would include slightly increased canopy closure due to ingrowth and expanded conifer dominance on sites identified as grass, shrub and forb (E1). They would also not

include mortality due to insects, disease and fire. The amount of change since 2004 is thought to be so small that its affect would not meaningfully alter the analysis.

There have been numerous timber sales within the project area, which include a variety of harvest prescriptions. Records from the Paulina Ranger District indicate the following amount of past harvest treatments on Forest Service lands since 1978**:**

1. Regeneration Harvest Total – 3,371 acres
   - Clearcut/Clearcut with Reserve Trees – 2,059 acres
   - Shelterwood/Seedtree– 1,312 acres
2. Overstory Removal/Final Removal – 7,095 acres.
3. Partial Removal Cutting (thinning, selection cutting) – 4,681 acres

Additional harvest is known to have occurred in the area and they are not recorded in the District GIS records. A variety of old records were examined to gather sale information from 1951 to the 1970s for Table 15. These old records are not complete. More recent records are complete. In general, prior to 1970 the harvest was primarily focused on harvesting individual trees, often removing large diameter, high value trees which were deemed at risk to insect mortality. The Keen's Tree Classification system was used for this risk rating and ground based logging was most commonly used. In the 1970s and 1980s overstory removal harvests became common. Regeneration harvests began in the late 1970s and were common in the 1980s. This was especially true following mountain pine beetle outbreak of the late 1970s and 1980s. Some skyline logging occurred in the 1970s/1980s on the steeper ground in the planning area.

Timber sale harvest units over the course of 60 plus years have spatial overlap. This is easily noted in the case of a shelterwood harvest that was followed by a final removal of the overstory shelterwood trees.

Table 15. Past Timber Sales in the Jackson Project Area.

Years	Timber Sale Names
1951 - 1959	Big Happy, Big Springs/Beaverslide Salvage, Buck Hollow, Deep Creek Right-of-Way, Paulina Butte, Ridge Road Salvage, West Paulina Salvage.
1960 - 1969	Big Happy Salvage, Connally Spring Salvage, Crazy Creek, Crazy Creek Salvage, Little Summit Creek, Little Summit Creek Sanitation Salvage, Ridge Road Salvage II, Shown Trough, Thornton Creek, Thornton Sanitation Salvage, West Buker.
1970 - 1979	Crazy, Dean, Deep, Double Corral, Double Jack, Haypress, Jackson, Jackson Creek Salvage, Lava, Toggle, West Prairie, Wilson Spring.
1980 - 1989	Aspen, Blue Bull, Buckhorn, Bullpine Salvage, Chamberlin, Connally, Chuckles Dead, Dendro Salvage, Dublin Salvage, EP, Happy Dead, Indian, Jackpine, L.V., Mace, Puzzle, Round Meadows, Shakey, South Prairie, Wilson, Woodrow.
1990 - 1996	DCWR.
1996 - 2011	Deep Salvage, Summit.

The effects of past harvest, fire, and mortality have been incorporated into the analysis. Changes occurring since 2004 are so small in scale or effect that they would not meaningfully change this analysis.

Existing versus Historic Vegetative Conditions

The Viable Ecosystem model has been used to characterize the existing landscape and to provide a means of comparison to historical conditions. Five of the PAGs have been fully analyzed for the planning area. A range of acres for each stage is given to compare the current conditions to conditions found in the area historically. The existing conditions of the Western Juniper PAGs are displayed but effects on the alternatives on these PAGs were not analyzed as the amount of area is very small (less than 2% of the watershed).

Some of the more important departures from the historic condition are listed below:

1. The exclusion of fire as a disturbance agent, along with past harvest practices, has fostered changes in species composition. Fire intolerant understories have been allowed to develop and fire tolerant overstory trees have been removed. In many stands today there is relatively more western juniper, Douglas-fir, and grand fir and less ponderosa pine and western larch than what occurred historically.
2. Overall, stands dominated by large trees (size class 5) are deficient on the landscape. Stands of large trees with an open "park-like" nature were abundant historically, being maintained by frequent low intensity fires in most of the PAGs. Today, open "park-like" stands of large trees are relatively scarce and below their historic levels of abundance. Multi-story dense stands dominated by large trees are mainly within their historic levels of abundance. Fire exclusion (which allowed understory development) and past harvest (which removed large trees) have been the major causes of change. Many stands, which were once dominated by large trees, have been replaced by stands in which pole and/or small sized trees (size class 3 and 4) are the dominant feature.
3. Increases in stand densities have created more multi-storied stands than occurred historically. Fire exclusion has allowed the development of shade tolerant understories while at the same time selective harvest and overstory removal have decreased the abundance of large tree overstories.

The current trends within the area indicate that, without active management, many of these departures from the desired conditions will continue to increase. The vegetation across the landscape has been altered to the point that many natural disturbance agents can no longer function within their historic roles. Today, there is an elevated risk of experiencing disturbances such as stand replacement wildfire and insect and disease outbreaks of a size and intensity which rarely occurred before. Successional trends, in the absence of disturbance, will tend to favor a continued increase in late-seral and/or fire-intolerant species. Many of the vegetative components are so far out of balance that it may take 100 years or more to return all of them to their former ranges of abundance. The fundamental capability of the system is still largely intact and with careful management can support most historic vegetative conditions.

The following tables display the existing condition of each PAG and the low and high historic range for each seral/structural stage:

Table 16. Moist Grand Fir PAG

S/S Stage	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
E1	43	13.1	5	12	1.1	above
E2a	2	0.6	0	0	0.6	above
E2b	13	4.0	5	12	-1	below
E3a	11	3.4	1	3	0.4	above
E3b	9	2.8	4	12	-1.2	below
E4a	32	9.8	0.4	2	7.8	above
E4b	53	16.2	1.6	8	8.2	above
E5a	21	6.4	0.4	1	5.4	above
E5b	2	0.6	1.6	4	-1	below
M2a	5	1.5	0	0	1.5	above
M2b	2	0.6	3	10	-2.4	below
M3a	14	4.3	1	4	0.3	above
M3b	5	1.5	4	16	-3.5	below
M4a	16	4.9	12	32	-7.1	below
M4b	22	6.7	3	8	0	within
M5a	34	10.4	8	16	0	within
M5b	9	2.8	2	4	0	within

S/S Stage	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
L2a	0	0	0	2	0	within
L2b	0	0	0	0	0	within
L3a	2	0.6	1	5	-0.4	below
L3b	0	0	0	0	0	within
L4a	9	2.8	4	8	-1.2	below
L4b	11	3.4	0	0	3.4	above
L5a	10	3.1	4	8	-0.9	below
L5b	2	0.6	0	0	0.6	above

Table 17. Dry Grand Fir PAG

S/S Stage	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
E1	1950	8.2	2	7	1.2	above
E2a	70	0.3	0	0	0 .3	above
E2b	1733	7.3	3	8	0	within
E3a	435	1.8	1	3	0	within
E3b	1171	4.9	4	12	0	within
E4a	1572	6.6	2.4	4	2.6	above
E4b	7873	33.0	9.6	16	17	above
E5a	616	2.6	2.4	4	0	within
E5b	320	1.3	9.6	16	-8.3	below
M2a	164	0.7	0	1	0	within
M2b	448	1.9	3	8	-1.1	below
M3a	274	1.1	0	2	0	within
M3b	676	2.8	3	8	-0.2	below
M4a	641	2.7	3	5.6	-0.3	below
M4b	2166	9.1	12	22.4	-2.9	below
M5a	1132	4.7	2	5	0	within
M5b	801	3.4	8	20	-4.6	below
L2a	15	0.1	0	2	0	within
L2b	9	0.0	0	0	0	within
L3a	55	0.2	0	2	0	within
L3b	23	0.1	0	0	0.1	above
L4a	296	1.2	1.6	4	-0.4	below
L4b	828	3.5	0.4	1	2.5	above
L5a	504	2.1	3.2	6.4	-1.1	below
L5b	60	0.3	0.8	1.6	-0.5	below

Table 18. Douglas-fir PAG

	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
E1	409	7.7	5	20	0	within
E2a	20	0.4	0	0	0 .4	above
E2b	284	5.3	0	10	0	within
E3a	105	2.0	0	2	0	within
E3b	39	0.7	0	8	0	within
E4a	596	11.2	4	8	3.2	above
E4b	1641	30.8	16	32	0	within
E5a	137	2.6	7	10	-4.4	below
E5b	2	0.0	28	40	-28	below
M2a	0	0.0	0	0	0	within
M2b	21	0.4	0	10	0	within
M3a	71	1.3	0	0	1.3	above
M3b	1	0.0	0	5	0	within
M4a	60	1.1	1	4	0	within
M4b	473	8.9	4	16	0	within

	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
M5a	118	2.2	1	3	0	within
M5b	0	0.0	4	12	-4	below
L2a	62	1.2	0	1	0.2	above
L2b	35	0.7	0	4	0	within
L3a	70	1.3	0	4	0	within
L3b	30	0.6	0	1	0	within
L4a	531	10.0	3.2	6.4	3.6	above
L4b	370	6.9	0.8	1.6	5.3	above
L5a	249	4.7	3.2	6.4	0	within
L5b	0	0.0	0.8	1.6	-0.8	below

Table 19. Mesic Ponderosa Pine PAG

S/S Stage	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
E1	621	8.1	5	25	0	within
E2a	3	0.0	0	0	0	within
E2b	47	0.6	0	5	0	within
E3a	44	0.6	0	1	0	within
E3b	33	0.4	0	4	0	within
E4a	15	0.2	0	2	0	within
E4b	227	3.0	0	8	0	within
E5a	5	0.1	0	2	0	within
E5b	0	0.0	0	8	0	within
M2a	0	0.0	0	0	0	within
M2b	5	0.1	0	5	0	within
M3a	105	1.4	0	1	0.4	above
M3b	2	0.0	0	4	0	within
M4a	82	1.1	0	2	0	within
M4b	482	6.3	0	8	0	within
M5a	153	2.0	0	3	0	within
M5b	0	0.0	0	12	0	within
L2a	72	0.9	0	0	0.9	above
L2b	518	6.7	0	10	0	within
L3a	170	2.2	1	3	0	within
L3b	55	0.7	4	12	-3.3	below
L4a	1214	15.8	0	4	11.8	above
L4b	3593	46.8	20	36	10.8	above
L5a	234	3.0	0	4	0	within
L5b	4	0.1	50	66	-49.9	below

Table 20. Xeric Ponderosa Pine PAG

	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
E1	473	15.5	5	25	0	within
E2a	6	0.2	0	0	0.2	above
E2b	30	1.0	0	5	0	within
E3a	20	0.7	0	0.5	0.2	above
E3b	6	0.2	0	4.5	0	within
E4a	28	0.9	0	1	0	within
E4b	269	8.8	5	9	0	within
E5a	1	0.0	0	1	0	within
E5b	0	0.0	5	9	-5.0	below
M2a	4	0.1	0	0	0.1	above
M2b	6	0.2	0	5	0	within
M3a	19	0.6	0	0.5	0.1	above
M3b	1	0.0	0	4.5	0	within

	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
M4a	193	6.3	0	2	4.3	above
M4b	428	14.0	5	18	0	within
M5a	29	1.0	0	1.5	0	within
M5b	0	0.0	5	13.5	-5.0	below
L2a	31	1.0	0	0	1	above
L2b	34	1.1	5	10	-3.9	below
L3a	69	2.3	0	2	0.3	above
L3b	4	0.1	5	18	-4.9	below
L4a	958	31.4	0	3.5	27.9	above
L4b	397	13.0	15	32.5	-2.0	below
L5a	46	1.5	0	4	0	within
L5b	0	0.0	15	36	-15.0	below

Table 21. Western Juniper Steppe PAG

	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
E1	383	51.4	50	70	0	within
M2a	3	0.4	0	0	0.4	above
M2b	12	1.6	5	10	-3.4	below
M3a	9	1.2	0	0	1.2	above
M3b	4	0.5	5	10	-4.5	below
L4a	81	10.9	0	0	10.9	above
L4b	250	33.6	15	30	3.6	above
L5a	3	0.4	0	0	0.4	above
L5b	0	0.0	5	12	-5	below

Table 22. Western Juniper Woodland PAG

S/S Stage	Existing Acres	Existing Acres (%)	HRV Minimum (%)	HRV Maximum (%)	Difference in HRV (%)	Relation to HRV
E1	1	5.3	50	70	-44.7	below
L2a	1	2.6	0	0	2.6	above
L2b	1	2.6	5	10	-2.4	below
L3a	1	2.6	0	0	2.6	above
L3b	1	2.6	5	10	-2.4	below
L4a	16	42.1	0	0	42.1	above
L4b	15	39.5	15	30	9.5	above
L5a	1	2.6	0	0	2.6	above
L5b	0	0	5	12	-5	below

Successional and structural changes due to the proposed treatments and projections through time were estimated using the Viable Ecosystems model. This model accounts for multi-directional change (multiple pathway succession) through time, but does not include future disturbances. The model includes density dependent growth effects. The fuels reduction treatments (underburning and piling) have not been incorporated into the projections as the effects of these treatments are not anticipated to create changes in species composition, structure, or density of a magnitude large enough to be measured.

There are two primary processes that affect the movement of one seral structural stage to another. Species composition changes due to succession tend to favor shade tolerant species and move stages from early seral to late seral. Growth moves stages from smaller structure to larger structural stages. Although some insects and disease disturbances are species specific and can move early seral to mid or late seral, natural disturbance processes (including fire, insects and diseases, and flooding) tend to move stages backward from mid or late seral to early seral. The magnitude of movement depends on the intensity of the disturbance. Some disturbances, such as low intensity fire, may not affect the dominant stand character, but serve to maintain the existing stage.

Differing growth rates were applied to the two density categories ("a" and "b" densities) within the grand fir, Douglas-fir, and ponderosa pine PAGs. These growth rates directly correspond to rates of change in structure in the Viable Ecosystem seral/structural stages. Less dense "b" stages received an average 20% growth rate bonus over stands which have high "a" densities. This estimate corresponds with density and spacing studies (Oliver 1979, Barrett 1982, Cochran and Barrett 1993, Cochran and Barrett 1999b) where growth rate increases from thinning varied between 15 to 25% depending on stand density and little gains were realized when canopy closure was not reduced below 50 to 60%.

The projected future abundance of each stage is based on stand development assumptions for the various seral structural stages. The 20, 30, and 50-year time intervals were chosen to demonstrate vegetation development over time. The projections that follow later in this report do not include future disturbance events such as widespread insect and disease occurrences, fire, or management activities other than continued fire suppression.

Effects Common to all Action Alternatives

Proposed treatments (both commercial and noncommercial) are designed to reduce tree density and improve growth and vigor of the residual trees and reduce susceptibility to insects and disease. Thinning will more quickly restore historic seral/structural stage conditions and improve growing conditions for larger trees than either no action or prescribed fire alone. Thinning also decreases the probability of crown fires, reducing the potential area burned by unwanted fires, and decreases potential fire severity (Peterson et al. 2005). Thinning followed by fuels treatment has been shown to be effective at mitigating wildfire severity in dry western forests (Prichard 2010).

Live trees 21 inches DBH or larger are not planned to be removed with this project. However, in the event that unsafe working conditions occur, trees 21 inches and greater could be cut to resolve the hazard. Hazardous trees that are cut down in Riparian Habitat Conservation Areas would be left on site.

Numerous studies have shown increased growth and vigor of remaining trees following density management treatments (Oliver 1979, Barrett 1981, Barrett 1982, Barrett 1989, Larson et al. 1983, Cochran and Barrett 1999a, and Cochran and Barrett 1999b). Growth response to thinning has been shown to occur in all size classes of trees, including large old ponderosa pine (McDowell et al. 2003). Other studies have shown reduced susceptibility to many insect and diseases that are density related (Roth and Barrett 1985, Filip and Schmidt 1990). Further studies show moderated fire hazard and lower crown fire potential as a result of thinning and fuel treatment (Omi and Martinson 2002, Pollet and Omi 2002).

Table 23. Summary of Proposed Silvicultural Treatments in Jackson Project Area (acres)

Proposed treatments	Alternative 1	Alternative 2	Alternative 3
Commercial thinning	0	5,744	5,545
Noncommercial thinning outside of commercial units	0	8,841	7,629

Table 24. Acres of Silvicultural Treatment by PAG – Alternative 2

Plant Association Group	Commercial Harvest[1]	Non-Commercial Thinning Only[2]
Moist Grand Fir	7	70
Dry Grand Fir	4,011	3,737
Douglas-fir	304	1,297
Mesic Ponderosa Pine	1,049	2,104
Dry Ponderosa Pine	187	728
Juniper Woodland	0	12
Juniper Steppe	10	119
Non-Forest	175	774
Total	**5,744**	**8,841**

1. The commercial harvest includes the acres of commercial aspen treatment.
2. Non-commercial is of acres outside of commercial harvest, and includes the acres of juniper and aspen treatments.

Table 25. Acres of Treatment by PAG – Alternative 3

Plant Association Group	Commercial Harvest[1]	Non-Commercial Thinning Only[2]
Moist Grand Fir	4	67
Dry Grand Fir	3,913	3,160
Douglas-fir	300	1,083
Mesic Ponderosa Pine	964	1,853
Dry Ponderosa Pine	185	714
Juniper Woodland	0	12
Juniper Steppe	10	116
Non-Forest	168	624
Total	**5,545**	**7,629**

1. The commercial harvest includes the acres of commercial aspen treatment.
2. The non-commercial is of acres outside of commercial harvest, and includes the acres of juniper and aspen treatments.

Departure from Historic Conditions- Direct and Indirect Effects

Alternative 1

No treatments would occur. Vegetation would continue to develop within the project area in a manner determined by existing stocking and species composition. Many of the future stages, which develop through natural growth and succession, would tend towards mid or late-seral species composition and multi-strata characteristics. The rate at which many stands would develop large tree character would be hampered by overstocked conditions. The density of most stands would continue to increase and individual tree growth rates are expected to decline. On drier sites, such as ponderosa pine PAGs, stand stagnation would become more common. Existing trees would continue to be weakened by competition in overly dense stands.

In the absence of stand treatments, the presence of Douglas-fir in the understory of Douglas-fir PAG stands would increase as would the grand fir in dry grand fir PAG stands. Western juniper seedlings would continue to become established in dry and mesic ponderosa pine PAG stands and grow into saplings and pole sized trees that will compete with the ponderosa pine. The establishment of these seedlings and saplings in the understory aids in the development of ladder fuels. Increasing and sustained high stand densities would result in high shade levels and reduce the amount of understory vegetation that is important for soil protection and forage.

Density related tree mortality is expected to increase and would result in increased amounts of dead and down wood in these same stands. Increased ground and ladder fuels and high crown closure would maintain a higher risk of intense fire behavior. High intensity wildfires have the greatest

potential to create rapid, large scale change to stand structure and density. In the event of such a fire, more early seral stand structures dominated by shrubs, herbaceous plans and tree seedlings/saplings would be created.

Dense structural stages, already above the historic abundance, would continue to increase, reaching the highest levels of all alternatives. Acres dominated by grand and Douglas-fir would steadily increase, while acres dominated by ponderosa pine and western larch would steadily decrease. Tables 26, 27 and 28 and Figures 3, 4, and 5 display the effects of the alternatives on species composition and dense conditions.

Alternative 2

Treatment would generally move stands in a multi-strata condition to or towards a single-strata condition. Many stands would continue to be in an uneven-aged condition. Reducing stand density would reduce competitive stress on the remaining trees (Powell 1999). This would result in more large trees being maintained over time, as well as to encourage the development of additional large trees (Cochran et al. 1994). The abundance of early-seral species would be maintained and enhanced in the long-term; however, late seral species would continue to be present in stands where they exist prior to treatment. Grand fir and Douglas-fir would be retained both in the overstory (all trees ≥21" dbh) as well as in the understory but at lesser amounts.

Treatments are also proposed in single-strata conditions but where stocking density is currently considered to be too high. Treatment would target the smaller diameter and less vigorous trees for removal, while maintaining the generally single strata characteristics. This would encourage the development of large structure at an accelerated rate. In addition, reducing stocking density would increase tree vigor and reduce insect and disease hazard.

The amount of dense structural stages would be reduced by about 2,000 acres, remaining within the historic range. After 20 years and beyond, the amount of dense conditions increases to be above the historic range as succession and growth continue in the absence of additional disturbance. Acres dominated by grand and Douglas-fir would be reduced the most of any alternative, and is projected to remain with the historic range for 50 years. Acres dominated by ponderosa pine and western larch would be maintained within the historic range for 50 years. Over time this alternative retains the most acres with ponderosa pine and larch dominance.

Alternative 3

Treatment would generally move stands in a multi-strata condition to or towards a single-strata condition. Many stands would continue to be in an uneven-aged condition. Reducing stand density would reduce competitive stress on the remaining trees (Powell 1999). This would result in more large trees being maintained over time, as well as to encourage the development of additional large trees (Cochran et al. 1994). The abundance of early-seral species would be maintained and enhanced in the long-term; however, late seral species would continue to be present in stands where they exist prior to treatment. Grand fir and Douglas-fir would be retained both in the overstory (all trees ≥21" dbh) as well as in the understory but at lesser amounts.

Treatments are also proposed in single-strata conditions where stocking density is currently considered to be too high. Treatments would target the smaller diameter and less vigorous trees for removal, while maintaining the generally single strata characteristics. This would encourage the development of additional large structure at an accelerated rate. In addition, reducing stocking density would increase tree vigor and reduce insect and disease hazard.

The amount of dense structural stages would be reduced by about 1,900 acres and be within the historic range. After 20 years and beyond, the amount of dense conditions increases above the historic range as succession and growth continue in the absence of additional disturbance. Acres dominated

by grand and Douglas-fir would be reduced by about 475 acres, yet remain within the historic range for the next 50 years. The amount of area dominated by ponderosa pine and western larch would be increased over time, but not to the extent of Alternative 2.

Table 26. Acres of Dense Structural Stages

	0 years	20 years	30 years	50 years	Historic Low	Historic High
Alt 1	10,137	17,271	20,150	24,660	4,848	11,772
Alt 2	8,093	15,395	18,366	22,214		
Alt 3	8,240	15,522	18,484	23,180		

Figure 3. Dense Structural Stages

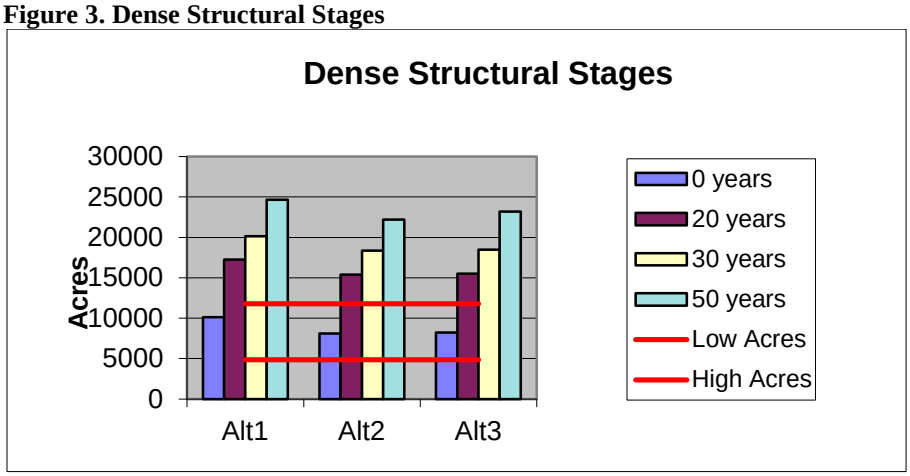


Table 27. Acres Dominated by Grand Fir and Douglas-fir

	0 years	20 years	30 years	50 years	Historic Low	Historic High
Alt 1	3,109	3,781	4,011	4,532	1,886	5,510
Alt 2	2,554	3,170	3,356	3,778		
Alt 3	2,636	3,198	3,385	3,811		

Figure 4. Grand Fir and Douglas-fir Dominated Stages by Alternative and Historic Range

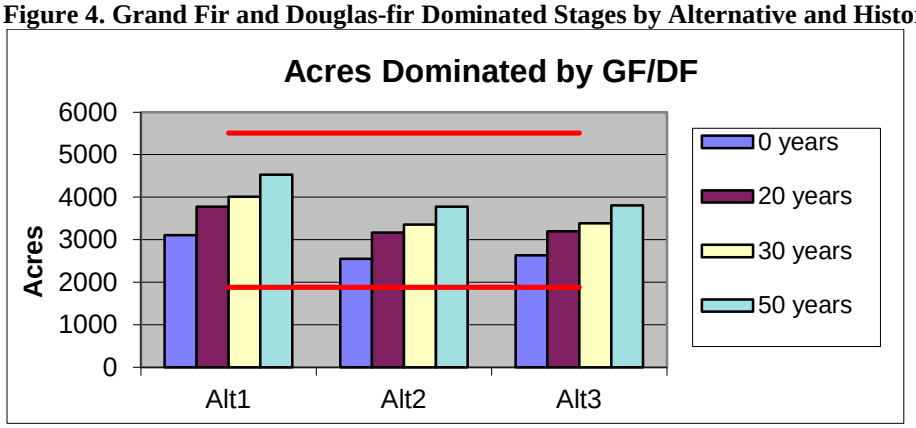
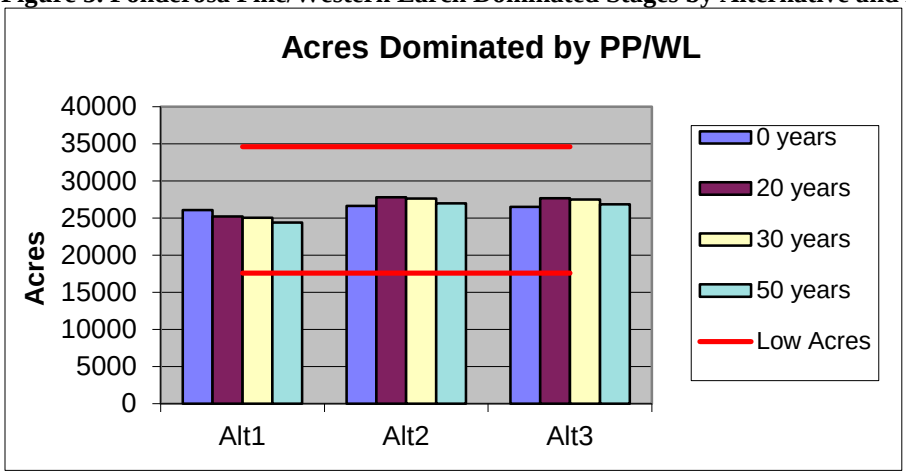


Table 28. Acres Dominated by Ponderosa Pine and Western Larch

	0 years	20 years	30 years	50 years	Historic Low	Historic High
Alt 1	26,096	25,205	25,052	24,415	17,585	34,616
Alt 2	26,623	27,783	27,634	26,973		
Alt 3	26,511	27,666	27,517	26,856		

Figure 5. Ponderosa Pine/Western Larch Dominated Stages by Alternative and Historic Range



Cumulative Effects – Departure from Historic Conditions

There is one proposed timber sale in the project area called Wheeler Aspen Stewardship agreement. This timber sale would help restore three aspen stands (19 acres) in the upper part of the project area along the 30 Road. Commercial and noncommercial sized conifers that are shading the aspen clones are planned to be removed from these stands. All sizes of aspen trees would respond to the increased levels of sunlight and growing space, restoring aspen dominated stands. Trees 21 inch DBH or larger would be retained in these aspen stands, helping to provide diversity for wildlife species. There are no other planned timber sales within the planning area. The effects of past harvest and have been included in the analysis of the existing condition as described previously.

The Deep Creek Watershed Restoration EA is an ongoing restoration project in the Jackson area. This project is focused on stream restoration work and has little effect on upland forested areas.

The Ochoco Summit OHV Trail is a proposed project that that would implement 4x4, ATV and motorcycle trails through the Jackson project area. Portions of the proposed trail system are located on existing road beds of both open and closed roads. This project proposes to convert some of the closed roads to motorized trails. This conversion would involve narrowing the road by placing material like soil, rocks and logs on the roadbed. The roadbed would remain in place and could be used for future timber sale activities, including log trucks. However, the cost of removing soil, rocks and logs from the road bed would be assessed to the timber sale. Segments of the proposed trails would be closed for public safety when the trail is an area of timber sale activity, non-commercial thinning or prescribed burning or when the trail is located on a road being used by logging traffic. The overall effect of these trails on upland forest vegetation is expected to be minimal.

Insects and Disease

Past management practices, including fire suppression and selection harvest, have favored the development of stands which are now considered to be out of balance when compared to their historic conditions. Historically (100+ years ago) many stands in the planning area would have commonly had more ponderosa pine and western larch and less grand fir, Douglas-fir and western juniper. There would have been more open and single storied stands rather than the multi-storied stands of today. These stand conditions were maintained by frequent low-intensity fires, which prevented them from becoming overcrowded. Natural disturbance agents have always been present in the planning area, however, the degree to which they now affect the area can be considered to be a reflection of the decline in the ecosystem's health and resiliency.

According to "America's Forest Health Update 2009" published in June 2009 by the Forest Service, "much of the Interior West was significantly drier during the period from 1996 to 2005, compared to the 110-year average". "Periods of below normal precipitation, often coupled with above normal temperatures, can lead to increased tree stress, reduced tree resistance to insects and pathogens, accelerated insect life cycles, and insect abundance, resulting in high levels of tree mortality and increased wildfires". These observations along with the current stand conditions points towards an un-sustainable situation for many forest stands in the Jackson project area which are overstocked.

Bark Beetles: Aerial insect and disease surveys for years 2003 through 2011 show numerous active mortality centers due to bark beetle feeding. Field observations by District foresters have verified the current bark beetle activity and susceptible stand conditions. A primary concern is the loss of large diameter mature ponderosa pine, and to a lesser extent Douglas-fir.

Mountain pine beetle (*Dendroctonus ponderosae*) and western pine beetle (*Dendroctonus brevicomis*) occur in the project area. Ponderosa pine is a susceptible host to both beetles in overstocked stands, and mature lodgepole pine stands attract mountain pine beetles. Bark beetle mortality is symptomatic of over-stocked stand conditions that create competition stress and reduce tree vigor (Schmidt et al.1994, Graham and Knight 1965). Thinning (density reduction) has been shown to be effective in reducing bark beetle susceptibility in stands (Fettig et al. 2007, Shaw et al. 2009). Drought conditions and root disease can also contribute to a tree's susceptibility to a successful bark beetle attack that result in the tree dying.

In recent years mortality caused by the mountain pine beetle activity has especially been noticeable in lodgepole pine in the project area around Little Summit Prairie, at the higher elevations of the project area, and adjacent to the following streams: Jackson, Happy Camp, Double Corral, Toggle, Thornton, and West Thornton. Mortality caused by the western pine beetle tends to occur in scattered locations where large, overstory ponderosa pines are crowded by a dense understory of conifers. Pockets of large pine mortality can also be found following prescribed burning where dense stand conditions have weakened the overstory trees and additional stress from the burning has put the individual trees at risk.

Also occurring in the project area are Douglas-fir beetle (*Dendroctonus pseudotsugae*) and the fir engraver (*Scolytus ventralis*). Both of these insects are regarded as secondary pests because they attack trees that are weakened and stressed. Factors such as drought, defoliation, overstocking and disease can result in outbreaks of these insects that can cause increased mortality within a stand. Managing stands within recommended stocking levels, removing low vigor/high susceptibility trees, and favoring non host species such as pine and larch are recommended management strategies for reducing susceptibility to these insects (Fettig et al. 2007, Shaw et al. 2009). Aerial surveys in 2004 found that the fir engraver population rapidly increased in the project area; however it quickly fell the following year.

Foliage Insects: A group of insects called defoliators are also present in the area. The western spruce budworm is the most notable. From approximately the mid-1980s to the early 1990s the western spruce budworm was at an outbreak level in the planning area, along with the rest of the Ochoco, which caused large amounts of trees damage and/or mortality in nearly all stands in which grand fir and Douglas-fir were major components. Attributes, which contribute to high susceptibility to defoliating insects, are: 1) increased amount of late seral host species, 2) increased stand densities, and 3) the development of multi-storied stand structure (Carlson and Wulf 1989). The trend without vegetative treatments would be for these characteristics to increase until insect population dynamics and climatic conditions combine to generate another outbreak of epidemic proportions.

The Douglas-fir tussock moth is another defoliating insect present in the project area. Douglas-fir and grand fir are the preferred hosts for this species. Stands dominated by these species that have multiple canopy layers are at the highest risk to defoliation during an epidemic outbreak. Management activities that reduce the canopy layers to two or fewer layers and promote the stand composition of non-host species (ponderosa pine, western larch, lodgepole pine) can reduce the effects from the Douglas-fir tussock moth during an epidemic outbreak (Shaw et al. 2009).

Another defoliator that is present is the larch casebearer. In recent years, the larch casebearer has been quite noticeable in the larch along Jackson and Little Summit drainages. It is especially noticeable because the casebearer can be accompanied by larch needle blight and larch needlecast, and some years it appears that the larch is near death. Since larch produces new foliage every spring, the impacts of the casebearer and these diseases is only for a year at a time. However, repeated heavy defoliation for five years or more by the casebearer can retard growth and occasionally stress a tree enough that is succumbs to other factors. Dwarf mistletoe and overstocked stand conditions are the other factors that contribute to tree stress. Treatments that manage stand stocking levels and reduce the presence of mistletoe can promote healthy and vigorous larch that are less affected by the casebearer (Shaw et al. 2009).

Dwarf mistletoe: Ponderosa pine dwarf mistletoe (*Arceuthobium campylopodum*) decreases tree vigor, reduces growth, and increases susceptibility to other pathogens (Hawksworth and Shaw 1987). Infections in trees of the upper canopies spread readily to trees in the lower canopies. Douglas-fir dwarf mistletoe (*Arceuthobium douglasii*) and larch dwarf mistletoe (*Arceuthobium laricis*) cause growth loss, reduce wood quality, and result in top kill and eventually mortality. Larch dwarf mistletoe is common in larch throughout the project area and is the most damaging disease-caused parasite for the species (Burns 1990). Observations by District foresters confirm that severe dwarf mistletoe infections are the main contributor to larch mortality. When present in Douglas-fir, the Douglas-fir dwarf mistletoe can also be severe and lead to mortality. Ponderosa pine dwarf mistletoe is also present in the planning area. It is not widespread, but in selected stands the infection level is severe, as seen in the vicinity of Big Springs Campground.

Dwarf mistletoes accelerate the movement to mid and late seral species compositions by reducing the vigor of infected early seral species and increasing the competitive advantage of later seral species. Dwarf mistletoes cause branch structure to broom creating nest and hiding sites for many animals. Some animals forage on dwarf mistletoe plants.

Dwarf mistletoes are probably more common at present than historically due to the reduction of normal fire events. Dwarf mistletoe spreads from infected trees to adjacent trees that are close enough to catch mistletoe seeds as they are released from the plant. Historically, more stands in the project area were open with fewer understory trees. Frequent low ground fire would have scorched lower branches thus killing infected branches and preventing mistletoe spread. As stands have become more dense and multi-strata, dwarf mistletoes have been able to spread faster. As height growth slows due to infected branches, dwarf mistletoe moves more quickly into the higher tree crown. Branches with

mistletoe brooms may contribute to ladder fuels that allow wildfire to reach tree crowns, increasing the risk of crown fire initiation (Hessburg, 1994).

Dwarf mistletoe management can be directed at either prevention or reduction. The most effective treatment for dwarf mistletoe control is to remove infected overstory trees. However, removal of large trees is not part of the proposed treatments in this project. Harvest or non-commercial thinning do, however, reduce stocking and can effectively reduce some growth loss, improve vigor and reduce re-infection (Roth and Barrett 1985). Favoring of non-host tree species can also reduce mistletoe infestation as can increasing tree spacing which removes susceptible species from the seed dispersal area of an infected overstory tree (Shaw et al. 2009).

Indian Paint Fungus, stem decay, is common in late seral stands in the Dry and Moist Grand Fir PAGs in the project area. Trees infected with this disease develop heart rot and are prone to breakage as they have less strong heartwood to support them. Grand fir is commonly infected with Indian paint fungus, and a minor wounding of the tree can activate the dormant fungus (Mallams et al. 2010). In stands were grand fir is abundant today, this disease is most likely present. Across the interior west this decay pathogen has become prevalent as past timber harvest and fire suppression have resulted in stands that are composed of more grand fir and less ponderosa pine and western larch (Filip et al. 2009). To reduce tree wounding and subsequent decay from Indian paint fungus while thinning stands, implementation practices such as leave tree marking, designating skid trails and avoiding spring or early summer activities near host trees are recommended (Filip et al. 2009).

Root disease: Two strains of Annosus root disease have been identified in the project area. The P-Group affects ponderosa pine and western juniper, and it has been found in both species in the northwest corner of the project area along the 30 Road. The S-Group Annosus, which affects grand fir and Engelmann spruce, has been observed throughout the project area in old grand fir stumps. The spread of this disease is associated with past timber harvest of large diameter trees. Future spread from timber harvest can be prevented through the use of borax (registered product name Sporax) applied to freshly cut stumps. Most trees to be removed in this proposed timber sale are of small diameter and do not function as a host to the disease. As a precautionary measure, in select stands, grand fir and ponderosa pine stumps that are 18 inches in diameter and larger would be treated (Shaw et al. 2009). Favoring tree species that are resistant to the specific root disease is another management strategy to manage root disease (Shaw et al. 2009).

Armillaria root disease and laminated root rot are two other root diseases of concern for the project area although disease centers have not been located in the project area. They are most evident in stands of high density and stands with a major component of late seral species. Vigorously growing trees can be infected but can often confine the fungi and limit the extent of the infection (Hadfield et al. 1986, Shaw et al. 2009). Favoring tree species that are resistant to the specific root disease is an important management strategy (Shaw et al. 2009).

The grand fir PAGs are where most of the root disease activity can be found, especially in areas where stands conditions combine to reduce stand vigor. These diseases can kill trees directly, and often work in conjunction with insects and disease to create pockets or patches of mortality (Hagle and Shaw 1991). Historically, these disease centers were usually small and contributed to stand diversity. With the changes over time in species composition, the incidence of and susceptibility to root disease infection is increasing (Schmitt 2001). The tendency, without disturbance or management, is for infection centers to be repopulated with host tree species and for infections to perpetuate and intensify.

Direct and Indirect Effects – Insects and Disease

The susceptibility of the landscape to disturbance agents has been evaluated by examining the abundance of those vegetative stages that have a high risk factor associated with them. Table 29 displays the stages that are considered to be at high risk to insects and disease:

Table 29. High Insect Risk Stages by PAG

PAG	High Risk Stages
Moist GF	E4a, E5a, M5a, L3, L4a, L5a
Dry GF	E3a, E4a, E5a, M4a, M5a, L3, L4, L5
Doug-fir	E3a, E4a, E5a, M4a, M5a, L3, L4a, L5a
Mesic PP	M4a, M5a, L4a, L5a
Xeric PP	M3, M4a, M5a, L4a, L5a

Alternative 1

Currently, there are about 10,160 acres within the project area that are in stages rated as high risk. This is currently within the historical range. Under this alternative, no actions are proposed which would reduce susceptibility. Vegetative development would continue dependent on the conditions and successional trends which currently exist. Many of the stages, which become more abundant in the future, have high risk factors associated with them (high density, abundance of late-seral species, etc.) In 20 years the amount of high risk area is projected to increase to about 17,150 acres, which is above the historical range by about 5,100 acres.

Table 30 and Figure 6 display the amount of high risk area associated with each alternative.

Alternative 2

The actions proposed in this alternative reduce the high-risk stages by almost 2,100 acres, which is within the range at which it historically occurred. The proposed treatments would reduce stand densities, increase the relative abundance of early-seral species, and increase resistance to disturbance agents. This alternative reduces the acres of high risk condition the most of all the alternatives. This trend continues through the 50 year projection period. However, in 20 years the amount of high risk area is projected to increase to about 15,218 acres, above the historical range by 3,162 acres.

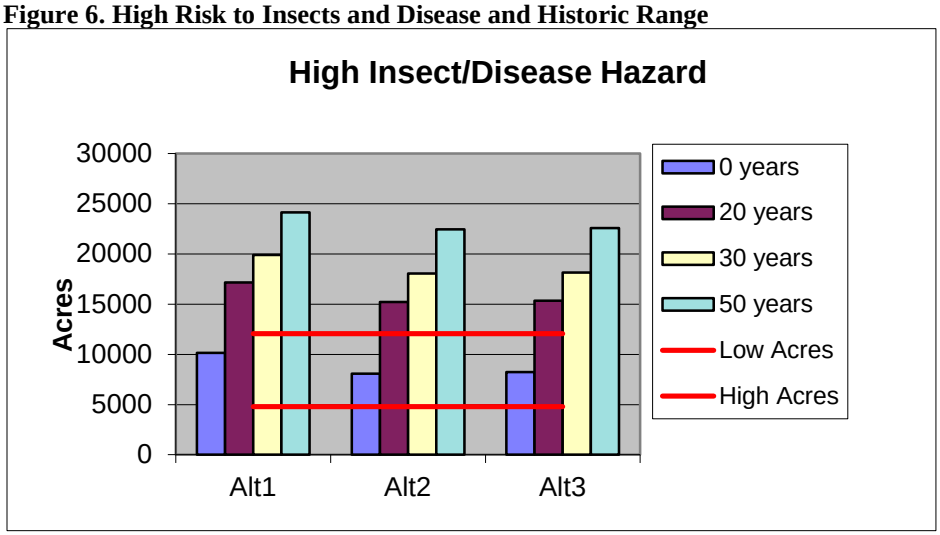
Alternative 3

The actions proposed in this alternative reduce the high-risk stages by about 1,930 acres, and bring the amount of area to within the range at which it historically occurred. In 20 years the amount of high risk area is projected to increase to 15,347 acres, above the historical range by 3,291 acres.

Table 30. Acres in a Condition of High-Risk to Insects and Disease.

	0 years	20 years	30 years	50 years	Historic Low	Historic High
Alt 1	10,163	17,156	19,900	24,156	4,782	12,056
Alt 2	8,085	15,218	18,040	22,464		
Alt 3	8,233	15,347	18,161	22,572		

Figure 6. High Risk to Insects and Disease and Historic Range



Cumulative Effects

The 20, 30 and 50-year projections include only the proposed actions associated with each alternative. They do not include any future management such as continued underburning, thinning, or other stand tending activities, which could occur. Thus, the acres of high risk increase with time as succession and stand growth continue uninterrupted. The effects of past actions are included in the descriptions of existing condition.

Late and Old Structure

Late and old structure (LOS) is an important vegetative condition specifically identified in the Regional Forester's Forest Plan Amendment #2 (June 1995). The amendment defines LOS as those vegetative structures in which large trees are a common feature. It goes on to identify two different structural conditions, multi-strata and single-strata. The amendment provides guidance to analyze LOS and, depending on its abundance in relation to historic condition, sets different scenarios for interim management.

Satellite imagery is used as the landscape analysis tool to estimate the existing amount of LOS. The Viable Ecosystem's size/structure class 5 (21"+ dbh) is used to identify existing LOS. Differentiation between multi- and single-strata LOS is based on the "a" and "b" density classifications. The amount of each LOS type by PAG has been compared to its corresponding HRV. This comparison determines which of the scenarios outlined in the amendment are applicable to the Jackson project.

Existing LOS Condition

There are currently an estimated 4,490 acres of LOS within the grand fir, Douglas-fir, and ponderosa pine PAGs. The majority **(**3,289 acres**)** of the LOS is in a multi-strata condition. Historically, the overall total amount of LOS would have ranged between 13,203 and 25,910 acres, with the bulk of it in a single strata condition due to frequent low-intensity fires which were the dominant disturbance regime in the area. Examination of each PAG reveals that all PAGs except Douglas-fir are within the historic range for the multi-strata condition. Except for moist grand fir, all PAGs are below the historic range for the single strata condition. Across all PAGs, the total amount of multi-strata LOS is within the combined historic ranges, while single stratum LOS is below.

Table 31. Existing LOS and Historic Ranges by PAG

PAG	LOS Type	Existing Acres	Historic Low Acres	Historic High Acres	HRV Status
MGF	multi	65	41	82	Within
	single	13	12	26	Within
	Total	78	52	108	Within
DGF	multi	2,252	1,812	3,670	Within
	single	1,181	4,386	8,960	Below
	Total	3,433	6,198	12,630	Below
DF	multi	504	596	1,033	Below
	single	2	1,747	2,854	Below
	Total	506	2,343	3,887	Below
M Pine	multi	392	0	692	Within
	single	4	3,842	6,608	Below
	Total	396	3,842	7,300	Below
X Pine	multi	76	0	199	Within
	single	0	764	1,786	Below
	Total	76	764	1,985	Below
Total	multi	3,289	2,449	5,676	Within
	single	1,200	10,751	20,234	Below
	Total	4,489	13,199	25,910	Below

Table 32. Summary of Existing LOS Status by PAG

Plant Assoc. Group	Multi-strata LOS	Single-strata LOS	RF Amend. #2
Moist Grand Fir	Within Historic	Within Historic	Scenario B
Dry Grand Fir	Within Historic	Below Historic	Scenario A
Douglas-fir	Below Historic	Below Historic	Scenario A
Mesic ponderosa pine	Within Historic	Below Historic	Scenario A
Xeric ponderosa pine	Within Historic	Below Historic	Scenario A

The information displayed above includes all LOS, regardless of patch size. This ranges from individual 1/6th acre pixels to groups of several pixels. Often there are numerous individual pixels in close proximity to one another but not connected. The Ochoco National Forest has also identified a minimum patch size of 5 acres that must be met in order to qualify as an LOS “stand” as described in the Regional Forester’s Amendment. To identify LOS stands, pixel maps, on-the-ground field checking, and aerial photo interpretation was conducted. Using these techniques, 4,191 acres of LOS stands have been identified and mapped. The amount of LOS stand acreage is less than discussed previously because the pixels of LOS can be scattered, and a minimum of 5 acres was needed to be mapped as a LOS stand. Using this mapped technique, some stands that are classified as LOS contain some non-LOS conditions within them as well as small inclusions of non-forest land. All mapped LOS stands are classified as multi-strata.

Up to 1996, most timber sales within this project area concentrated on harvest of large trees. However, many harvested stands still have a component of large trees that can be maintained and augmented over time. Some areas nearly meet the large tree criteria for LOS and present opportunities for expanding the size of existing LOS stands and developing new LOS.

Under Scenario A of the RF Amendment #2, the Interim Wildlife Standard directs that no harvest activities will occur within late and old stands that are below HRV and that live trees 21 inches DBH or larger would be maintained. Silvicultural treatments outside late and old structural stands should maintain or enhance late and old structure components. Open, park-like stand conditions would be

maintained where it occurred historically. A memo from the Regional Forester dated June 11, 2003 encourages site-specific Forest plan amendments to treat LOS stands to help meet LOS objectives.

Due to the current multi-strata, dense conditions within LOS stands, large trees within them are at risk of mortality from insects and disease. As discussed previously, there is evidence that density reduction treatments have shown increased diameter growth rates and improved vigor of large residual trees thus helping to maintain them over time. For this reason Alternatives 2 and 3 propose harvest and non-harvest treatments within mapped LOS stands to help maintain the existing large tree structure, enhance the development of additional large trees, and lessen the risk of loss. Implementation of Alternatives 2 and 3 would require a Forest Plan Amendment (Chapter 2) to implement as they propose commercial harvest within mapped LOS stands that are currently below historic abundance (Douglas-fir) or would drop below historic abundance with implementation (Dry Grand Fir).

Direct and Indirect Effects – Mapped LOS Stands

Part of the purpose and need in this project area is development and maintenance of late and old structure. Alternatives 2 and 3 include harvest and non-harvest treatments (non-commercial thinning, slash piling, and prescribed fire) within LOS stands. Alternative 1 does not propose any treatment in LOS stands. The following tables show the amount of mapped LOS stands treated by alternative and harvest in LOS stands by plant association group. Within the Jackson project area approximately 4,190 acres of LOS stands were delineated. The majority of the LOS stands (2,663 acres) are within the dry grand fir plant association group. The xeric ponderosa pine PAG has the least amount of mapped LOS stands (43 acres).

Table 33. Acres of Mapped LOS Stands by Plant Association Group

PAG	Acres
Moist Grand Fir PAG	188
Dry Grand Fir PAG	2,663
Douglas-fir PAG	978
Mesic Ponderosa Pine PAG	319
Dry Ponderosa Pine PAG	43
Total	4,191

Table 34. Acres of LOS treatment by Alternative

	Alternative 1 No Action	Alternative 2	Alternative 3
Acres LOS stands treated	0	1,696	1,435
Commercial thinning with noncommercial thinning and/or fuel treatment	0	733	695
Noncommercial thinning and fuel treatment	0	729	526
Prescribed burning only	0	234	214

Table 35. Acres of Harvest within LOS Stands by Alternative and Plant Association Group

Alternative	Moist Grand Fir	Dry Grand Fir	Douglas-fir	Mesic Pine	Xeric Pine
1	0	0	0	0	0
2	3	531	29	159	11
3	1	517	29	137	11

Alternative 1

No treatments would occur. LOS stands that are currently over-stocked would remain dense with high risk of competition-related mortality, especially of the large tree component. Review of the annual aerial surveys for insect and disease occurrence showed several LOS stands with bark beetle activity. LOS stands would remain at high risk of severe wildfire due to high canopy closure and existing ladder and ground fuels.

Alternatives 2 and 3

Commercial harvest and non-commercial thinning would help maintain large trees by reducing stand density, thus reducing competition stress in the older, larger overstory and removing ladder fuels which would lessen the risk of crown fire. Prescribed fire would reduce existing and activity fuels and also reduce risk from wildfire. These treatments reduce the risk of losing LOS stands to wildfire or insects/disease.

Large trees in treated LOS stands are expected to persist longer than those in untreated LOS stands. Due to the number of large trees and existing stand densities, some treated LOS stands would still retain basal areas above the recommended stocking which means that the effects of treatment would not last as long or produce as much growth as stands with lower densities.

Direct and Indirect Effects – Total LOS

Predictions have been made for each alternative, which display future amounts of LOS occurring within the planning area at 20, 30, and 50 years as a result of the proposed alternatives. These projections include changes from natural growth and succession, as well as endemic levels of disturbance (insects and disease). These projections do not include widespread events such as stand replacement wildfire, western spruce budworm, or bark beetle epidemics. They also do not include assumptions about future management except for continued fire suppression.

Overall, the planning area is currently within HRV for multi-strata LOS and below for single-strata LOS. These tables display the immediate effect of each action alternative on the total amount of LOS and the resultant status for the entire planning area. Single-strata LOS would continue to be below HRV for these PAGs, while multi-strata would continue to be within except for Douglas-fir, which is already below by about 90 acres and Dry Grand Fir would fall below HRV by 84 acres. The total LOS acres displayed in Table 36 for alternatives 2 and 3 do not match the total acres of LOS for alternative 1. However, the total acres of LOS for each alternative should be the same since there would be no immediate loss or gain of LOS by implementing alternatives 2 or 3. No trees greater than 21 inches would be harvested with either of the action alternatives. The rounding of numbers that occurs when this analysis was calculated has created this situation, and when compared to the total number of acres this rounding error is within one percentage point.

Table 36. Existing and Post-treatment LOS by PAG (acres).

PAG	LOS Type	Existing	Alt 2	Alt 3	Historic Low Acres	Historic High Acres
MGF	multi	65	65	65	41	82
	single	13	13	13	12	26
DGF	multi	2,252	1,728	1,741	1,812	3,670
	single	1,181	1,679	1,666	4,386	8,960
DF	multi	504	473	473	596	1,033
	single	2	34	34	1,747	2,854
M Pine	multi	392	298	307	0	692
	single	4	97	89	3,842	6,608
X Pine	multi	76	72	72	0	199
	single	0	4	4	764	1,786
Total	multi	3,289	2,636	2,658	2,449	5,676
	single	1,200	1,827	1,806	10,751	20,234
	Total	4,489	4,463	4,464	13,199	25,910

Table 37. Projected Acres of LOS in Years 20, 30, and 50 by Alternative.

		Year 20	Year 30	Year 50
Alternative 1	multi	5,879	7,062	9,239
	single	2,373	2,756	3,223
	Total	8,252	9,818	12,462
Alternative 2	multi	5,337	6,575	8,856
	single	3,162	3,599	4,124
	Total	8,499	10,173	12,980
Alternative 3	multi	5,354	6,589	8,867
	single	3,130	3,562	4,082
	Total	8,484	10,151	12,948

Figure 7. Projected Acres of Multi-strata LOS by Alternative

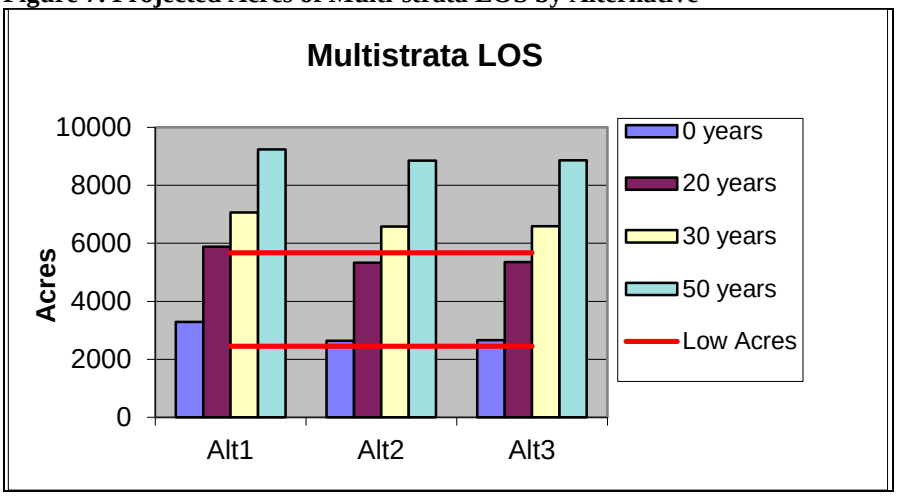


Figure 8. Projected Acres of Single Strata LOS by Alternative

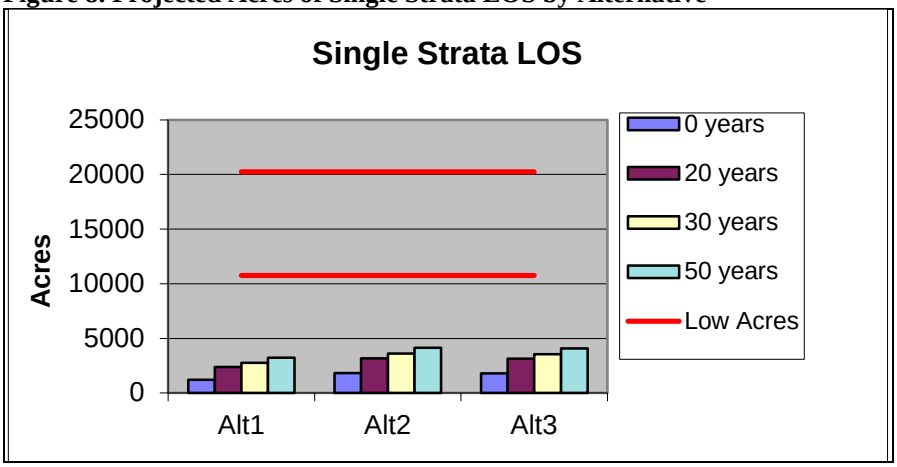
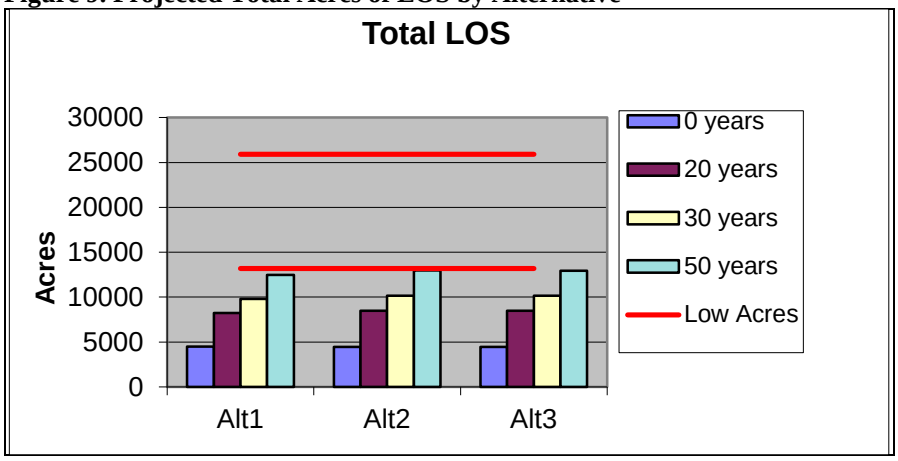


Figure 9. Projected Total Acres of LOS by Alternative



Alternative 1

No proposed activities would occur. LOS development within the planning area would be in a manner determined by existing stocking and species composition. Much of the future LOS that develops through natural growth and succession would tend towards mid or late-seral species composition and multi-strata characteristics. These conditions are currently within HRV for all of the PAGs except the Douglas-fir PAG, which is currently below HRV by about 90 acres. The rate at which stands would develop large tree character would be hampered by over stocked conditions. On drier sites, such as the ponderosa pine and Douglas-fir PAGs, stand stagnation may preclude the attainment of additional large trees. Large trees within existing LOS stands would continue to be susceptible to mortality from competition with understory trees and the accompanying increase in risk to loss due to insects, disease, and wildfire.

Alternative 2

Treatments would remove understory trees to reduce stand density, maintain existing large trees, and enhance the development of additional large trees. No live trees 21 inches dbh or larger, except those trees considered hazardous to the logging/hauling operation, would be cut. Primarily fire-intolerant, late-seral species would be targeted for removal although these species would not be eliminated.

Reduction in stand density would reduce competitive stress. This would result in more large trees being maintained over time, as well as encourage the development of additional large trees. Treatment would also reduce the risk of large tree mortality due to disturbance agents. Single-strata conditions are more likely to be sustained over time than multi-strata conditions since the trees are more vigorous and less susceptible to insects, disease, and wildfire. The abundance of early-seral species would be maintained and enhanced in the long term.

Following the implementation of this alternative these changes would occur:

- Moist Grand Fir multi-strata and single strata LOS remains unchanged within HRV.
- Dry Grand Fir multi-strata LOS acreage drops 84 acres below HRV, while the single stratum increases by 500 acres. Within 20 years, the Dry Grand Fir multi-strata is back within HRV.
- Douglas-fir multi-strata LOS acreage drops 31 acres further below HRV, while the single stratum increases by 31 acres. Within 20 years the Douglas-fir multi-strata is back within HRV.
- Mesic ponderosa pine multi-strata LOS remains within HRV, while the single strata increases by 90 acres.

- Dry ponderosa pine multi-strata remains within HRV, while the single stratum increases by 4 acres.

Alternative 3

Treatments would remove understory trees to reduce stand density, to maintain existing large trees, and to enhance the development of additional large trees. No live trees 21 inches dbh or larger, except those trees considered hazardous to the logging/hauling operation, would be cut. Primarily fire-intolerant, late-seral species would be targeted for removal although these species would not be eliminated.

Reduction in stand density would reduce competitive stress. This would result in more large trees being maintained over time, as well as encourage the development of additional large trees. Treatment would also reduce the risk of large tree mortality due to disturbance agents. Single-strata conditions are more likely to be sustained over time than multi-strata conditions since the trees are more vigorous and less susceptible to insects, disease, and wildfire. The abundance of early-seral species would be maintained and enhanced in the long term.

Following the implementation of this alternative these changes would occur:

- Moist Grand Fir multi-strata and single strata LOS remains unchanged within HRV.
- Dry Grand Fir multi-strata LOS acreage drops 70 acres below HRV, while the single strata increases by 480 acres. Within 20 years the Dry Grand Fir multi-strata is back within HRV.
- Douglas-fir multi-strata LOS acreage drops about 31 acres further below HRV, while the single stratum increases by 31 acres. Within 20 years the Douglas-fir multi-strata is back within HRV.
- Mesic ponderosa pine multi-strata remains within HRV, while the single strata LOS increases by 80 acres.
- Dry ponderosa pine multi-strata remains within HRV, while the single stratum increases by 4 acres.

Cumulative Effects

There is another small timber sale proposed in the Jackson project area, Wheeler Aspen. A portion of one unit of this aspen restoration project occurs within a stand mapped as dry grand fir multi-strata LOS. Ten acres of harvest is proposed. The harvest would not remove trees 21 inch DBH and greater, and the treatment would result in the stand moving from a multi-strata to a single strata LOS stand. The effects of past harvest and other activities have been included in the description of the existing condition as described previously.

Connective Corridor Treatments

The Interim Wildlife Standard contained within the Regional Forester's Forest Plan Amendment #2 (1995) provides guidance to maintain connectivity between LOS stands and between all Forest Plan designated old growth habitats. Connective corridors have been mapped for the project area and various treatments, including timber harvest, have been proposed within them. Approximately 1,225 acres within the project area are mapped as connective corridors. (See Map 12, Appendix D).

Table 38. Proposed Activities within Connective Habitat by Alternative (acres)

	Alternative 2	Alternative 3
Commercial Harvest with noncommercial thinning and/or fuels treatment	112	107
Noncommercial thinning and fuels treatment (no harvest)	309	159
Underburning only	182	150

The Interim Wildlife Standard provides stand criteria relating to structure and density which should be met within connective corridors when proposing harvest activities. The Interim Wildlife Standard does not apply to activities such as non-commercial thinning and fuels reduction which are not timber sales. The described condition is: "Stands in which medium diameter and larger trees are common, and canopy closures are within the top one-third of site potential". Medium and large trees are not defined, but for the purposes of this analysis it is assumed that an average tree diameter of 16 inches at breast height would meet this criterion. To meet the density criteria it would be necessary to maintain enough trees to maintain between 66 percent and 100 percent of full stocking. Full stocking is the density level at which inter-tree competition is occurring and resulting in mortality (in other words the stand is self-thinning). Stand densities above full stocking are not sustainable due to competition related mortality and resultant susceptibility to attack by insects and disease (Powell 1999).

The Wildlife Standard allows for timber harvest within connectivity corridors so long as these two criteria (tree size and canopy density) can be met, as well as criteria relating to corridor width. It also directs that some amount of understory (if any exists) be left in patches or scattered to assist in supporting stand density and canopy cover.

The upper limit of the management zone is set at 75 percent of full stocking, while the lower limit of the management zone is set at 50 percent of full stocking. Retaining trees at these densities would result in a corresponding canopy closure ranging from 50 to 75 percent of site potential. Retaining additional understory trees during non-commercial thinning would add to the amount of canopy closure retained. These understory trees may be retained in clumps or scattered as mentioned previously. The table below displays representative canopy closures which would be retained in various plant association groups for a stand of primarily ponderosa pine with an average stand diameter of 16 inches (Powell 1999). The plant associations selected as examples are those common within the project area.

Table 39. Example Canopy Closures at Various Densities.

Plant Association Group (Plant Association)	Full Stocking Canopy Closure (%)	Upper Limit Management Zone Canopy Closure (%)	Lower Limit Management Zone Canopy Closure (%)
Xeric Ponderosa Pine (Ponderosa pine/Idaho fescue)	52	39	26
Mesic Ponderosa Pine (Ponderosa pine/pinegrass)	68	51	34
Douglas-fir (Douglas-fir/pinegrass)	68	51	34
Dry Grand fir (Grand fir/pinegrass)	73	55	37
Moist Grand fir (Grand fir/twinflower)	75	56	49

Thinning to densities within the management zone would reduce canopy cover to between 50 and 75 percent of site potential. This does not include additional canopy contributed by any understory that would be retained during non-commercial thinning. Thinning to the lower level of the management

zone within connective corridors would result in a canopy closure that is lower than the top one-third of site potential and would require a Forest Plan Amendment. Thinning to the midpoint of the management zone and leaving additional understory would retain canopy closure in the top third of site potential and not require a Forest Plan amendment. In Alternatives 2 and 3 the harvest that is proposed within connective corridors occurs primarily within the dry grand fir plant association group (approximately 100 of the 112 acres).

Alternative 1

No proposed activities would occur. Stand development within the connective corridors would be in a manner determined by existing stocking and species composition. Current stocking levels are above the upper limit of the management zone. Corridors would continue to increase in density until a disturbance agent such as insects or wildfire causes tree mortality. Once this mortality occurs it is likely that density would be reduced below the top third of site potential since insects and wildfire in densely stocked stands tend to remove entire patches of live trees as opposed to selectively thinning them. The rate at which stands would develop large tree character would be hampered by over stocked conditions. On drier sites, such as the ponderosa pine and Douglas-fir PAGs, stand stagnation may preclude the attainment of additional large trees. Existing large trees would continue to be susceptible to mortality from competition with understory trees and the accompanying increase in risk to loss due to insects, disease, and wildfire.

Alternatives 2 and 3

The commercial harvest proposed within Alternatives 2 and 3 would selectively thin stands to reduce density thereby increasing tree growth and reducing susceptibility to insects, disease, and fire. Thinning would reduce densities to be within the “management zone” as determined by site productivity and tree size (Powell 1999). The management zone is that range of stand density between full utilization of the site resources (on the lower end) and the onset of competition induced mortality (at the upper end). Both alternatives 2 and 3 include portions of harvest units within connective corridors, encompassing approximately 112 and 107 acres respectively. Prescriptions in the connective corridors would be modified to retain density in the upper half of the management zone (63 percent of site potential). This level of density, in addition to retained understory, would maintain canopy closure in the top one third of site potential and meet the Interim Wildlife Standard. Thinning would maintain or enhance the large tree component.

Alternatives 2 and 3 propose other treatments in addition to the harvest units previously discussed. While the Interim Wildlife standards do not apply to these treatments they would have an effect of reducing canopy cover by thinning or killing smaller trees. Changes in stand density are expected to retain canopy cover in the top half of site potential since stocking would be maintained within the management zone (minimum of 50% of full stocking) and only smaller understory trees would be affected. The effect of these treatments is to: 1) cause a reduction in tree density and encourage the growth of the remaining trees, 2) reduce competitive stress on the remaining trees, especially the larger trees, and reduce the risk of insect mortality, and 3) reduce the risk of wildfire causing the loss of tree structure. Non-commercial thinning prescriptions within these units would be modified to retain clumps of understory as described previously. Non-harvest treatments would meet the intent of the Interim Wildlife standards.

Cumulative Effects to Connective Corridors

There are no other proposed treatments within the planning area which would affect mapped connectivity corridors. Past harvest and treatments that have occurred within connectivity corridors were considered when the corridors were delineated.

Aspen Treatments

Quaking aspen stands can be found throughout the Jackson planning area. Many are located along streams, while others are at springs, rock outcrops, within meadows and some are located in upland forest stands. Overall the aspen stands are small in size and fragmented across the watershed. Historically many of these stands were believed to be connected, lining streams and prospering in meadows (Shirley and Erickson 2001). Today most stands are less than 1 acre in size, with the largest stand at 15 acres. Aspen stands are struggling in the watershed for many reasons, with one main reason being the encroachment of conifers into the aspen stands. Aspen needs full sunlight to thrive (Burns and Honkala 1990). As the presence of conifers has increased the aspen have become shaded. Conifer competition along with other factors: livestock grazing, big game browsing, lowered water tables through stream down-cutting and road building, fire suppression, and aspen diseases, have combined to a rapid decline of the species (Bartos, et al. 1998, Bates et al. 2010, Shepperd et al. 2001). Conifers compete for not only sunlight, but also for limited site factors, nutrients and water. In most aspen stands, the majority of the conifers present are less than 21 inch DBH. Conifers larger than 21 inch DBH are present in many aspen stands and function as a historical component of the stand. The trees under 21 inch DBH typically provide most of the competition to the aspen trees since there are many more of them present

Aspen are a key species for the Blue Mountains, providing habitat for many species including neotropical birds, upland game birds, cavity nesting species, snowshoe hares, beavers, deer, elk, and black bears (DeByle 1985). Their spreading roots provide excellent stability to streambanks and soil surfaces, and their leaves provide shade to streams, aid in soil fertility and aquatic system health. In the fall the leaves enhance the scenery with vibrant color. Recreationists are drawn to aspen areas for camping, hiking and bird watching.

Direct and Indirect Effects – Aspen Stands

One purpose of this project area is to restore and enhance aspen stands. Alternatives 2 and 3 include harvest and non-harvest treatments (non-commercial thinning, slash piling, snag creation/girdling up to 15 inch dbh, fencing/caging for protection and planting) within aspen stands. Alternative 1 does not propose any treatments in aspen stands. Alternative 2 proposes to restore nearly all the known aspen stands within the Jackson planning area that are in need of restoration. For both Alternatives 2 and 3 there are 18 non-commercial thinning units that have scattered individual aspen trees within them, and are referred to as noncommercial thinning treatment with an aspen component. In these 18 units, the majority of the acres would be treated with a regular noncommercial thinning treatment and when the scattered aspen are encountered the treatment would be modified to benefit aspen.

Table 40. Aspen treatments by Action Alternative

	Alternative 2	Alternative 3
Acres aspen stands commercially treated	126	94
Acres of aspen stands with non-harvest treatments	169	199
Number of noncommercial thinning stands with an aspen component	18	18

Alternative 1

No treatments would occur. Aspen stands that are currently struggling to regenerate due to conifer competition, big game and livestock grazing would continue to decline with a high risk of aspen mortality and conversion of the site to be fully occupied by conifers.

Alternatives 2

Commercial harvest and noncommercial thinning would help reduce conifer competition, providing more growing space, sunlight, water and nutrients for aspen. This alternative is the most beneficial for restoring aspen in the project area by commercial removing conifers from 126 acres and non-commercially removing conifers from 169 acres. Alternative 2 commercially removes conifers from 32 more acres than alternative 3 and non-commercially thins 30 less acres than alternative 3. Almost the same numbers of acres are treated in the two action alternatives, the difference being the size of conifer trees being removed from the aspen stands. Where needed, protection from big game browsing and livestock grazing would aid aspen regeneration to grow above browse height and establish the site. These treatments should lead to the restoration of aspen stands, aiding to maintain the genetic diversity of the different stands across the watershed.

Alternative 3

Commercial harvest and non-commercial thinning would help reduce conifer competition, providing more growing space, sunlight, water and nutrients for aspen. This alternative restores 94 acres of aspen by removing conifers with a commercial timber sale and non-commercially thins conifers from 199 acres. Where needed, protection from big game browsing and livestock grazing would aid aspen regeneration to grow above browse height and establish the site. These treatments should lead to the restoration of aspen stands, but not as well as alternative 2 as explained above.

Cumulative Effects

The Paulina Ranger District has been working to restore aspen in the Jackson planning area over the past 12 years. Since 1999, forty-three acres of non-commercial thinning and eight acres of commercial thinning have been completed in aspen stands to reduce conifer competition. This restoration work has been accomplished with timber sales, post and pole sales, and non-commercial thinning with contractors. Aspen fences and cages have been constructed by fire crews, youth crews, employees, volunteers, and partners. The earliest of these aspen treatments have been very successful at getting aspen regeneration established and aiding in trees growing above browse height.

The Wheeler Aspen Restoration Project is a proposed on the Paulina Ranger District. Only part of this project is within the Jackson planning area. Under this proposal an additional 19 acres of commercial harvest and 2 acres of non-commercial thinning would occur in aspen stands. All of these proposed treatment acres are scheduled to protect aspen regeneration from grazing and browsing using fences or cages.

The Deep Creek Watershed Restoration project is ongoing in the Jackson area. This project focuses on restoring streams, springs and riparian vegetation in the watershed. Many projects are planned ranging from cutbank revetment to decommissioning roads. Completion of the projects that repair headcuts and streambanks would have a positive benefit for the restoration of aspen by helping to raise the water table along restored stream segments. The construction of livestock riparian exclosures and riparian pasture fences could also benefit aspen in the watershed when aspen occurs within the fenced areas. Headcut repairs that have been completed are located in the headwaters of Big Springs and Little Summit Creeks. New fences have been completed at Toggle Meadows and the headwaters of Big Springs Creek. Upstream of the completed headcut repairs are existing aspen stands and it is also present inside the livestock exclosure fence that was constructed at the headwaters of Big Springs Creek.

Table 41: Status of Deep Creek Watershed Restoration Projects

Deep Creek Watershed Restoration	Planned	Accomplished
Headcut Stabilization	37 Headcuts	3 Headcuts
Grazing Exclosures	226 Acres	85 Acres

Forest Wood Products and Jobs

Affected Environment

For the purposes of describing socio-economic effects on the economy, this analysis focuses on the economy of central and southeastern Oregon. The effects to the local economies are based on the estimated number of jobs created. The bulk of the area and communities potentially influenced by actions on the Ochoco National Forest lie within Deschutes, Crook, and Jefferson, the southernmost part of Wheeler, eastern most part of Grant, and the northern most sections of Harney and Lake counties. This is referred to as the Zone of Influence. The major population centers within the Zone of Influence and their population figures, based on the 2000 and 2010 census figures, are displayed in Table 42.

Table 42. Population change for the Central Oregon Zone by County

County	Population		Change	Percent Change
	2000 Census Data	2010Census Data		
Jefferson	19,009	21,720	2,711	14.3%
Deschutes	115,367	157,733	42,366	36.7%
Crook	19,182	20,978	1,796	9.4%
Wheeler	1,550	1,441	-109	-7.0%
Grant	7,950	7,445	-505	-6.4%
Harney	7,609	7,422	-187	-2.5%
Lake	7,422	7,895	473	6.4%
Total	**178,089**	**224,634**	**46,545**	**26.1%**
Information retrieved Oct., 2011, from http://factfinder.census.gov/				

Future population projections are expected to mimic that of the past decade. Deschutes, Crook, and Jefferson Counties are expected to continue with growth, whereas the more rural counties, Wheeler, Grant, Harney, and Lake are projected to grow quite slowly, if at all. Table 43 summarizes the changes in the civilian labor force in Central Oregon from 2000-2009.

Table 43. Changes in civilian labor force in Central Oregon.

County	Civilian Labor Force		Change	Percent Change
	2000 Census Data	October, 2009		
Jefferson	8,570	9,282	712	8.3 (+)
Deschutes	57,614	83,578	25,964	45.1 (+)
Crook	7,525	9,467	1,942	25.8 (+)
Wheeler	598	642	44	7.4 (+)
Grant	4,051	3,384	-667	16.5 (-)
Harney	3,110	3,376	266	8.6 (+)
Lake	3,371	3,711	340	10.1 (+)
Total	84,839	113,440	28,601	33.7 (+)
Information retrieved on November 24, 2009, from http://www.qualityinfo.org/pubs/rolf/09/rolf1109.pdf.				

The following information comes from a report generated by the Oregon Employment Department in August, 2009. In Crook County, the three largest sectors of employment changes were government, (1,410), trade (1,390), and manufacturing, including wood products (860). In Deschutes County, the three largest sectors were trade (12,740), leisure and hospitality (10,770) and government (9,010). In Jefferson County, the three largest sectors were government (2,710), trade (900), and manufacturing (810). In Wheeler County, the three largest sectors were government (155), trade (35), and leisure and hospitality (35). In Harney County, the three largest sectors were government (1,200), trade (380), and leisure and hospitality (270). In Grant County, the three largest sectors were government (1,180), trade (360), and leisure and hospitality (180). In Lake County, the three largest sectors were

government (1,140), trade (360), and manufacturing (250). Generally speaking, the number of jobs in each sector (other than government) has declined in recent years.[1]

As of August, 2011, the unemployment rate in Oregon was 9.6 percent; while unemployment rates in the individual counties were[2]:

- Crook, 15.6 percent;
- Deschutes, 12.7 percent;
- Jefferson, 13.6 percent;
- Wheeler, 9.3 percent;
- Harney, 11.8 percent;
- Grant, 10.4 percent; and
- Lake, 12.9 percent.

Jobs in manufacturing (including wood products) have declined over the last decade in the counties of Central and Eastern Oregon. However, these sectors remain strong in several counties and continue to provide jobs.

Environmental Effects

Alternative 1

There would not be any activities implemented; therefore, no jobs would be created. As a result there would be no direct benefits to the local or regional economies. In all actuality, the No Action Alternative would have negative impacts to local and regional economies because forest product jobs would not be maintained. The ability to substitute this material from another source is questionable given the current availability of timber, especially from Federal lands. As noted in the affected environment section, Crook County no longer has any primary manufacturing capacity and more than half of the direct jobs supported by the harvesting, transporting, and processing of timber are associated with primary manufacturing. However, since the activities would take place in Crook and Wheeler counties, it is likely that many of the logging jobs that would be supported under the action Alternatives would in fact be associated with Crook County and Wheeler counties logging industry. It is also unlikely that many of these local logging jobs would be supported by another harvest activity on the Ochoco National Forest or within the Zone of Influence. This would result in some downward pressures on all facets of Crook County's economy.

The economic activity associated with road work, and vegetation and fuel treatments, would not occur under this alternative. Except for the prescribed fire treatments (these are usually accomplished with local Forest resources), many of the jobs associated with these activities, especially the noncommercial thinning and slash piling, are accomplished through the use of contracting and many of the resources needed, including workers, are from outside the Zone.

Alternatives 2 and 3

Timber harvest (lumber and wood products) and road work (temporary road construction and reconstruction) would affect employment and income in three ways: (1) direct effects attributable to employment associated with the harvesting, transportation, and manufacturing; (2) indirect effects attributable to industries that supply materials, equipment, and services to these activities; and (3) induced effects attributable to personal spending by the owners, employees, families, and related industries. Employment (and personal income) impacts were made from estimates derived from Gebert et al. (2002). The jobs associated with prescribed fire and noncommercial thinning are based on local observations and do not include indirect and induced jobs.

[1] Retrieved on Octoer 5, 2011 from http://*olmis.emp.state.or.us/pubs*/lltpacket/lltpacket_0809.pdf.
[2] Retrieved on October 5, 2011 from http://www.qualityinfo.org/olmisj/AllRates.

Table 44 shows the estimated annual job and income by alternative. No attempt has been made to value what has been termed ecosystem service values. This type of analysis, if done at all, is more appropriate at the Forest Plan level, not at the project level (Bartuska, 2000, and a United States Court of Appeals, 9th circuit Memorandum, 2006).

Timber harvest jobs and income shown in Table 44 are based on State-wide relationships and are not necessarily the expected impact in any one county. Because of this, the estimated jobs and income figures are likely to be higher than what one would expect in a less developed rural economy. For example, the indirect and induced jobs described above would be less in a rural economy such as Crook's as money "leaks" out of the local economy to Redmond, Bend, and the Willamette Valley. The jobs and income associated with the road work are directly tied to Crook County's economy. However, they are based on all road work within the County. Because the road work on the Forest is generally less intensive, the number of jobs portrayed in Table 44 is likely overstated.

Over half of the timber jobs displayed in Table 44 are associated with primary manufacturing (sawmills), and since there is no certainty on where this manufacturing would occur, as materials may not be processed within the Zone of Influence; it is therefore not possible to predict where many of these jobs would exist.

Table 44. Projected annual employment and income

	Alternative 2	Alternative 3
Total Jobs commercial harvest	227	219
Personal Income (Direct), timber harvest ($1000)	4,500	4,300
Jobs, noncommercial thinning	40	33
Jobs, prescribed fire	8	7

Alternatives 2 and 3 propose commercial harvest activities and would contribute to the local, regional, and State economies. The estimated jobs would occur over several (3 to 7) years as timber is harvested and processed. Given the major restructuring of the wood product industries over the past 10 to 15 years, it is likely that these would not be new jobs but jobs needed to maintain current levels of employment in the forest products industry. As noted in the affected environment section, Crook County no longer has any primary manufacturing capacity. Over half of the direct jobs supported by the harvesting, transporting, and processing of timber are associated with the primary manufacturing. Although many of the logging activities may be associated with Crook County, the most likely location for processing is in Grant, Klamath or southern Deschutes County.

In addition to the employment and income figures from harvesting and manufacturing of wood products, the vegetation, fuel treatments, and road work would also generate jobs and income over the next 3 to 10 years.

It is reasonable to expect a good proportion of the noncommercial thinning work would go to minority-based small businesses, as they have in the past. The vast majority of these businesses and their employees are based along the I-5 corridor, so most of the disposable income from these activities would not flow into local communities. There would be some local economic activity generated from these activities. The primary services needed by the workers would be food and shelter. Local businesses that can supply food (grocery stores and restaurants) and other services would capture most of the money being spent by the workers in the area. Some businesses may need to increase their employment, either by temporarily adding employees, or giving present employees more hours. This would likely result in increased local household incomes during implementation of project activities. Since these businesses have supported similar workforces in the past, capitol expansion would probably not be required.

Within the social context presented above, the action alternatives have the potential to bring in workers from the outside to perform logging and related activities. While the outside workforce is more likely to be racially diverse than the local resident population, the residents have worked

effectively with and supported anticipated fluctuations in the workforce expected with the implementation of either action Alternative.

Cumulative Effects

Overall, the economic influence from implementation of any of the alternatives is likely to be small within the economic context of the zone as a whole. Trends in employment indicate increased employment, primarily in construction, services, and trade. This would help ameliorate any adverse economic impacts under Alternatives 1.The Action Alternatives, which provide commercial wood products in addition to economic activities associated with the other management activities, along with these same overall economic trends, would help strengthen local, particularly Crook's, and regional economies. In the context of larger economies, regional or State-wide scales, the amount lost under Alternative 1, or the amount provided in the Action Alternatives, would not be measurable.

Fire and Fuels

The following information is summarized from the "Fire and Fuels Specialist Report for the Jackson EIS," which is located in the Jackson project file on the Paulina Ranger District, Prineville, Oregon.

The most common natural disturbance that affects vegetation on the Ochoco National Forest is lightning-caused fire. Fire exclusion over the past 90 – 100 years has reduced the acres burned by naturally-occurring, low intensity fires and allowed the buildup of surface fuels, the development of ladder fuels, and an increase in fire intolerant species such as grand fir. Stands have become denser and the potential for high severity fires has increased.

Affected Environment

Historically, fire has been the dominant natural disturbance in the Jackson project area. A fire scar analysis for the years 1650 thru 1900 from a dry mixed conifer site 10 miles southwest of the Deep watershed shows an average fire return interval of 15 years (Heyerdahl 2010). A fire scar analysis for the years 1770 thru 1900 from a dry mixed conifer site 20 miles northwest of the Deep watershed shows an average fire return interval of less than 10 years (Burleson 1981). A fire scar analysis from a site adjacent to a moist mixed conifer site 15 miles west of the watershed shows an average fire return interval of 33 years (Dean 2009).

A fire scar analysis conducted in the middle of the Deep Creek watershed in November 2010 for cat-faces and other evidence of fire, found 71 scars on 10 samples (Dean, Scholz 2010). It is evident from numerous scars on the trees near Happy Camp Creek that low intensity fire was historically a common occurrence. Judging from the size class and density of lodgepole in the understory, which (along with grand fir) is not a fire tolerant species, it appears that fire hasn't occurred here in many decades (fire-adapted ponderosa pine, western larch and Douglas-fir are the dominant species on the Ochoco, and are not naturally prone to landscape-scale stand replacement fires.)

The estimated historic acres burned by wildfire in the 55,432-acre Deep watershed, based on a 10-year fire return interval for the lower elevations and south slopes, and a 30-year fire return interval for the higher elevations and north slopes, is 2500 acres per year (Viable 2004). However, in the last century, extensive livestock grazing (which reduces the fine fuels that carry fire) and fire suppression have caused a significant decrease in the number of acres burned. On the entire Paulina Ranger District, from 1970 thru 1989 (excluding two large fires), there were 509 wildfires for 303 acres burned. In the Deep watershed, from 1986 thru 2007, there were 89 wildfires, all fewer than 5 acres. Prescribed fire has been used since the 1980s to reduce fire hazard, but not at a rate that would maintain conditions in a historic range. From 2001-2008, prescribed fire was used on 8976 acres, an average of 1122 acres per year, less than half that estimated to occur historically. The evidence

demonstrates that the majority of the Jackson area was historically subjected to a fire regime of high frequency/ low intensity fires.

Condition Class

Existing Condition

Condition class describes changes in stand conditions and fire effects caused by fire exclusion. The three Condition Classes are generally equivalent to low, moderate and high departure from historic conditions at a stand level. Table 45 describes some of the characteristics of the three condition classes. Table 46 describes the effects of wildfires that burn in each condition class. Changes in condition class result from changes in surface fuels, ladder fuels and stand density. In general, stands in Condition Class 1 support low intensity/low severity fires, stands in Condition Class 2 support moderate fires while stands in Condition Class 3 support high intensity/high severity fires.

All of the forested area within the Jackson project area has been assigned a Condition Class based on its existing vegetation and fuel condition. Currently about 58 percent of the project area is in Condition Class 1, 27 percent in Condition Class 2, and 15 percent in Condition Class 3.

Table 45. Characteristics of condition classes.

Condition Class I	Condition Class 2	Condition Class 3
• Low intensity fire has occurred within 0-15 years • Fuel models[3] 2,8,9 • Flame lengths 2-4 feet • non-lethal fire effects • ladder fuels scattered, clumpy • crown base heights > 6ft • crown fire potential low • light smoke, short duration • canopy closure <55%	• No fire has occurred for 15-35 years • Fuel models 2,6,9,10,11 • Flame lengths 4 to 8 ft • mixed fire effects (between 20% and 80% mortality to overstory) • ladder fuels filling in understory • moderate to high crown fire potential • canopy closure 55% to 70%	• No fire has occurred for 35+ years • Fuel models 6,10,11,12,13 • Flame lengths over 8 ft • lethal fire effects • ladder fuels abundant • crown fire potential is high • heavy long term smoke from complete combustion[4] • tree growth is reduced • tree mortality increases

Table 46. Potential effects of wildfires burning in each condition class.

	Low Severity Fire Condition Class 1	Mixed Severity Fire Condition Class 2	High Severity Fire Condition Class 3
Litter	Scorched, charred, consumed	Consumed	Consumed
Duff	Intact, surface charred	Deep charred	Consumed
Woody debris – small, < 3 in. diameter	Partly consumed - charred	Consumed	Consumed
Woody Debris – large, > 3 in. diameter	Charred	Deep charred, consumed	Consumed
Ash color	Black	Light gray	Reddish orange
Mineral soil	Unchanged	Unchanged	Altered structure, hydrophobic
Soil temp at 0.4 in	< 120 F	210-390 F	>490 F
Nungerford 1996 and DeBano and others 1998, cited in Robichaud and others 2000, and from Tarrant 1956, cited in Wells and others 1979.			

[3] see Anderson 1982.
[4] See Table 902 under Air Quality.

Environmental Effects

Alternative 1

According to the Deep Creek Watershed Analysis (2010), the density of small trees within many stands have increased above historic levels. Stands that were thinned and burned in the 1980s and 1990s are in need of additional thinning and burning to maintain low surface fuels and ladder fuels, or these stands run an increased risk of crown fire.

Under alternative 1, stands that are in Condition Class 1 would not be maintained in that condition, and could transition into Condition Class 2 within the next 5 - 10 years. Surface fuels would continue to accumulate, ladder fuels would fill in the understory and raise the fuelbed, and the forest canopy would close. Wildfires would tend to be more severe and difficult to control.

Without treatment, the amount of forest in Condition Class 2 and 3 would increase. Limited vegetation management, aggressive wildfire suppression, and insect and disease mortality would continue the trend of increased fuel loading in the form of dead and down trees, small diameter trees growing into the overstory, and dense crown conditions. These conditions would increase the potential for a surface fire to transition to a crown fire, which could result in the loss of late and old structure, wildlife cover, and large woody debris in riparian areas.

Alternatives 2 and 3

Changes in Condition Class would result from reductions in surface fuels, ladder fuels and stand density. The activities would reduce the potential for high intensity fire by 1) reducing surface fuels, which would shorten the flame lengths of surface fires, 2) increasing crown base heights, the distance from the ground to the base of the canopy, requiring longer flame lengths to initiate tree torching, and 3) decreasing crown density, making it harder for fire to travel from tree to tree.

Example: Unit 39 has fuels conditions characteristic of Condition Class 3; closed canopy, heavy surface fuels, and heavy ladder fuels. Proposed commercial harvest would open the canopy, noncommercial thinning would reduce ladder fuels, and underburning would reduce surface fuels; the resulting stand would be in Condition Class 1, following completion of all proposed activities. Table 47 compares stand conditions before and after treatment, and fire effects before and after treatment, from a fire under late summer conditions; a 6 mph mid-flame wind, 90 degrees, low humidity and low fuel moistures.

Table 47. Example of anticipated effects of project activities in Jackson Unit 39.

Stand Condition Attributes	Current Condition Condition Class 3	After treatment Condition Class 1
Trees per Acre	1731	56
Basal Area	154	58
Canopy Base Height (feet)	7	29
Fire Effects		
Flame Length (feet)	6 (78 with torching)	2
Wind speed needed to torch canopy	11	174
Probability of Mortality	100%	16%
Smoke Production, tons per acre of pm 2.5	0.63	0.30

Alternatives 2 and 3 have similar effects to condition class, although Alternative 2 results in the most Condition class 1 and the least amount of Condition class 3 within the project area.

Table 48. Acres of condition class by alternative.

Alternative	Condition Class 1	Condition Class 2	Condition Class 3
1	23,736	10,940	6,326
2	27,827	8,061	5,116
3	27,601	8,223	5,175

Potential Fire Behavior and Probability

Potential fire behavior and probability for the Jackson project area was analyzed utilizing FlamMap, Version3 (Finney et al, n.d.). Modeling was used to predict various fire behavior characteristics and probabilities of occurrence for Alternative 1 (no action) to assess the current condition as well as Alternatives 2 and 3 to assess the changes anticipated as a result of proposed activities. Alternatives 2 and 3 show very similar results since the overall amount of treatments affecting fuel conditions is similar. Fire behavior attributes assessed include flame length, rate of spread and potential crown fire activity. This analysis is landscape-based and provides an assessment of the entire project area as opposed to condition class which is a stand-based analysis. This analysis considers adjacency of various fuel conditions and utilizes topographic and weather influences to model fire behavior.

Fuel Hazard

Fuel hazard defines the likelihood of effective fire suppression actions. Fires in low hazard areas could be effectively suppressed using hand crews and direct fireline construction. Moderate and high hazard areas would require increasingly heavy equipment such as dozers, and/or aerial methods to effectively suppress a wildfire. Moderate and high hazard areas have an increased likelihood of negative resource effects from wildfire: overstory tree mortality, detrimental soil impacts, and undesired smoke production etc.

The analysis defines fuels hazard for a combination of flame length and crown fire potential as displayed below.

Table 49. Fuel Hazard matrix.

Flame Length (feet)	Fire Type		
	Surface Fire	Passive Crowning	Active Crowning
0	Low	Low	Low
0-2	Low	Low	Low
2-4	Low	Low	Medium
5	Low	Medium	Medium
6	Medium	Medium	Medium
6-8	Medium	High	High
8-11	High	High	High
11-20	High	High	High
20+	High	High	High

Burn Probability

High burn probabilities are related to the sizes of fires that occur on a given landscape -- for the same conditions, large fires produce higher probabilities than small fires (each burn a larger fraction of the landscape). Since fire size is a function of the gross spread rate and duration of the fire, treatments or conditions that reduce the spread rate will lower the burn probability. For the Jackson analysis, 2000 fires were simulated with 12-hour duration. Conditions were the same as shown in Table 47. Burn probability for the Jackson alternatives is displayed in Table 51.

Risk

Risk is the probability of a given point burning on the landscape. Burn probability is used to determine risk. The FlamMap model (Finney et al, n.d.) was used to generate the outputs from flame length, fire type (crown fire) and burn probability for the Jackson project area. Conditions used in the model represent those occurring in the 97th percentile conditions from the Rabbit Remote Automated Weather Station (RAWS).

Environmental Effects

Alternative 1

Hazard and Risk within the Jackson Planning Area

There would be no activities that would result in modifying fire behavior or burn probabilities across the project area other than continued fire suppression efforts for unplanned wildfires. Currently about 29% of the Jackson area has fuel conditions that would support a moderate or high fire hazard and 28% that indicate high burn probability. Continued stand growth, successional changes, and continued fire exclusion would result in these conditions increasing over time. Table 50 and Figures 10 and 11 display the current landscape fire hazard within the Jackson area.

Action Alternatives 2 and 3

Hazard and Risk within the Jackson Planning Area

Both action alternatives include activities that would modify fire behavior by reducing ground fuels, reducing ladder fuels, reducing crown densities, and removing activity-generated fuels following commercial and noncommercial treatments. In both the action alternatives, the number of acres at high or moderate risk of loss would be reduced to approximately 23 percent of the project area. Both action alternatives would reduce high burn probabilities for all fire types to 13 percent of the planning area.

Although the FlamMap predictions for fire behavior and burn probability show slight differences between Alternatives 2 and 3, these differences are not meaningful because they fall within the uncertainty and randomness associated with the model. Both action alternatives produce essentially the same results because there are only small differences between the total amount of treatment and the arrangement of treatments within the project area. Both alternatives are designed to reduce surface and ladder fuel, which are the primary factors associated with fire behavior. Table 50, 51 and Figures 10 -14 display the anticipated landscape fuel hazard and burn probabilities within the Jackson area for the action alternatives.

Table 50. Fuel Hazard for Existing and Action Alternatives (Acres)

Hazard	Alternative 1	Alternative 2	Alternative 3
Low	39,311 (71%)	42,892 (78 %)	42,806 (77%)
Medium	6,136 (12%)	5,548 (10%)	5,471 (10%)
High	9,994 (17%)	7,000 (12%)	7,163 (13%)

Table 51. Burn Probability for Existing and Action Alternatives (Acres)

Burn Probability	Alternative 1	Alternatives 2 and 3
Low	39,738 (72%)	48,267 (87%)
High	15,703 (28%)	7,174 (13%)

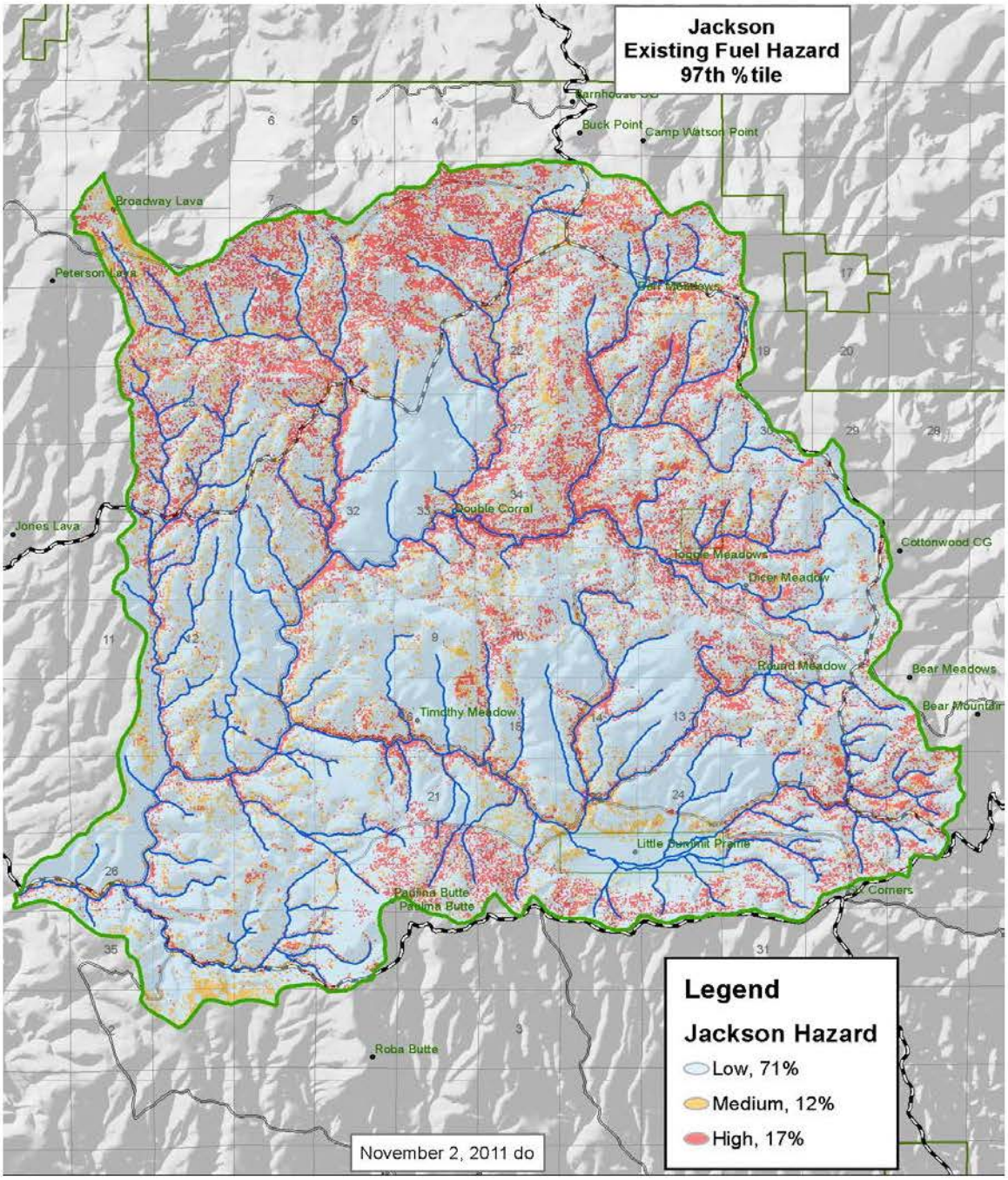


Figure 10. Existing Fuel Hazard in the Jackson project area.

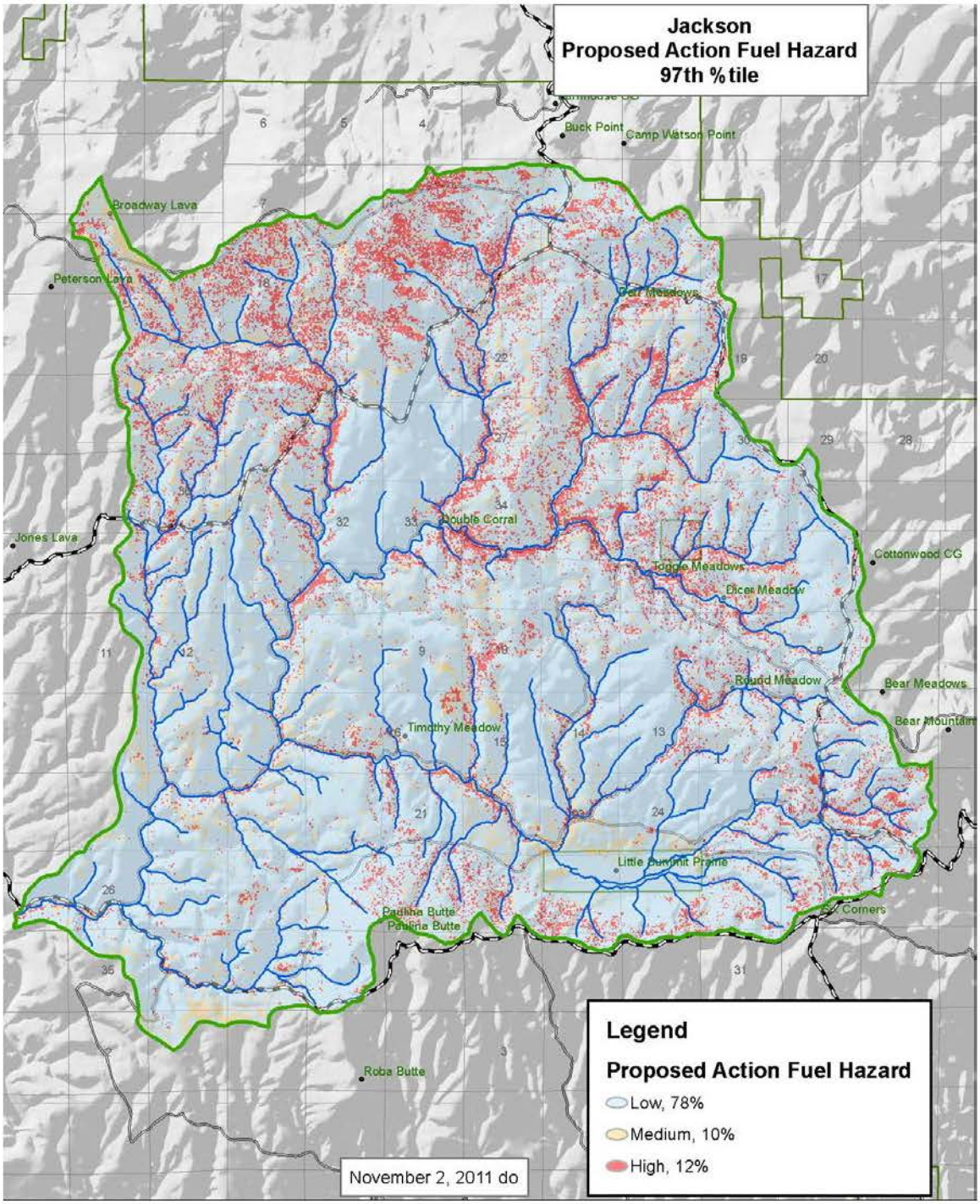


Figure 11. Anticipated Fuel Hazard in the Jackson project area for Proposed Action

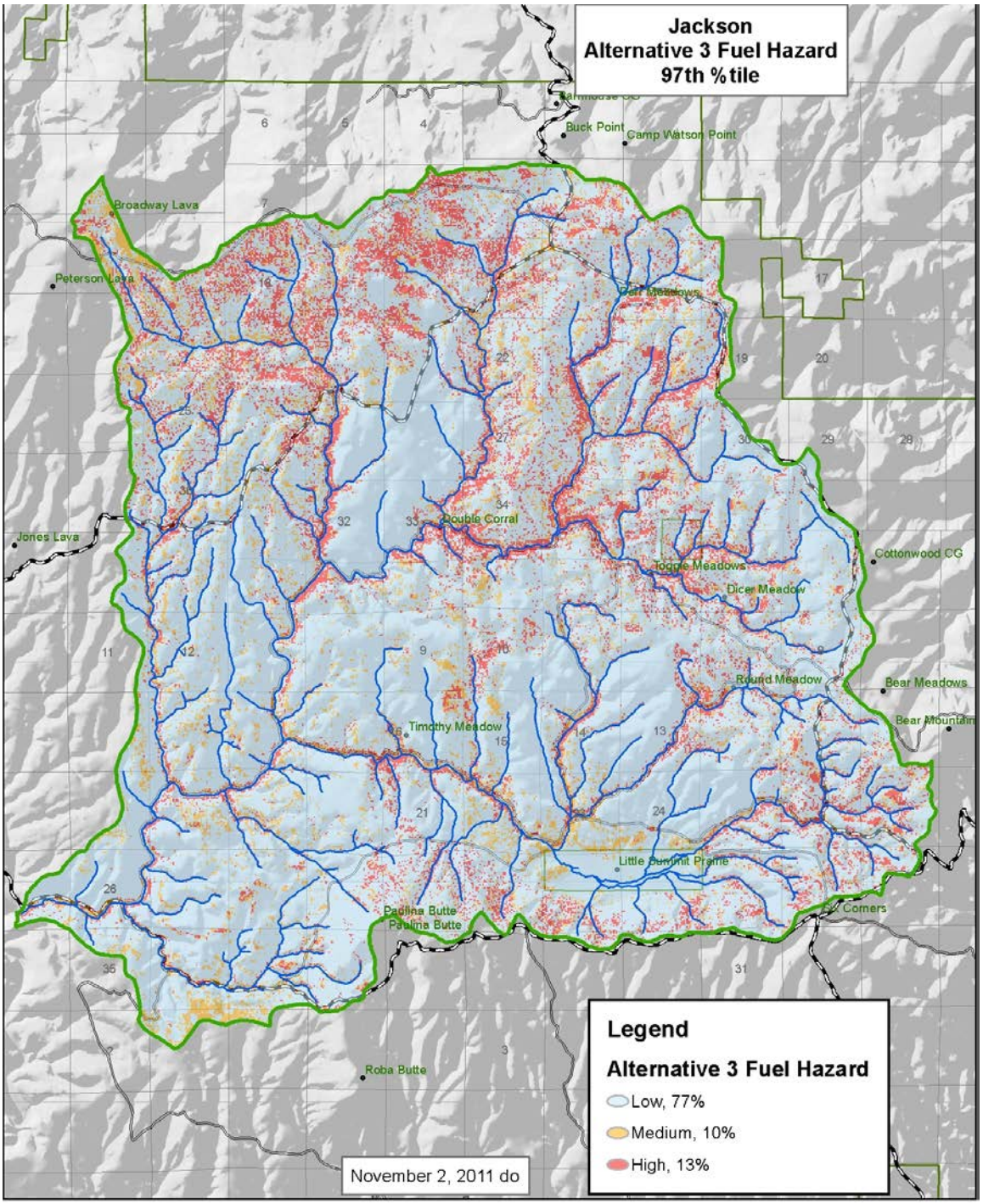


Figure 12. Anticipating Fuel Hazard in the Jackson project area for Alternative 3

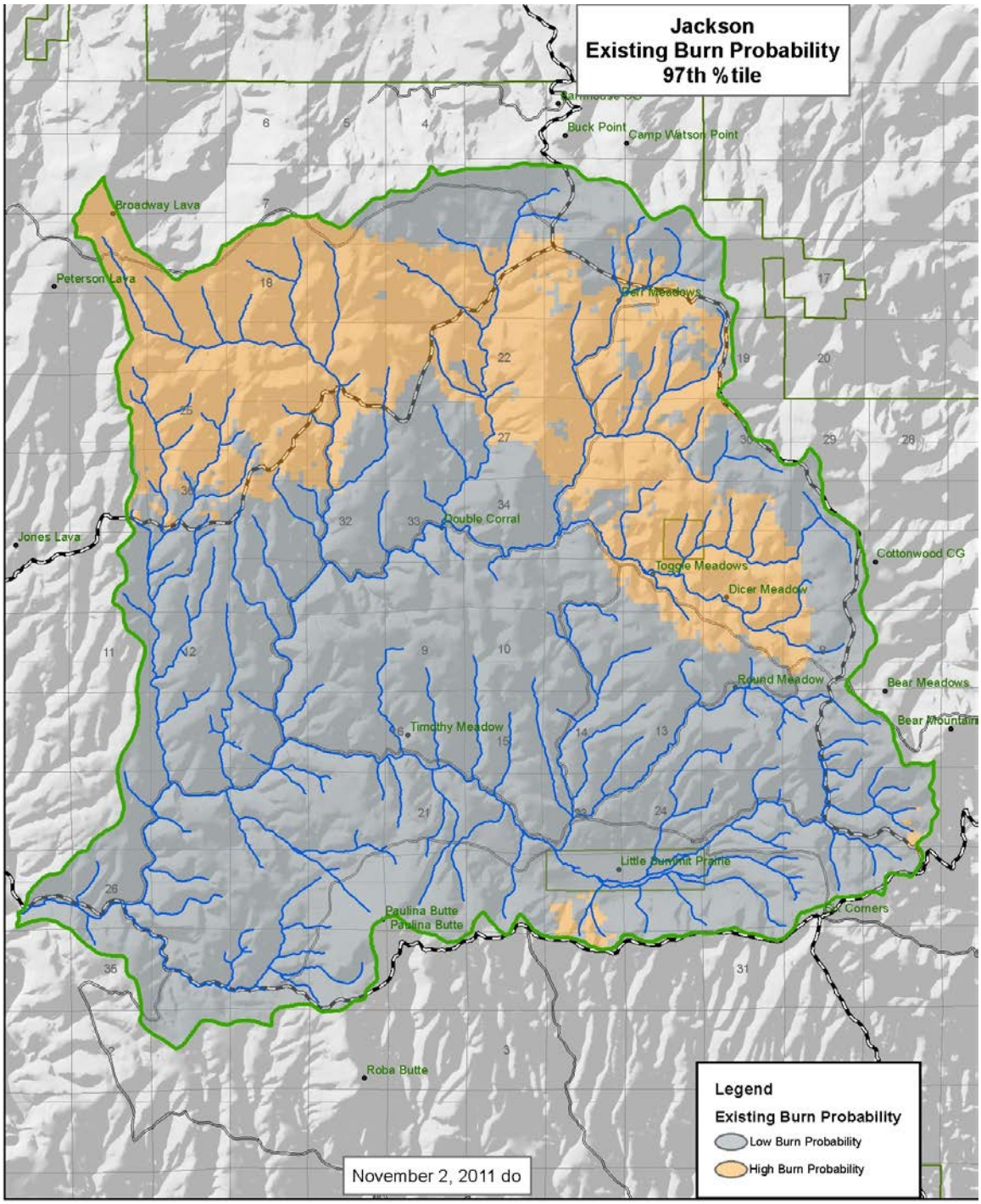


Figure 13. Existing burn probability in the Jackson project area.

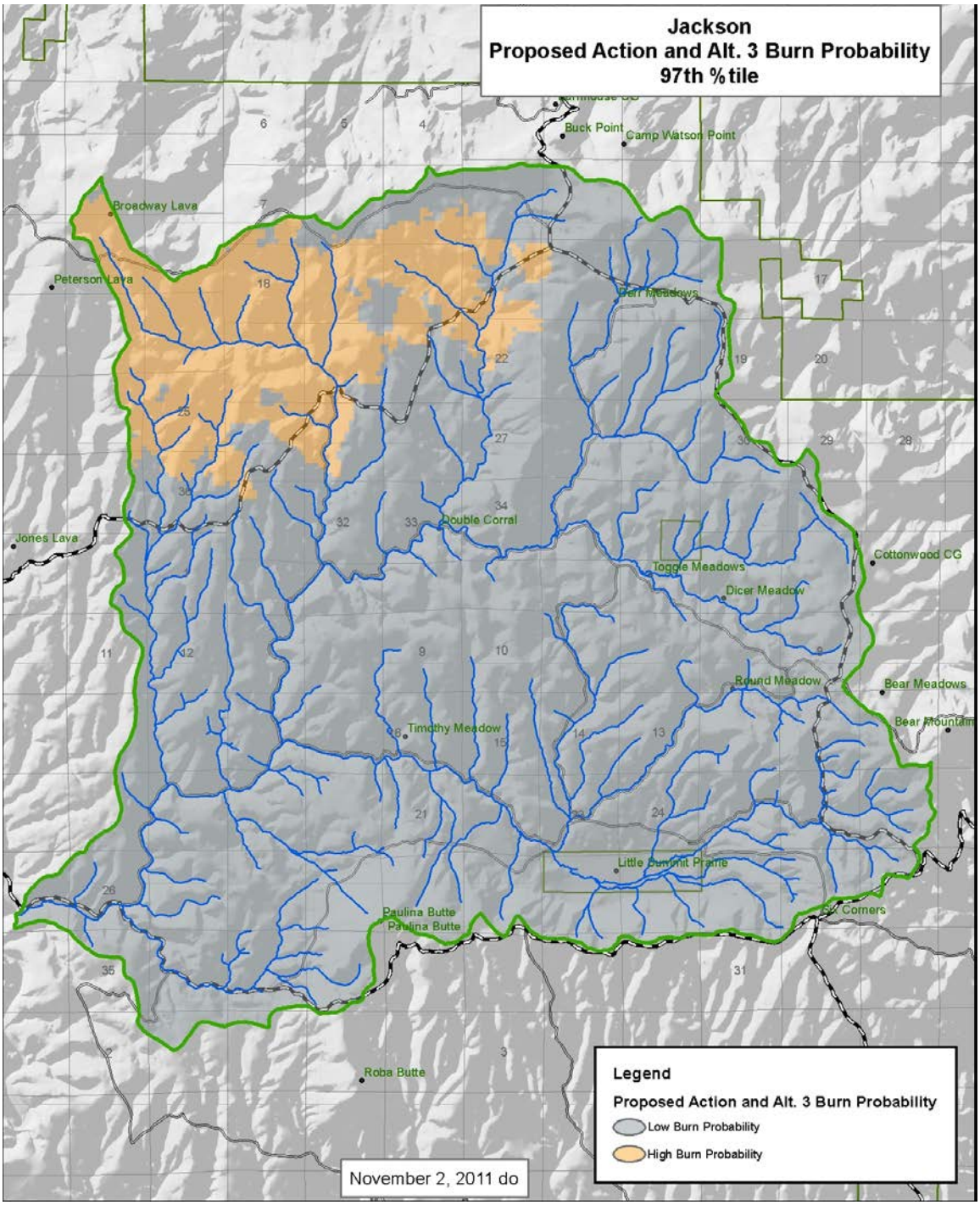


Figure 14. Anticipated burn probability under the action alternatives in the Jackson project area

Hazard and Risk Late and Old Structure

The Jackson project area is deficient in Late Old Structure Stands (LOS). The existing LOS is extremely vulnerable to high severity fires because it is heavily stocked with fire-intolerant understories and heavy surface and ladder fuel loads. As a result, LOS has higher flame lengths and a greater risk of experiencing a crown fire. Implementing the proposed action would result in reducing areas of medium/high hazard fuels in LOS by 387 acres (8%). In Alternative 3, areas of medium/ high hazard fuels in LOS would be reduced by 325 acres (7%) (see Table 52 and Figures 15, 16, and 17).

Table 52. Fuel hazard in LOS stands by alternative

	No Action Alternative	Alternative 2	Alternative 3
Low Fuel Hazard	2544 acres (59%)	2930 acres (67%)	2868 acres (66%)
Medium/ High Fuel Hazard	1800 acres (41%)	1413 acres (33%)	1475 acres (34%)

Hazard and Risk within Riparian Habitat Conservation Area

Wildfire and prescribed fire exclusion within the Jackson project area has resulted in increased stocking levels of conifers and higher surface and ladder fuel loads in RHCAs. Heavier fuel loads increase the risk of wildfire intensity. The occurrence of high intensity wildfires with RHCAs could significantly increase sediment delivery into streams, decrease stream shade and reduce future recruitment of large woody debris. Currently, 2926 acres support medium/high hazard fuels in RHCAs. Alternative 2 would reduce the amount of medium/high fuels hazard by 776 acres- a reduction of 12%. Alternative 3 would reduce the amount by 224 acres- a reduction of 3%. In both alternatives, the reduction in hazard fuels would be accomplished through a reduction in both ladder and surface fuels (See Table 53 and Figures 18, 19, and 20).

Table 53. Fuel Hazard for RHCAs by alternative

	Alternative 1	Alternative 2	Alternative 3
Low Fuel Hazard	3243 acres (53%)	4019 acres (65%)	3487 acres (57%)
Medium/High Fuel Hazard	2926 acres (47%)	2150 acres (35%)	2682 acres (44%)

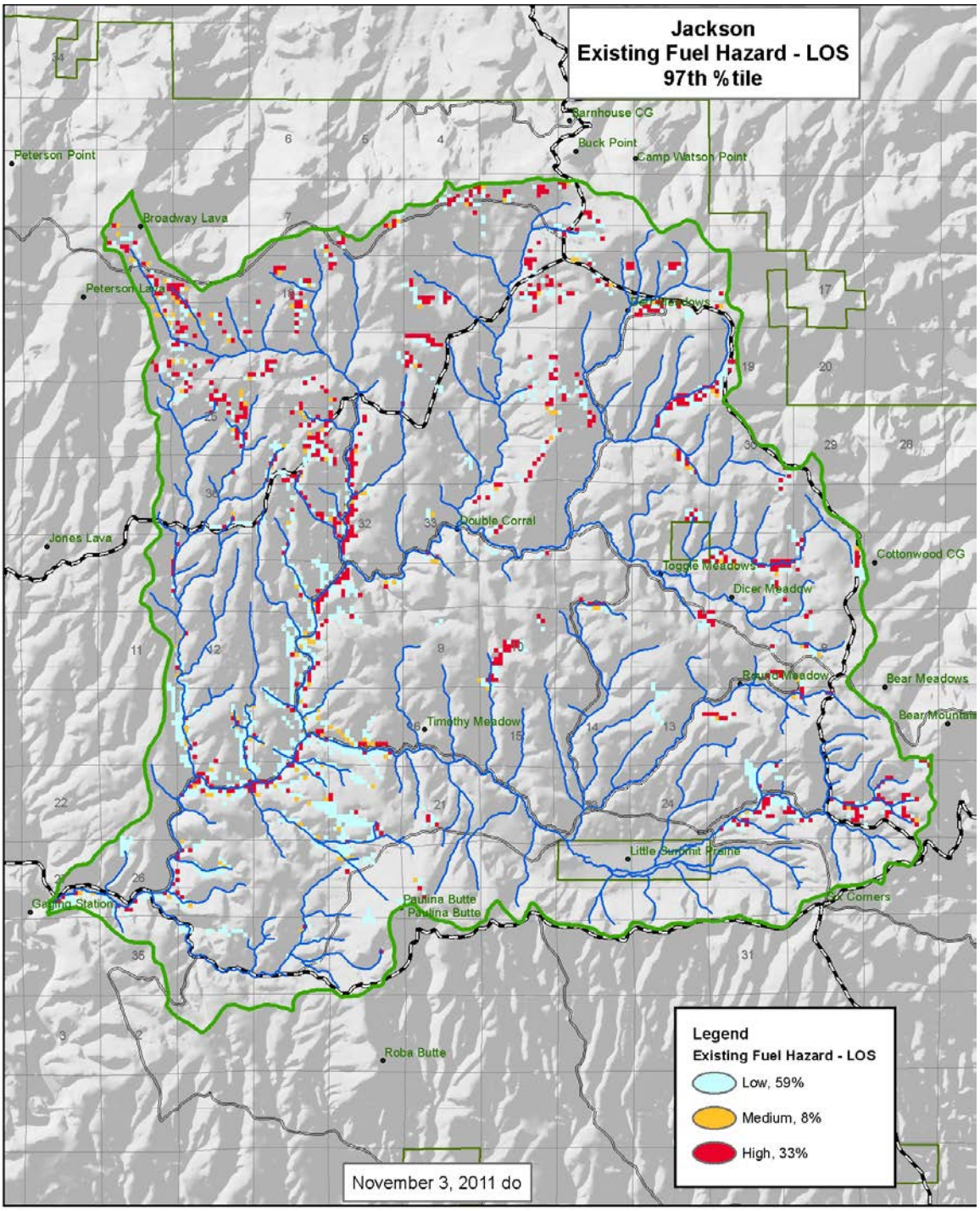


Figure 15. Existing Fuel Hazard in LOS for the Jackson project area

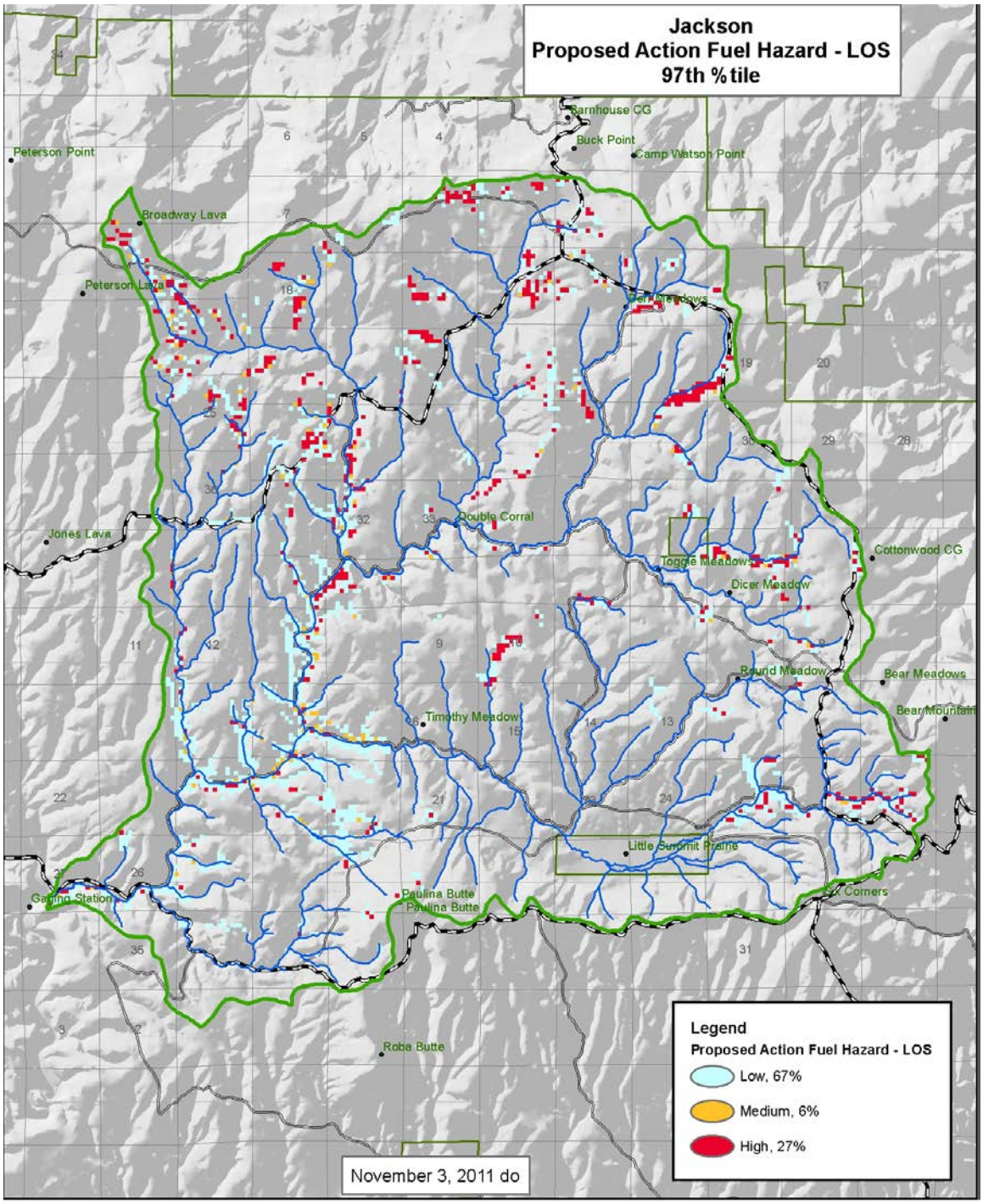


Figure 16. Proposed Action Fuel Hazard for LOS stands in Jackson project area

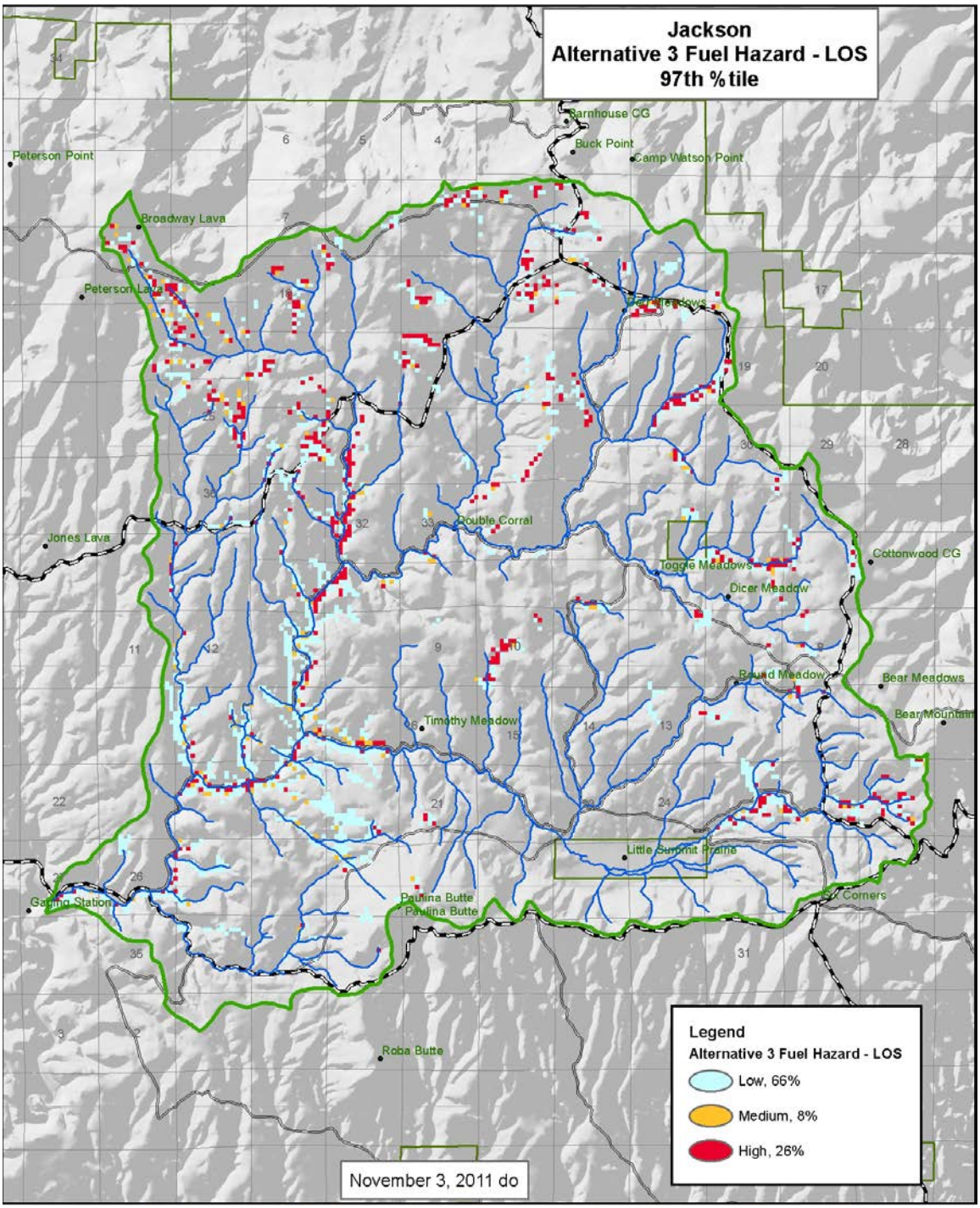


Figure 17. Alternative 3 Fuels Hazard for LOS stands in Jackson project area

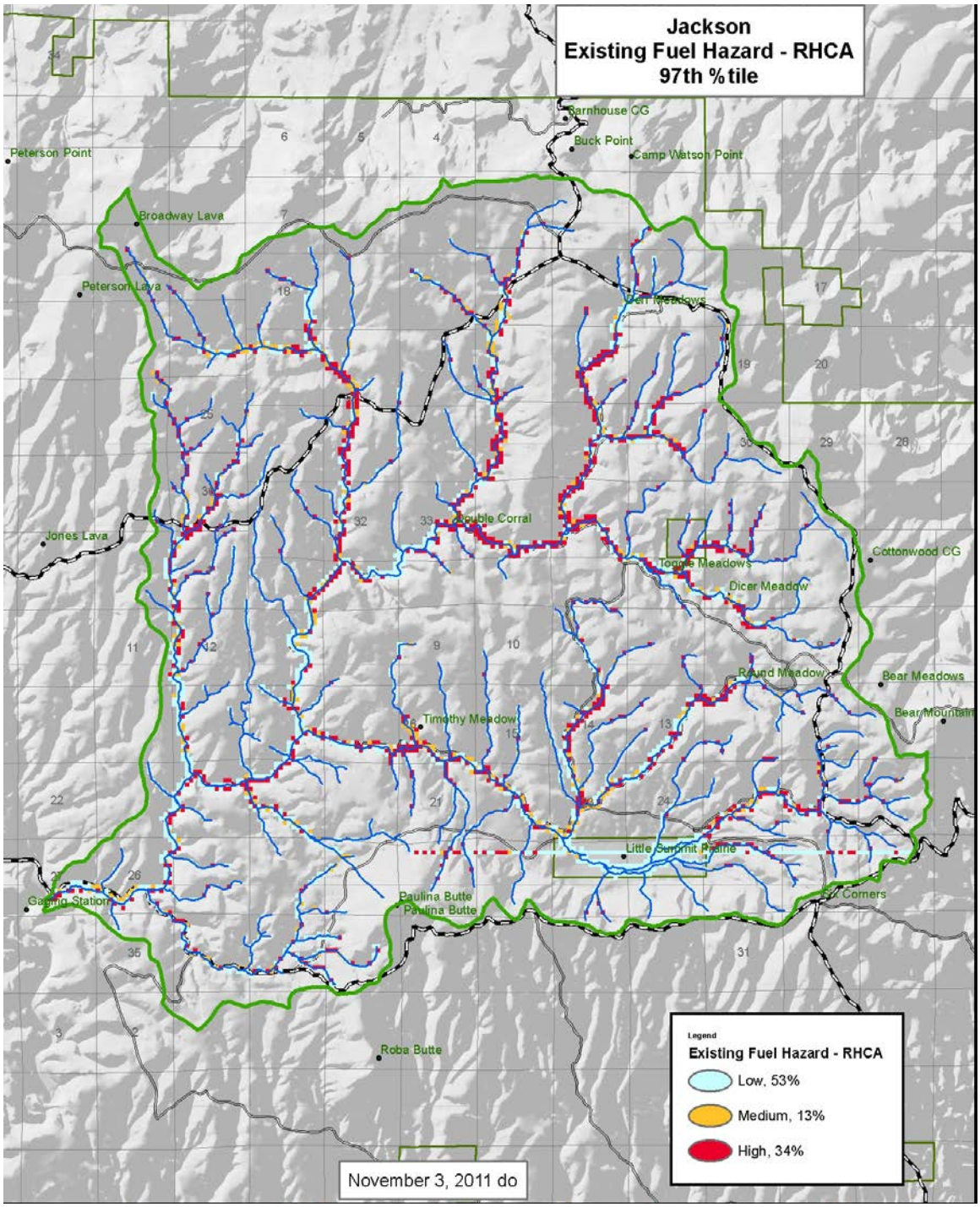


Figure 18. Existing Fuel Hazard within RHCA

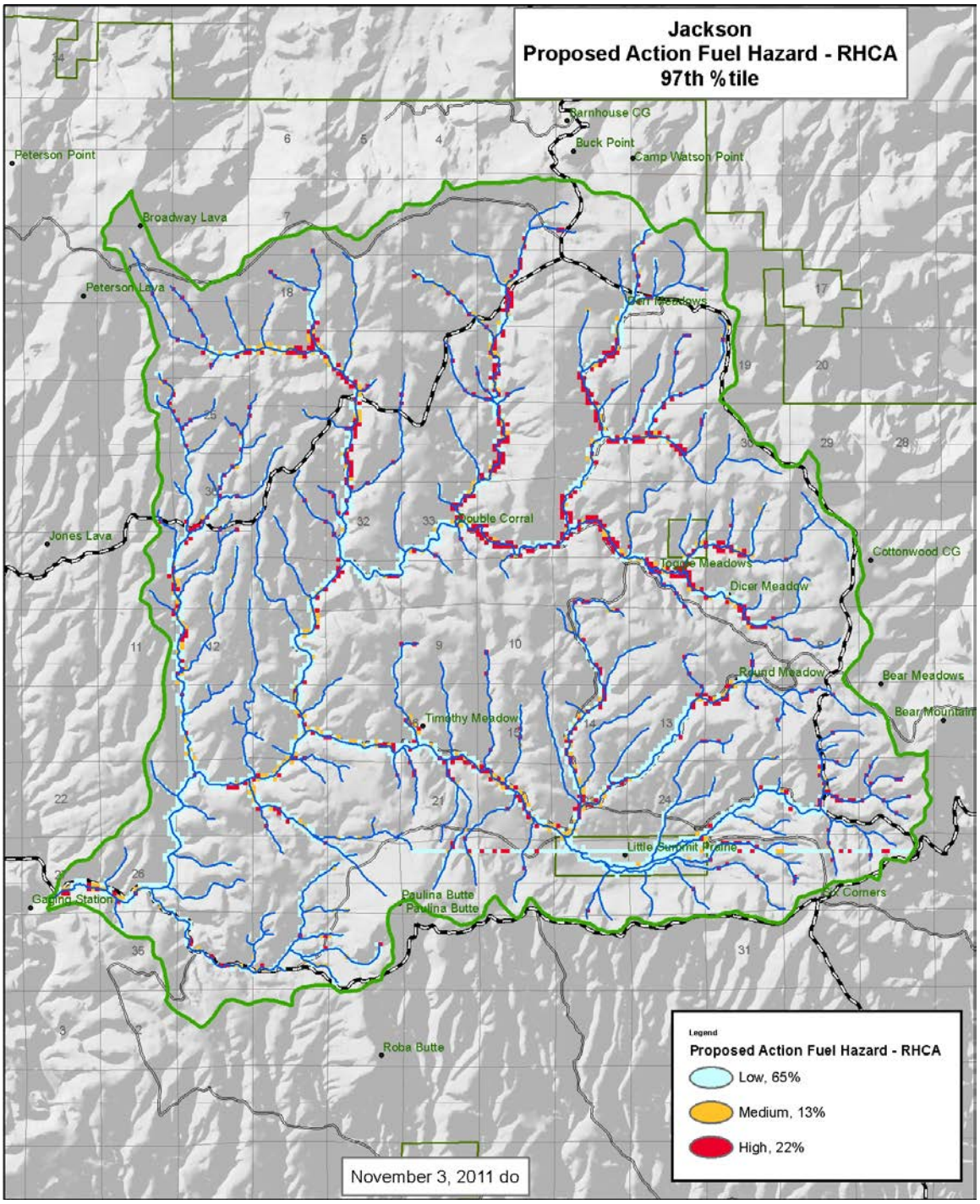


Figure 19. Proposed Action Fuel Hazard in RHCA

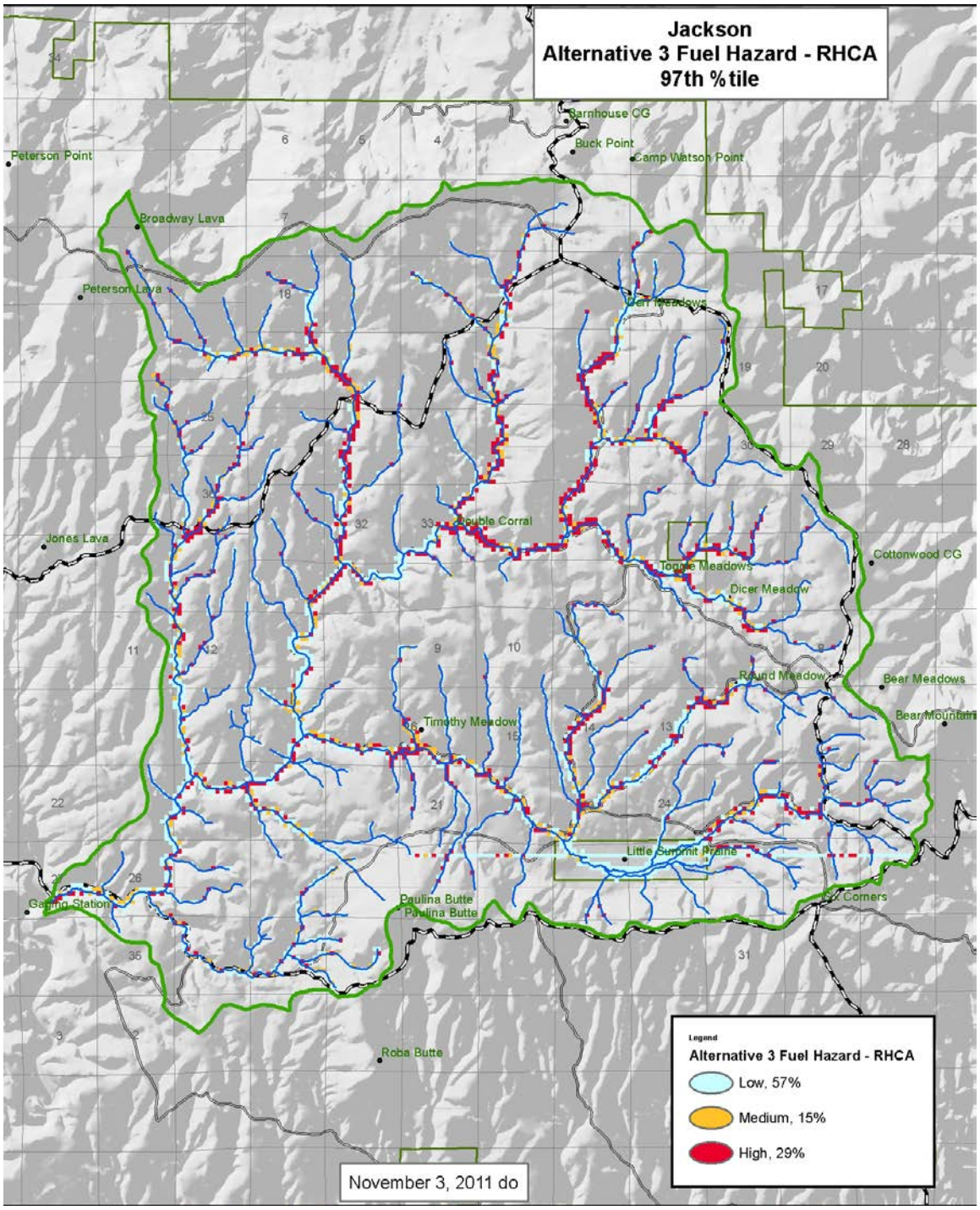


Figure 20. Alternative 3 Fuel Hazard in RHCA

Fine Fuel Increase

Thinning would increase the amount of sunlight and moisture that reaches the forest floor, which would increase the quantity and vigor of native grasses, forbs and shrubs (fine fuels). The average temperature and wind speed would increase while average humidity would decrease. This would lower fine fuel moisture, the amount of moisture in dried grass and timber litter (pine needles and small sticks).

The average wind speed in thinned stands would also increase. Open stands have higher surface wind speeds than closed stands. A fully-sheltered, dense stand has a wind reduction factor of 0.1; a fully-sheltered, open stand has a wind reduction factor of 0.2, and a partially-sheltered open stand has a wind reduction of 0.3. With a wind speed of 15 mph at 20 feet above the canopy, the wind speed in the dense stand is 1.5 mph, the wind speed in the fully-sheltered, open stand is 3 mph, and the wind speed in the partially-sheltered open stand is 4.5 mph.[5]

Lower fine fuel moisture and higher wind would facilitate the spread of surface fire. More frequent surface fires in treated stands would maintain historically low levels of surface fuels and ladder fuels, which would decrease the risk of crown fire.

Thinning Slash Hazard

Thinning can cause a short-term increase in fuel hazard if the fuel load is heavy and continuous, the slash has dried out, and a fire occurs during hot and dry conditions. The heat generated by the increased fuel load has the potential to cause undesired effects to the surrounding stand, soils and other resources.

Recent commercial thinning operations on the Ochoco NF have used whole tree yarding, which means the entire tree is brought to a landing where it is limbed and topped, and the limbs and tops are piled. Whole tree yarding does not increase fire hazard because it does not increase surface fuels.

However, the noncommercial thinning of trees less than 7” dbh could result in a short-term increase in hazard. The hazard from untreated slash is reduced by either lopping (cutting) the slash to reduce the height of the fuel bed to under 24 inches (the lower the fuel bed, the lower the flame length), or by piling the slash. In units that have been lopped, the slash gets further compacted by winter snows and after 2 or 3 years is compacted to less than 12 inches and can be burned with a low intensity underburn. Leaving slash in place during this time allows for the redistribution of nutrients from the slash back into the soil (Graham et al., 1999).

Large Old Pine

While both action alternatives reduce the risk of losing large old pine to wildfire, some mortality of large pine is expected after prescribed burning. Trees are more at risk in units that have missed several fire entries (Condition Classes 2 and 3). Mortality from prescribed fire is less than 5% (Ochoco NF prescribed fires, personal observation, 1986-2010). By contrast, 48% of the 18,000 acre Hash Rock fire in the Mill Creek Wilderness in 2000 had 100% mortality from stand replacement fire.

As ponderosa pine trees grow, they shed bark chips. Fire exclusion has allowed large piles of chips to accumulate around their base. These duff collars are often more than a foot deep, and are sometimes 2-3 feet deep. There has been mortality associated with the complete consumption of these collars when they burn. Frequent low-intensity fires would have prevented these collars from accumulating. Using fire around these trees when there is moisture in the collars could reduce the collars with less risk to the trees than wildfire.

Mountain Mahogany

Curlleaf mountain-mahogany (*Cercocarpus ledifolius*) is usually killed by high-intensity fire, but the thick bark on mature trees allows some plants to survive low-intensity fires in stands with low litter levels and primarily grass fuels.

Recent monitoring of underburning indicates that it can be beneficial in rejuvenating mountain-mahogany.

[5] 1992 Fire Behavior Field Reference guide PMS 436-4, pgs 32, 33.

Cumulative Effects

The effects of past thinning and burning projects in the Jackson project area are measured by Condition Class, and have been incorporated into the description of existing condition.

The Deep EIS (2001) included approximately 5,080 acres of noncommercial thinning and 8980 acres of prescribed burning within the Jackson project area. All of these treatments are completed. Changes in Condition Class were captured in the description of the Existing Condition.

There are no other actions proposed within the Jackson project area which would substantially modify potential fire behavior. However, continued livestock management in the project area could reduce fire spread in open stands with light fuels by reducing grass, which helps carry fire through a stand. The amount of reduction would depend on how intensely an area is grazed, how productive the grass is in any given year, and how extreme fire conditions are on any given day. Livestock grazing does not affect fire intensity in closed canopy, multi-storied stands with heavy surface fuel loading. Livestock grazing does not affect the distribution of condition classes because grazing does not alter stand structure and density.

Geology and Soils

The following information is summarized from the Geology and Soils reports, which are located in the Jackson project file at the Paulina Ranger District, Prineville, Oregon.

Introduction

The long-term sustainability of forest ecosystems depends on the productivity and hydrologic functioning of soils. Ground-disturbing management activities directly affect soil properties, which may adversely change the natural capability of soils and their potential responses to use and management. A detrimental soil condition often occurs where heavy equipment or logs displace surface organic layers or reduce soil porosity through compaction. Detrimental disturbances reduce the soils ability to supply nutrients, moisture, and air that support soil microorganisms and the growth of vegetation. The biological productivity of soils relates to the amount of surface organic matter and coarse woody debris retained or removed from affected sites.

Forest soils are considered to be a non-renewable resource, as measured by human life spans, and maintenance or enhancement of soil productivity is an integral part of National Forest management. Therefore, an evaluation of the potential effects on soil productivity is essential for integrated management of forest resources.

Target Landscape Condition

The primary goal for managing the soil resource is to maintain or enhance soil conditions at acceptable levels without impairment of the productivity of the land. The extent of detrimental soil disturbances is minimized through the application of project design criteria, management requirements and mitigation measures designed to minimize, avoid or eliminate potentially significant effects, or rectifying effects in site-specific areas by restoring the affected environment. The land effectively takes in and distributes water, and erosion rates are controlled to near-natural levels. The biological productivity of soils is ensured by management prescriptions that retain adequate supplies of surface organic matter and coarse woody debris without compromising fuel management objectives.

Management Direction

Ochoco Forest Plan

The Ochoco Forest Plan provides forest-wide standards and guidelines for the soil resource on pages 4-195 through 4-198. The following text comes directly from the Forest Plan.

Soil Compaction and Displacement

The threshold level of detrimental compaction is defined as any bulk density increase of 15% (20% on ash soils per the R6 supplement; see below) or more or any macro pore space reduction of 40% or below 15%. These values are critical changes over the natural state in the top 12 inches of soil.

In order to maintain site productivity, all project activities would be planned to reduce soil compaction and displacement to the lowest reasonable level and strive to reduce compaction and displacement to get as close to 90 percent of the total activity area (including permanent, rocked, and non-surface roads) remaining in a non-compacted/non-displaced condition, as realistically possible, one year after any land management activity. The minimum would be 80 percent of the total activity area. Existing areas exceeding these standards would be scheduled for rehabilitation as soon as possible.

Surface Soil Erosion

Land management activities would be planned to achieve effective ground cover as indicated in Table 54.

Table 54. Erosion hazard class and effective ground cover.

Erosion Hazard Class	Minimum % effective ground cover, first year	Minimum % effective ground cover, second year
Low	20-30	30-40
Moderate	30-40	40-50
Severe	50-60	60-75
Very Severe	60-75	75-90

Effective ground cover is defined as the basal area of perennial vegetation, plus litter and coarse fragments (greater than 2mm sizes), including tree crowns and shrubs that are in direct contact with the ground. Exceptions may occur where specific projects meet erosion control objectives without meeting the ground cover objectives stated above.

Soil Mass Wasting

When a project could result in an increased potential for mass wasting, which could cause significant soil loss or sedimentation, hazards to property, loss of fish habitat, or damage to other resource values, alternative project proposals would be evaluated and documented through the project's environmental analysis.

Fragile Areas

Recognize the sensitivity and potential of certain areas and/or situations to be adversely affected by management activities and plan accordingly to minimize those effects. Fragile areas include scablands (shallow soil areas), elk wallows, and other isolated soil areas which exhibit sensitivities that require special care.

Additional Jackson Project Direction

Temporary Roads

Effects of temporary roads stem directly from compaction and include loss of infiltrative capacity, increased erosion potential, and dramatically reduced vegetative productivity. Compaction results in increased bulk density and reduced porosity, primarily through the loss of macropores, leading to reduced aeration and drainage, as well as disruption to microbial populations that causes reduced productivity and increased erosion potential (Elliot et al., 1999). Bulk density has been shown in several studies to reduce tree growth not only within the compacted area itself, but also for trees adjacent to the compacted area because of root zone compaction (Froehlich, 1979; Heilman, 1981; Helms and Hipkin, 1986; Conlin and van den Driessche, 1996) as a result of increased root impedance and disrupted microbial processes. Natural recovery from compaction can be variable, with the more dramatic reduction in bulk density coming near the surface of the soil profile, but in general the rate of natural, unassisted recovery is slow (Froehlich et al., 1985). These effects would be reduced by subsoiling so that they generally apply only over the short term – five years or less. Because of the moderate ground slopes and moderate to high infiltration rates of the soils adjacent to these temporary road beds, sedimentation effects would be localized to upland areas immediately adjacent to the roads.

Winter Harvest Units

Winter Logging Specifications: Logging over various combinations of frozen ground and snow must meet one of the below criteria: 6 inches of frozen ground, 4 inches of frozen ground and one foot of snow or more than 24 inches of snow. These specifications have helped reduce impacts to soils, cultural heritage resources and sensitive plant populations. However, they are not a panacea. Effectiveness can vary considerably according to snow texture for instance. Conditions vary from winter to winter and can even vary from morning to afternoon. Regular presence of harvest inspectors is critical. Winter logging units are specified in Appendix C, Table C-1.

Forest Service Region 6 Supplement

Guidelines (FSM 2500, R-6 supplement 2500-98-1) describe conditions detrimental to soil productivity and outlines Soil Quality Standards to limit the extent of these conditions to less than 20% of an activity area. Detrimental soil conditions are described in the Soil Quality Standards as follows:

- Detrimental soil compaction in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent or greater over the undisturbed level.
- Detrimental puddling occurs when the depth of ruts or imprints is six inches or greater.
- Detrimental displacement is the removal of more than 50 percent of the A horizon from an area greater than 100 (10’ x 10’) square feet and at least 5 feet in width.
- Detrimental burn damage requires significant color change of the mineral soil surface in an area greater than 100 (10’ x 10’) square feet to an oxidized reddish color, with the next one-half inch below blackened from organic matter charring as a result of heat conducted from the fire.
- Detrimental erosion requires visual evidence of surface loss over an area greater than 100 (10’ x 10’) square feet, rills or gullies, and/or water quality degradation from sediment or nutrient enrichment.

The Forest Service Region 6 Supplement also includes policy direction for designing and implementing management practices which maintain or improve soil and water quality. An emphasis is placed on protection over restoration. Specifically, under 2520.3 – Policy, the narrative reads:

"When initiating new activities:

- Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area (this includes the permanent transportation system).
- In areas where less than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20 percent.
- In areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality."

Affected Environment

The Jackson Planning Area encompasses 54,609 acres and incorporates Jackson Creek (24,091 acres), Little Summit Prairie Creek (15,947 acres) and Crazy Creek-Deep Creek (14,571 acres) subwatersheds within the Deep watershed (Table 55). They are all located east of Big Summit Prairie in the Ochoco Mountains on Paulina Ranger District, Ochoco National Forest. All the percentages listed in the report are based on the acres of federal land contained in the watersheds.

The analysis area is within the Blue Mountain ecological region (Level IV). Through further refining of the eco-regions (Level V), the area breaks into 5 units (Table 55). The differences in the lithology, soils, landform and potential natural vegetation reflect the eco-regions in this watershed. Little Summit Prairie is within the Large Meadow Complex. There is a small segment of the North Slope Ochoco at the top of Jackson Creek and Little Summit Prairie Creek subwatersheds. The majority of the planning area is in the South Slope Ochoco, Low Elevation Scab Stringer and the High Elevation Scab Stringer eco-regions. The soils report would further discuss the South Slope and Scab Stringer concerns.

Table 55. Level V Eco-regions of Deep Creek Watershed

Level V Eco-region	Crazy Creek-Deep Creek	Jackson Creek	Little Summit Prairie Creek	Grand Total (acres)
Large Meadow Complex	0	0	219	219 (0.4%)
North Slope Ochoco	0	78	830	908 (1.7%
Scab Stringer (Low Elevation)	10009	2587	7036	19632 (36%)
Scab Stringer (High Elevation)	3454	9640	180	13275 (24.3%)
South Slope Ochoco	1107	11786	7682	20575 (37.6%)
Grand Total (acres)	14571	24091	15947	54609

Physical Environment

The Jackson project area is located on the western corner of the Blue Mountains physiographic province, which also includes the Wallowa, Elkhorn and Strawberry mountains. The shaping of the landform in the subwatersheds is a reflection of the past geologic history of the area. The tectonic movement, combined with the uplift of the Blue Mountain anticline and mass wasting processes, have created the broad ridges and steep draws. Mass wasting, sheet erosion and rill erosion are some of the physical processes currently in action. Table 56 summarizes the geologic formations in the Jackson project area.

Table 56. Acres of lithology in the Jackson project area.

Subwatershed	Tertiary Picture Gorge Basalt (acres)	Quaternary Alluvium (acres)	Total Acres
Crazy Creek-Deep Creek	14,571	0	14,571
Jackson Creek	24,091	0	24,091
Little Summit Prairie Creek	15,677	270	15,947
Total Acres	54,339 (99%)	270 (1%)	54,609

The project area is underlain mainly by basalt. The climate of 60 million years ago, to the present, has evolved from warm tropical regime to the temperate four distinct seasons of today. High plateaus and dissected ridges with moderately steep side slopes are the principal landform. Landslides played a minor role in the shaping of the watershed, creating small areas of hummocky terrain, seeps, ponds and springs along the northwest and south central portions of the planning area. Present day erosion processes are primarily channel, sheet and rill with minor mass wasting in the form of landslides, rock topple and slope creep. The watershed is a recharge collection area for regional and local groundwater aquifers and annual precipitation ranges from 19 to 31 inches.

Landslides

Based on an air photo interpretation, the Jackson project area has a series of dormant landslide scarps and debris lobes spread along the south rim of Little Summit Prairie, a stretch of Happy Camp Creek and along a segment of Jackson Creek. The dormant landslides range in width from 700 to 2,700 feet**,** occur on slopes greater than 40 percent and are generally associated with ridge tops. The dormant landslide forms originate on Picture Gorge Basalts. The toes of the dormant landslides along Little Summit Prairie are in the alluvium. When the dormant landslides were more active, they contributed a portion of the existing sediment currently occupying the flood plains of the stream courses. The visible landslides and related debris cover a total estimated 644 acres at 10 locations or 1 percent of the project area. These areas are in a low to moderate risk for reactivation by management activities such as harvest, or by the continued weather pattern of higher precipitation.

Landscape and Soil Patterns

Soil mapping has been completed for the project area; the Soil Resource Inventory (SRI) coverage includes lands within the National Forest (NF) boundary and Natural Resource Conservation Service (NRCS) data includes lands outside the NF boundary. Most of the land area in the watershed is mountainous terrain. This terrain typically is strongly dissected mountain sidelopes and drainways.

Within the Soil Resource Inventory, the landtype is the basic unit of landscape stratification. An acreage summary by major landtype within the project area is provided in Table 57.

Table 57. Jackson Project Area major landtypes from Paulson, 1977, ONF SRI.

Landtype Group	Acreage	Percent of Project Area (USFS Lands)	Parent Material
P Landtypes	40,614	73	Picture Gorge Basalts and Andesites
Y Landtypes	12,376	22	Mixed Basalt
M Landtypes	1,983	4	Alluvium
S Landtypes	408	1	Basalt

Additional landtype breakdowns are as follows: Ash soils composed predominately of P1, P2, P9, and Y2 landtypes along with alluvial meadow soils (M landtypes) total approximately 16,654 acres or 30 % of the project area. Non-forested soils which include scablands, meadows and shrublands compose

approximately 14,372 acres or 26 % of the project area. Scabland soils (largely P5, P54, P5Y, P85 and S1) are very shallow to shallow (<20 inches to bedrock). Shrubland soils range from moderately deep to deep (from >20 to 60 inches). Most meadow soils (M landtypes) are deep to very deep (greater than 40 inches).

Soils

Existing Condition

The existing condition of soils in the Jackson project area was determined by the Forest soil scientist and other members of the interdisciplinary team. A combination of local knowledge, walk-through transecting, and aerial photo interpretations was used to determine existing soil disturbance classes for each proposed harvest unit. These results are compiled in Appendix B. The regional standards and guidelines in relation to these proposed activities apply at the individual unit level. Existing disturbance was quantified to the nearest ten percent bracket (0-10, 10-20, etc.), estimates were made as to tillage potential, and unit specific mitigations identified where needed to ensure compliance with the soil standards.

In this project area it is estimated that 38,000 acres have been harvested since 1950. Given this assumption, it is estimated that 15 to 35 percent of the tractor harvested acres or approximately 9,528 acres have been detrimentally compacted and/or displaced. These 9,528 acres comprise 17 percent of the total project area (54,609 acres). The total existing road mileage is 366 miles. Road acreage (about 1.82 acres/mile for a 15-foot wide road) is approximately 692 acres (about 1.2% percent of the total project area). Livestock grazing has taken place throughout the project area for several decades, resulting in localized areas of compaction; where applicable, this has been included in the estimates of existing detrimental soil conditions.

Environmental Effects

Scope of the Analysis

The soil resource may be directly, indirectly and cumulatively affected within each of the activity areas proposed within the project area. For analysis of the soil resource, an activity area is defined as “the total area of ground impacted activity, and is a feasible unit for sampling and evaluating” (FSM 2520). The Ochoco Forest Plan reiterates this definition on page 4-196: “An activity area is the total area for which a ground-impacting activity is planned, for example, a unit for a timber sale, slash disposal project, or grazing allotment. The area would also include transportation systems within and directly adjacent to the project.” For this project proposal, activity area boundaries are considered to be the smallest identified area where the potential effects and soil quality standards would be focused on the units proposed for silvicultural and fuel reduction treatments. The activity areas range in size from about 5 acres to 292 acres.

Quantitative analyses and professional judgment were used to evaluate the proposed alternatives by comparing existing conditions to the anticipated conditions which would result from implementing the proposed actions. The temporal scope of the analysis is defined as short-term effects being changes to soil properties that would generally revert to pre-existing conditions within 5 years or less, and long-term effects as those that would substantially remain for 5 years or longer. This analysis also considered the effectiveness and probable success in project design and implementation of the management requirements, mitigation measures, and Best Management Practices (BMPs) that are designed to avoid, minimize or reduce potentially adverse impacts to soil productivity.

Alternative 1

Implementation of this alternative would comply with the regional soil standards.

This alternative proposes no management actions that would affect the soil resource in the short term. Existing natural processes would continue. No soil restoration tillage would be performed. Recovery of existing soil (compaction) would occur through natural processes. These processes include frost heaving in the top 4 to 6 inches of soil and biopedoturbation (soil disturbance by organisms such as rodents, insects, arthropods and worms). These natural processes can take 10 to 50 years or more to fully restore damaged ash soils, while clayey residual soils may recover in a shorter timeframe due to shrinking and swelling actions. Untreated fuels may increase the intensity and severity of wildfire, should wildfire occur; intense wildfires can reduce soil productivity (Harvey et al., 1991).

Alternative 1 would allow the dormant landslide terrain to continue the natural process of erosion under the current precipitation pattern.

Alternative 2

Implementation of this alternative would comply with the regional soil standards.

Commercial thinning activities involve the use of machinery on skid trails, which are established on an average of 100-foot spacing. The majority of this ground based disturbance is on existing skid trails, landings and roads. Most of these units have been entered several times for harvest treatments in the past 40 to 50 years and have a harvest framework present.

Alternative 2 proposes 5,744 acres of commercial thinning. Grapple piling is proposed on 1021 acres which are largely in commercial thinning units. Table B1 (Appendix B) describes unit-specific mitigations that would reduce this effect and ensure that all activity units meet regional soil standards. Commercial thinning proposed in Alternative 2 would have little effect on fungal associations in treated units, because live trees would be retained in all activity units (Richards, 1987; Ingram, 1997).

Alternative 2 proposes 7,779 acres of noncommercial thinning, 893 acres of juniper thinning, and 169 acres of noncommercial thinning to enhance aspen. Soil disturbance associated with noncommercial activities is limited in scale and low intensity; no detrimental soil conditions are anticipated to result from noncommercial activities.

Alternative 2 proposes underburning on 7,485 acres. Due to burning prescriptions, project design features, and dispersed effects of the burns themselves, this activity would not be expected to result in detrimental soil conditions.

This alternative would contribute approximately 18.2 acres of detrimental soil conditions due to construction of 10 miles of new temporary roads, 15 miles of temporary roads on existing disturbance and .3 miles of road reconstruction.

Implementation of this alternative would result in approximately 161 acres of tillage to alleviate detrimental soil compaction, dependent on post-harvest monitoring. Tillage is proposed in many units contingent on monitoring (see Table B1).

Alternative 3

Implementation of this alternative would comply with the regional soil standards.

Alternative 3 proposes 5,545 acres of commercial thinning. Grapple piling would occur on 999 acres largely in commercial thinning units. Table B1 (Appendix B) describes unit-specific mitigations that would reduce this effect and ensure that all activity units meet regional soil standards. Commercial thinning proposed in Alternative 3 would have little effect on fungal associations in treated units, because live trees would be retained in all activity units (Richards, 1987; Ingram, 1997).

Alternative 3 proposes 7,779 acres of noncommercial thinning, 863 acres of juniper thinning, and 199 acres of noncommercial thinning to enhance aspen. Soil disturbance associated with noncommercial

activities is limited in scale and low intensity; no detrimental soil conditions are anticipated to result from noncommercial activities.

Alternative 3 proposes underburning on 6,697 acres. Due to burning prescriptions, project design features, and dispersed effects of the burns themselves, this activity would not expected to result in detrimental soil conditions.

This alternative would contribute approximately 18.2 acres of detrimental soil conditions due to construction of 10 miles of new temporary roads, 15 miles of temporary roads on existing disturbance, and .3 miles of road reconstruction.

Implementation of this alternative would result in approximately 161 acres of tillage to alleviate detrimental soil compaction, dependent on post-harvest monitoring. Tillage is proposed in many units contingent on monitoring (see Table B1).

Cumulative Effects

Present and Foreseeable Future Actions

Rangeland Management

Westside AMP EA: The Westside AMP has modified grazing practices in the Deep Creek, Derr, Happy and Little Summit Allotments to protect and enhance riparian vegetation. These practices encourage cattle to move into the uplands and disperse more evenly thereby reducing pressure on riparian areas which will improve bank stability and decrease compaction. Range conditions have generally improved throughout these allotments. Cattle will continue to have an effect on riparian soils in this area (see Range Report).

Fence construction and maintenance- Approximately 77 miles total for the Jackson project area total. Status: yearly maintenance over selected portions (data from Holly Myers- Range Specialist; Paulina Ranger District, 2011). Boundary fences around private land comprise about 7 miles of this total. These fence lines are maintained by permittees. Permittees are allowed to use motorized vehicles to access fence lines for purposes of maintenance, repair, construction, and reconstruction of fence lines. Assuming a “road” width of 10 feet, it is estimated that there are approximately (1.21 acres/mile x 77 miles) = 93 acres associated with such roads to provide access to fence lines. This is approximately 0.0016 percent of the Jackson project area.

Water Developments- There are approximately 47 existing water developments located on the Jackson project area. Each water development is estimated to include approximately one acre of land immediately adjacent to the development that has detrimentally impacted soils associated with livestock use of the development. Impacts include compacted, displaced, and exposed soils. These areas are generally denuded of vegetation. The estimated 47 acres of detrimentally impacts soils associated with the existing developments is approximately 0.0008 percent of the Jackson project acres associated with grazing allotments.

Maintenance of exclosures- When maintained, exclosures help reduce the effect to soils from cattle hooves in the inside of the exclosure area.

Transportation

Currently the net amount of road length in this project area is approximately 366 miles.

Road Maintenance- Ongoing road maintenance activities would continue. This includes activities such as cleaning culverts and ditches, installing drain dips, blading road surfaces, and replacing road signs. Road Maintenance has short term effects to soils but helps prevent the magnitude of long term impacts. The soil effects produced by road maintenance are short term (2 to 5 years) erosion increases due to blading (reduction of effective ground cover along shoulders), culvert cleaning, and road

clearing of brush and trees in roadside ditches. Long term (7 to 10 year) effects are reduced soil erosion due to less surface erosion on the road prisms.

Recreation Use

Forest/District Firewood Program-Firewood cutting occurs throughout project area . The firewood synopsis specifies no cutting within riparian habitat conservation areas. Upland firewood cutting has produced localized impacts such as soil rutting.

Off Road Vehicles- ATV use is an on-going use largely during hunting season. Wet season use in the spring for turkey hunting, horn hunting, and mushroom hunting has been shown to contribute to erosion and delivered sediment in localized areas. The new national process for managing ATV will close the forest to cross country travel and maps of the travel system will be released soon.

Noxious Weed Treatments

Treatment of noxious weed populations both existing and new will continue to be a component of the ONF program of work. Project coordinated through existing Ochoco Integrated Weed Management program will occur mostly along main roads.

Effects to soils: Given the limited extent of treatment this has no measurable effect on soils. Soils along the highway are often mixtures of subsoil, aggregate, cobble, stone and cinders. In general, a reduction in invasion and colonization of undesirable weed species, many of which limit the re-colonization of disturbed sites by desirable natives or native cultivars will improve soil conditions.

Travel Management Plan- Changes in OHV management. Based on changes in 36 CFR 294, the FS has designated routes, trails, and areas for OHV use. Maps will be produced shortly. This will have the effect of reducing effects of OHV use throughout the forest which will help reduce erosion both on uplands and riparian areas.

Ochoco Summit OHV Trail is a proposed project that would implement 4X4, ATV and motorcycle trials throughout the Jackson project. These designated trails would have the effect of reducing erosion both on the uplands and riparian areas by removing off-trail OHV use.

Mass Wasting

Existing Condition

Portions of Happy Camp Creek and Little Summit Prairie are underlain by active and dormant landslide terrain. When there is a change in the ground water flow through the unstable terrain, the potential is increased for slope movement. Rapid shallow debris flows and deeper rotational slides can result, altering the vegetation potential and possibly releasing sediment into the stream systems, depending on proximity to the riparian areas. Effects of the alternatives on the landslide terrain would be measured by:

- Acres of dormant landslide terrain and mapped landslide debris
- Miles of road within dormant landslide terrain and mapped landslide debris

Environmental Effects

Alternative 1

The No Action Alternative would allow the dormant landslide terrain to continue the natural process of erosion under the current precipitation pattern.

Alternatives 2 and 3

The proposed noncommercial treatments (including noncommercial thinning, aspen treatments, prescribed natural fire and juniper thinning) would not increase slope instability. These treatments would encourage increased growth of the vegetation, which would increase the evapotranspiration, thereby increasing slope stability.

The primary concern from a mass wasting standpoint is for those units on dormant landslide terrain and underlain by mapped landslide debris that have commercial treatments. Landslide terrain tends to develop unusual subsurface drainage patterns. The intensity and style of management activity on landslide terrain, in the vicinity of seeps and springs, could potentially change the drainage pattern, possibly increasing the risk for instability.

Alternative 2 proposes commercial harvest management of more acres located in dormant landslide terrain than Alternative 3; Alt 2 proposes 80 acres while Alt 3 proposes 53 acres (see Table 58).

Table 58. Acres of dormant landslide terrain by unit and alternative.

Unit	Alternative 2 (acres)	Alternative 3 (acres)
436b	6	6
40	7	6
230	6	6
246	8	8
435	7	7
436	20	20
415	26	0
Total	**80**	**53**

Those units located on the upper slopes of dormant landslide scarps have a slightly increased potential for reactivating the landslide debris on the lower slopes when combined with a higher precipitation or a rain on snow event like the forest experienced in 1997, due to the potential increase flow of groundwater to the lower slopes. There are 237 acres of dormant landslide terrain within the project area boundary. Commercial thinning proposed in Alternative 2 would be on about 1.4 percent (80 acres) of the dormant landslide terrain in the project area and on about 1 percent (53 acres) in Alternative 3.

Through the design elements and mitigation, the units identified in Table 58 would have seeps and springs buffered and any evidence of recent motion evaluated by the geologist. The tractor method proposed for use in those units does have a tendency to compact the ground. The units, generally located on the upper slopes, could have a slightly increased risk for indirectly destabilizing the lower slopes if there should be a continued weather pattern of higher precipitation.

There is no risk for reactivation of landslide terrain through road related activity for the proposed temporary road construction, nor for the reconstruction for either action alternative.

Hydrology

Analysis Background

The primary factors that are assessed in this analysis are those hydrologic features that are directly and indirectly influenced by vegetation management activities. The critical features that may be affected by vegetation manipulation are stream discharge characteristics (which may lead to changes in channel morphology) and sediment input to streams from ground disturbing activities and increased overland flow due to soil compaction, less vegetative interception and decreased evapotranspiration. Riparian shade is another critical feature that may be affected by vegetation management activities and is discussed in the Aquatic Species section of this document. The

following discusses the hydrologic parameters of increased peak flow and sediment delivery as it is affected by the proposed project.

Stream Discharge and Overland Flow

Harvest treatments and associated activities have been shown to alter stream discharge conditions and overland flow conditions. Altered stream flow conditions are important to recognize as they can lead to changes in sediment input to streams and alteration of stream channel morphology (i.e. width to depth ratios, entrenchment, sinuosity, etc.). Literature indicates that there may be a threshold around 20-30% of a watershed that can be "equivalently clearcut" before there is an effect on flow (J. Seymour 2008). Watershed thresholds can vary depending on a variety of factors that include but are not limited to topography, elevation, soil type, and precipitation regime. The Ochoco LRMP (1989) established a 25% threshold of Equivalent Harvested Area (EHA) for the Deep Creek Watershed based on the physical attributes listed above.

Sediment Delivery and Turbidity

Increased sediment delivery and turbidity in streams have been documented following vegetation manipulation and associated activities. Sediment effects from anthropogenic disturbance are primarily due to changes in the quantities and patterns of overland flow, and the increased mobility of soils due to ground disturbing activities. Studies of buffer effectiveness have shown varying results but have found that buffers of less than 200 feet wide were effective in controlling sediment delivery under most harvest and road building activities. Most of the studies found the highest risk of sediment delivery resulted from ground disturbing activities less than 30 to 10 meters (98.4-32.8 feet). (Broderson, 1973; Lynch et al., 1983; Clinnic, 1985; Rashin et al., 2006; Heade, 1990).

Overland flow is a naturally occurring process in portions of the planning area depending on factors of soils, topography, geology, antecedent moisture conditions, and the timing and magnitude of storm events. It is often an occurrence in scab stringer land type areas, which comprise 23% of the project area and is an observable phenomenon in the remaining 77% of the planning area. The magnitude and frequency of overland flow can be increased in areas where infiltration rates have been reduced, such as compacted or frozen areas, or where there is increased snowpack from canopy removal. Overland flow can occur from a reduction in evapotranspiration due to timber harvest activities, some of which can and has resulted in elevated rates of sheet and rill erosion and sediment delivery. However, recent studies suggest that current forest harvest procedures and Best Management Practices are largely effective in reducing rilling and sediment delivery (Litschert 2009).

This analysis focuses on treatment activities within 200 feet of stream channels as the primary zone for potential effects to occur. This zone was delineated to encompass the dominant sediment contributing area for the project area. This determination was based on field observations and professional judgment, and was supported by the findings from peer-reviewed literature and research. The analysis focuses on the amount of sediment delivered from surface erosion and mass soil movement outside the stream channel dependent on existing and proposed ground disturbance, soil erodibility, slope, and distance to the stream. Because areas within 200 feet of the stream have largely been unaffected by management activities besides road building, background levels of sediment from surface erosion was modeled using existing roads – including those not used for the proposed activities or for haul.

Forest Plan standards for sediment and turbidity correspond with State of Oregon standards. There is no quantitative standard for sediment in the Oregon DEQ water quality rules. Narrative Criteria (section 340-041-0007-12) states that activities can not result in the formation of appreciable organic or inorganic deposits deleterious to fish or other aquatic life.

State water quality standards direct that turbidity levels should not exceed background levels by more than 10 percent. Turbidity is the degree to which suspended material in the water impedes light

penetration and is expressed in Nephrometric Turbidity Units (NTUs). Because turbidity typically only fluctuates during storm or peak flow events, while it may affect beneficial uses such as domestic use, it is not an enduring condition that affects the longevity of individual aquatic organisms, or the viability of populations. Most measurable effects to aquatic life result from sediment instead of turbidity. For this reason, this analysis would focus on sediment. There are currently no streams in the project area on the Oregon 303(d) list of impaired waters for sediment or turbidity. However, current stream surveys have measured percent fines in some stream channels in the project area to be relatively high. Some streams in the watershed are inherently high in sediment due to local soil types and geology, but documented streambank instability, high embededness, and the occurrence of ground disturbing activities that have the potential to produce and deliver sediment, indicate that sediment levels are likely above historic values.

In older surveys (pre 2010), totaling 62 miles of stream, it was estimated that cobble embeddedness exceeded 35 percent (see Hydrologist report on file). As exhibited by surveys conducted in 2010, fine sediment varies tremendously across the watershed and even within streams. Lows of 5% fine sediment and highs of 75% show that variability. In Deep Creek, bedload data shows fine sediment (particle sizes < 2 mm) making up 40 percent of the desired spawning material (gravels). Average % fines <2mm were recently analyzed for several major tributaries in the project area (see Aquatics section). Cobble embededness is a filling of the interstitial spaces of stream bed materials with sediment. Embededness levels above 25 percent may indicate excessive stream sedimentation as salmonid spawning success is impaired at this level. It is estimated that as much as 30 percent of the sediment load in the watershed comes from bank and channel erosion while the remaining sediment load comes from sources outside the stream channel and it is this parameter that is modeled in this analysis. Table 59 summarizes the potential effects from the Jackson Project and how they would be measured as they pertain to hydrology. Stream temperature/shade is discussed in the Fisheries Report.

Table 59. Potential effects associated with the Jackson Project and the measurement parameter used to assess the degree of the effect.

Potential Effects	Measurement
Increased Peak Flows from Timber Harvest and Fuels Treatment	Equivalent % of Forested Area Harvested (EHA)
Sediment Delivery to Streams from Proposed Vegetation Treatments and Roads	Relative Erosion Rate (RER) and Treatment Acres within RHCAs

Equivalent Harvest Area

Affected Environment

The flow regimes within the project area are driven primarily by spring snow-melt in March and April. However, peak annual flows resulting from rain on snow events in early winter have produced some of the highest flows in the project area over the last 50 years. High flows can also result from intensive convective thunderstorms that cause flash floods during the spring and summer. Flash flooding is not a major factor in the Deep Creek Watershed due to prevalent vegetation and ground cover and the buffering effect of the forest canopy.

However, peak flows are probably earlier and higher than they were historically owing to channel entrenchment, soil loss, soil compaction, timber harvest, and road construction which, taken together, cause flashier hydrological responses. This has been offset somewhat by increased understory canopy cover.

Base flows were probably higher prior to watershed alterations which have occurred over the last 150 years. Stream entrenchment has reduced storage potential in alluvial aquifers. Upland storage has been lost due to road construction, erosion, and compaction. Prior to European settlement, frequent fires maintained lower evapotranspiration and interception rates by maintaining very open stands and

substantially reducing juniper and marginal conifer stands. Water storage in wetlands and beaver ponds also contributed to higher base flows. Currently, many of the conifer stands are overstocked and conifers and juniper have moved into formerly un-forested areas and wet meadows.

Measurement

The Equivalent Harvest Area (EHA) model was used to determine the relative effects of timber harvest activities and forest vegetative conditions within the watershed (see Hydrologist report on file for EHA procedure). The EHA model is based on the principal that reduced stand density would reduce interception and evapotranspiration and may result in an increase in runoff and/or overland flow and snow accumulation. The EHA risk threshold should not be interpreted as a point above which detrimental impacts would occur but as a point above which detrimental impacts may occur should a 10-year or greater storm or runoff event take place. EHA is defined as that area, when harvested, which produces hydrologic effects similar to one acre of clearcut. The Ochoco Land Management Plan assigned an EHA threshold of 25 percent for the Deep Creek Watershed and is the point at which there is potential increase in flows for the watershed (Anderson 1989).

For analysis purposes, the EHA calculations assume for Alternatives 2 and 3 that one-third of the commercial harvest entries would occur in 2013 and two-thirds would occur in 2014, followed by noncommercial and prescribed fire activities. Other assumptions are that all sales would start on schedule, would take one year to complete and associated roadwork would occur as specified in the design criteria.

Figure 21 displays the EHA values by alternative for the proposed activities in the Jackson Project. The figure displays recovery over-time but does not account for other restoration activities scheduled to occur with the watershed under the Deep Restoration EA. Accounting for these restoration activities would expedite the recovery.

Figure 21. EHA values over time for the Jackson project area.

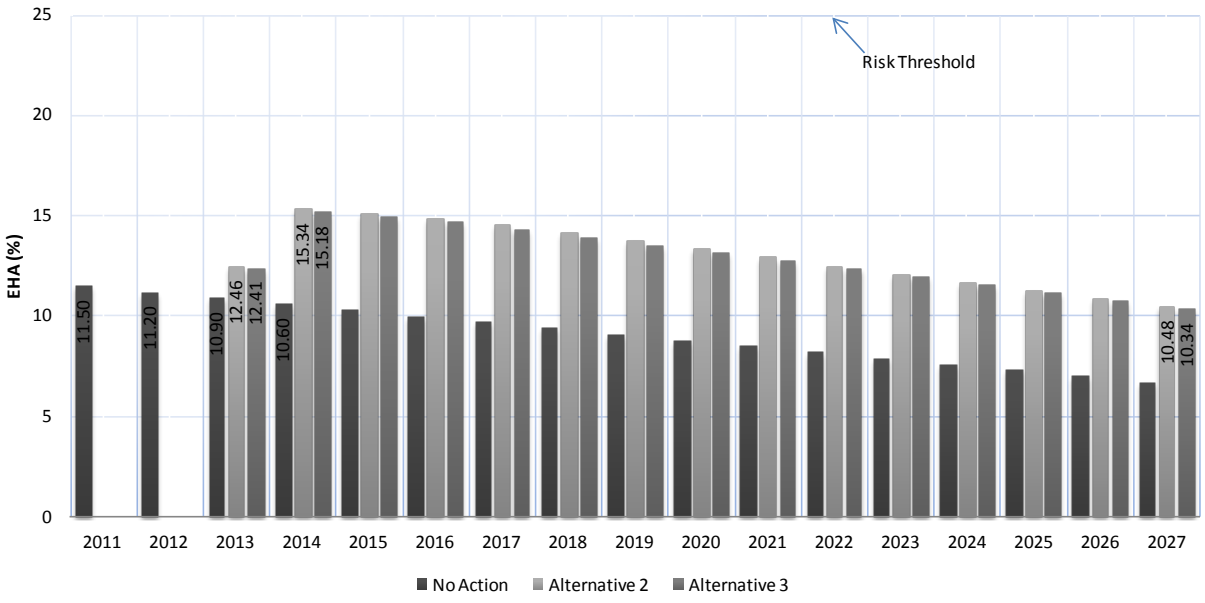


Table 60. Treatment* Acres within RHCAs by Alternative within the Jackson project area.

	Treatment Type					
	Commercial Harvest	**Commercial Hardwood**	**Noncommercial Thinning**	**Aspen Non-commercial**	**Juniper Thinning**	**Natural Fuels**
Alternative 1	0	0	0	0	0	0
Alternative 2	107	24	1358	89	25	115
Alternative 3	0	0	113	113	0	115
*PCT would occur in commercial harvest areas and Rx burning and fuels treatments would occur where PCT and CT is proposed. Proposed underburning would occur as a standalone activity.						

Direct and Indirect Effects

Alternative 1

In considering the existing condition, the current EHA value in the Deep Creek watershed is11.2. The overall recovery of the watershed has improved by 38% during the last 12 years, when EHA was last calculated. With no treatments proposed within this alternative, the EHA value would continue to decrease over time, as displayed in Figure 21, assuming no large scale disturbance events occur. The risk of a stand replacement wildfire would remain unchanged as no vegetative treatments would occur. No treatments would occur to improve stand resiliency. Ladder fuels would not be reduced by noncommercial thinning and ground fuels outside the historic range of variability would not be treated. Noncommercial thinning would not be accomplished to reduce stocking levels of small diameter trees and promote recovery or riparian vegetation. If a wildfire was to occur, there would be an increase in EHA commensurate with the size and intensity of the fire. Such an event could have substantial adverse impacts to RHCAs in terms of changes in flow. The risk of vegetation mortality to disease would also remain unchanged. If this vegetation condition were to contribute to a wildfire, EHA values for the watershed could increase considerably.

Although this alternative displays the lowest EHA value (well below the 25% threshold) when compared to Alternatives 2 and 3, it has no activities to protect and enhance Riparian Habitat Conservation Areas (RHCAs) and promote attainment of LRMP standards and guidelines, and Riparian Management Objectives (RMOs) described in Inland Native Fish Strategy (INFISH) (1995). In the short term (<5 years) this alternative would be consistent with standards and guidelines and with the Clean Water Act and Executive Orders 11988, 11990, and 12088. However, in the long term, if no restoration activities were to take place within RHCAs, resource conditions would continue to trend away from management objectives for these areas (Deep Creek Watershed Restoration EA 2004).

Alternative 2

Through the implementation of the proposed vegetation treatments in Alternative 2, EHA values are calculated to increase from 10.9 to 15.3. Although an increase in EHA is anticipated, the expected EHA value for this alternative is well below the established threshold of concern of 25% as specified for the watershed. The increase in EHA may result in small scale alteration of runoff/overland flow, but the degree is still well below threshold and is not expected to result in measureable adverse effects to peak flows or stream condition from erosion.

Following implementation, it is anticipated that the effects to stream discharge and overland flow from project implementation would decrease to levels near pre-harvest conditions by the year 2027.

The rate of recovery in the EHA model assumes that recovery would take place through natural processes of vegetation regeneration, increased ground cover, and restoration of soil properties conducive to site productivity and hydrologic function through mechanisms described in the Soils Report.

The EHA model does not account for the implementation of restoration measures that would be included with this project and potential future projects that would hasten recovery. Restoration activities that are included in this project may include tilling/subsoiling, seeding, and placing slash at the completion of the project on lengths of temporary roads, and lengths of re-opened closed roads within 200 feet of all streams. While the value of these projects cannot be calculated using the EHA model, these activities would advance recovery periods substantially.

While the EHA model accounts for treated acres throughout the watershed, the potential for increased peak flows can be augmented if treated units occur directly adjacent to, or in close enough proximity to stream channels that a direct hydrologic connection of surface runoff from the unit to the channel is created. A portion of the RHCAs within the watershed are proposed to be treated (see Table 60). In total, there are 107 acres of proposed commercial treatment within RHCAs that would employ mechanical means of tree harvest. However, commercial harvest is limited to areas outside of 50 feet of class I, II, and III streams and wetlands greater than 1 acre. Machinery would be limited to existing roads, trails, landings and crossings (Table 2, Figure 1). Commercial harvest is also limited to areas outside of 20 feet of class IV streams with machinery limited to existing roads, trails, landings, and crossings within 50 feet of the banks of the channel. This limits the potential for new disturbance and a direct hydrologic connection to stream channels. Commercial harvest units constitute 1.9% of the total RHCA acres within the Jackson project area in Alternative 2.

In addition to commercial harvest, there are 1,358 acres of noncommercial treatments (Table 60) (not including post treatment of the 107 acres from the commercially thinned acres within RHCAs) as well as 115 acres of natural fuels treatments. These treatments would occur by hand, and would not lead to significant ground disturbance that would contribute to peak flows beyond what is accounted for in the EHA model.

In total, there are 1,580 acres of RHCA treatments proposed in Alternative 2. This amounts to approximately 23% of the entire RHCA acres within the watershed. See Table 61 for treatment type acres by class/category of stream and subwatershed. Treatments within the RHCA are designed to enhance RMOs and improve watershed condition. Any potential for hydrologic connectivity from RHCA treatment units would be mitigated through the implementation of project design criteria and BMPs listed in Appendix C.

Roads and skid trails also have the potential to contribute to peak flows by conveying overland flow to streams. All existing, reconstructed, and temporary roads within the project area that would be used to implement Alternative 2 would be improved or designed to minimize hydrologic connectivity using techniques, criteria, and BMPs described in Appendix C. Roads and skid trails developed for the project would be placed in areas of existing disturbance. The potential for concentrated flow on road and skid trail surfaces would be dissipated through the implementation of road design features that include but are not limited to ditch relief culverts, dips, water bars and out sloping. Dissipation areas would be armored or located in areas with favorable gradient, surface roughness, and surface cover to avoid overland flow concentration, erosion and hydrologic connection to natural channels. Temporary roads and skid trails would be obliterated following use. The objectives and design considerations of these practices are described in the national U.S. Forest Service National Best Management Practices Program technical guide (USDA, 2011). Research and review of the effectiveness of individual practices in protecting soil and water resources has been shown to be effective to varying degrees, with overall effectiveness increasing with redundancy in implementation (Ice, 2009). Because of the application of multiple conservation practices, the contribution of roads

and trails to potential increases in peak flows through the implementation of Alternative 2 would likely be immeasurable.

Overall, this alternative would be consistent with the standards and guidelines in the Ochoco LRMP pertaining to EHA and flow and consistent with INFISH RMOs pertaining to channel condition. This alternative would be consistent with the Clean Water Act and Executive Orders 11988, 11990, and 12088. There are no expected measureable adverse effects to runoff and stream flow from this alternative.

Table 61. Vegetation Treatment Acres within RHCAs for the Jackson Project Alternative 2.

Commercial Harvest						
Subwatershed	**Stream Name**	**Category I RHCA**		**Category II RHCA**	**Category IV RHCA**	**Grand Total**
		Stream Class I	**Stream Class II**	**Stream Class III**	**Stream Class IV**	
Crazy Creek-Deep Creek	Big Spring Creek			2.87	8.27	11.14
	Buck Hollow			23.21		23.21
	Crazy Creek		0.28		3.07	3.35
	Deep Creek				6.39	6.39
	East Fork Crazy Creek			1.18	4.25	5.43
	West Fork Crazy Creek			0.97		0.97
		0.00	**0.28**	**28.22**	**21.98**	**50.49**
Jackson Creek	Cabbage Creek				0.04	0.04
	Derr Creek			1.01	1.40	2.41
	Dicer Meadow		0.00			0.00
	Double Corral Creek			0.15	0.00	0.15
	Happy Camp Creek		5.32		4.64	9.96
	Haypress Creek			5.22	0.01	5.23
	Jackson Creek	0.91			4.73	5.65
	Toggle Creek				0.01	0.01
		0.91	**5.32**	**6.37**	**10.84**	**23.44**
Little Summit Prairie	Little Summit Creek	3.42	4.21	3.31	10.00	20.94
	Thornton Creek				4.18	4.18
	West Fork Thornton Creek		0.13	4.88	2.51	7.52
		3.42	**4.34**	**8.19**	**16.69**	**32.63**
Non Commercial Treatments						
Subwatershed	**Stream Name**	**Category I RHCA**		**Category II RHCA**	**Category IV RHCA**	**Grand Total**
		Stream Class I	**Stream Class II**	**Stream Class III**	**Stream Class IV**	
Crazy Creek-Deep Creek	Big Spring Creek		57.70	2.87	16.25	76.82
	Buck Hollow			112.67		112.67

	Crazy Creek		4.66		24.70	29.36
	Deep Creek	118.90		0.82	61.56	181.28
	East Fork Crazy Creek		25.24	1.45	7.68	34.37
	West Fork Crazy Creek			52.94	5.77	58.71
		118.90	**87.60**	**170.75**	**115.96**	**493.21**
Jackson Creek	Cabbage Creek				0.04	0.04
	Derr Creek		10.63	2.42	9.29	22.35
	Dicer Meadow		1.04		0.67	1.71
	Double Corral Creek		11.38	0.15	8.67	20.20
	Happy Camp Creek		88.70		37.69	126.40
	Haypress Creek			6.37	8.20	14.57
	Jackson Creek	171.90	23.42		23.13	218.45
	Toggle Creek	14.69	0.00	0.79	7.80	23.29
		186.60	**135.18**	**9.73**	**95.50**	**427.01**
Little Summit Prairie	Little Summit Creek	48.21	153.39	11.26	91.48	304.34
	Thornton Creek		66.41		16.42	82.82
	West Fork Thornton Creek		30.53	5.77	15.10	51.41
		48.21	**250.33**	**17.03**	**123.00**	**438.57**

Fuels Treatments

Subwatershed	**Stream Name**	**Category I RHCA**		**Category II RHCA**	**Category IV RHCA**	**Grand Total**
		Stream Class I	**Stream Class II**	**Stream Class III**	**Stream Class IV**	
Crazy Creek-Deep Creek	Big Spring Creek		8.21	17.57	24.06	49.84
	Buck Hollow			136.12		136.12
	Crazy Creek		94.43		44.20	138.63
	Deep Creek	144.21		8.46	74.32	226.99
	East Fork Crazy Creek		25.24	1.45	7.68	34.37
	West Fork Crazy Creek			54.62	5.77	60.39
		144.21	**127.89**	**218.23**	**156.02**	**646.34**
Jackson Creek	Cabbage Creek				0.04	0.04
	Derr Creek		23.92	7.17	10.41	41.49
	Dicer Meadow		1.83		7.96	9.79
	Double Corral Creek		11.99	0.15	17.16	29.29
	Happy Camp Creek		19.31		20.59	39.90
	Haypress Creek			6.37	8.20	14.57
	Jackson Creek	32.76	2.17		33.93	68.86

	Toggle Creek	16.34	5.49	27.36	18.25	67.44
		49.10	**64.70**	**41.04**	**116.54**	**271.39**
Little Summit Prairie	Little Summit Creek	48.86	15.50	21.45	149.23	235.03
	Thornton Creek		84.96		26.54	111.50
	West Fork Thornton Creek		35.17	5.80	20.81	61.78
		48.86	**135.62**	**27.25**	**196.58**	**408.30**

Alternative 3

A portion of the RHCAs within the watershed are proposed to be noncommercially treated followed by prescribed fire and fuels treatments as summarized in Chapter 2. In this alternative, there would be no commercial treatment within RHCAs. The difference in EHA values between Alternatives 2 and 3 of 0.16 is primarily due to no commercial harvest in this alternative. Alternative 3 would elevate EHA values from 10.9 to 15.18, (compared to Alternative 2 that elevates EHA from 10.9 to 15.34). The values for the alternatives are well below the established threshold of 25% specified in the Forest Plan. With no RHCA commercial harvest in Alternative 3, there is a slightly lower potential for an effect to flow regimes than Alternative 2. With this alternative, it is anticipated that the effects to stream discharge and overland flow from project implementation would decrease to levels near pre-harvest conditions by the year 2027. The potential for increases in peak flow and overland flow from road and skid trail crossings are basically the same for Alternative 2 and 3 and would be mitigated by using BMPs and design criteria.

Alternative 3 would be consistent with standards and guidelines in the Ochoco LRMP pertaining to EHA and flow and consistent with INFISH RMOs pertaining to channel condition. This alternative would be consistent with the Clean Water Act and Executive Orders 11988, 11990, and 12088. This alternative would do less to meet the purpose and need than Alternative 2 but would also have a slightly lower risk for an effect to flows. There are no expected measureable adverse effects to runoff and stream flows from this alternative as the EHA value is well below threshold.

Cumulative Effects Common to Alternative 2 and 3

Past activities such as beaver eradication, livestock grazing, fire suppression and prescribed burning, timber harvest, road construction and maintenance, recreation, and special uses have produced much of today's hydrologic condition. These conditions include reduced riparian plant diversity, composition and vigor, down cut and degraded stream channels, changes in upland vegetation, and altered stream flows. Although many of the historic practices have been halted or modified, the effects to streams still show evidence of these practices.

Current and reasonably foreseeable activities within the Jackson project area.

- **Wheeler Aspen**- A small 19 acre timber sale that would have a very small, short term, non-measurable effect on EHA.
- **Westside EA-** Livestock grazing managed through the allotment plan would continue to have an effect that is not measurable by EHA.
- **Deep Restoration EA-** The implementation of restoration activities is expected to have a long-term, beneficial effect to peak flows within the Jackson project area.
- **Travel Management Plan-**The Plan limits vehicle traffic by regulation and if adhered to by the public it could result in decreased peak flows.

- **Ochoco Summit Trail**-The Ochoco Summit Trail is planned to limit OHV use to an established route. The creation of an established route could create new disturbance and disturb and hinder the progress of recovering areas but sensitive areas would be protected.

The expected direct or indirect effects to result from either action alternative are well below the threshold of concern. Because the reasonably foreseeable activities within the cumulative watershed effects area are largely intended to contribute to the restoration of the watershed, there is no expectation for deleterious cumulative effects to flow from the implementation of this project.

Sediment and Turbidity

Affected Environment

The Relative Erosion Rate (RER) model was used to determine the relative effects of sediment impairment to water quality. The RER predicts potential erosion and sediment delivery based on ground disturbance and slope/erosion class. Once slope and erosion class is determined, sediment delivery varies as a function of miles of road construction and reconstruction, and the amount of area harvested/treated. The intended use of this model is to compare alternatives, not for predicting specific quantities of sediment yield (USFS 1981). The sediment delivery zone for this analysis was identified as 200 feet from streams for reasons described on page 106.

Background, details, and basic assumptions used for modeling RER are included in Appendix C of the Hydrology Report. Other assumptions used in modeling were that conventional tractor logging systems implement ground lead cable methods (non-suspension). It was also assumed that traffic associated with the project implementation is constant. Although sediment delivery can vary depending on traffic levels, sediment delivery specifically associated with log truck traffic on haul routes is not included in this RER analysis. Sediment delivery from log truck traffic has the potential to increase proportionately to the number of trips taken over segments of road that have the potential to contribute to sedimentation in streams.

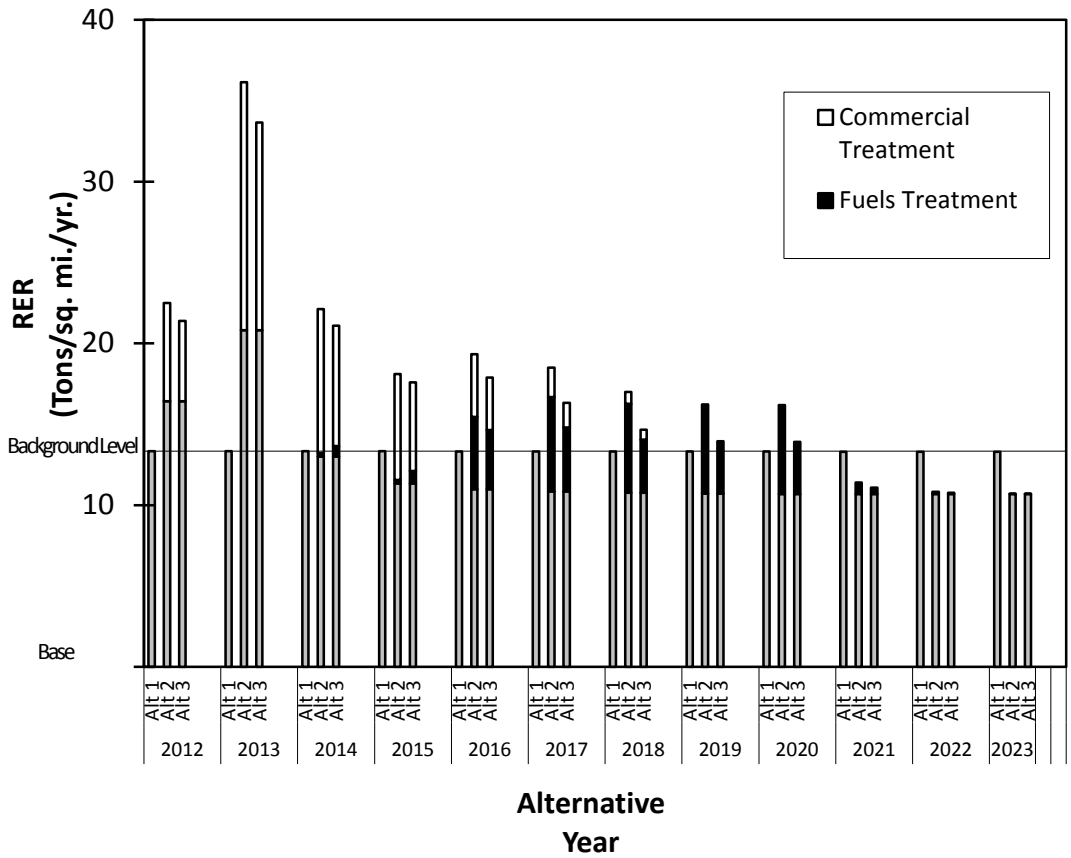
This analysis assumes that there would be a sale of one-third of the total acres in 2013 and two-thirds of the total acres in 2014 with either sale having a completion date as far out as two years from the sale date but only taking one year to complete the actual harvest.

In terms of the overall watershed, this project proposes harvest treatments as summarized in Chapter 2. A portion of those treatment acres are proposed to occur in RHCAs. While RHCA treatment acres are sometimes used for discussion purposes, they are not equivalent to the acres used to calculate RER, because 200 feet was the zone designated for potential sediment delivery. More specifically, for Class I and II streams, only 200 feet of the 300 foot RHCA buffer is within the RER sediment delivery zone. For Class III streams and wetlands great than 1 acre, there is an additional 50 feet included in the RER sediment delivery zone that is beyond the 150 foot RHCA buffer. And finally, for Class IV streams and wetlands less than 1 acre, there is an additional 150 feet included in the RER sediment delivery zone that is beyond the 50 foot RHCA buffer. Therefore, although Alternative 3 does not include commercial harvest in RHCAs, commercial harvest is included in the RER analysis for Alternative 3 in the areas that are beyond the RHCA buffer but still within the sediment delivery zone.

Figure 22 displays the results of the RER analysis. “Base levels” of erosion/sedimentation are displayed as zero but should not be considered absolute. Base level values of zero provide a relative value that includes sediment delivered via natural processes from an undisturbed upland area. Erosion/sediment generated from preexisting disturbance provides “background” levels. The “background” levels displayed in Figure 22 only displays background levels of sediment that is produced from the existing road network and its current use. Erosion/sedimentation values above background represent relative erosion rates potentially generated by different project alternatives.

BMPs and integrated design features would be monitored to verify that management objectives are being accomplished.

Figure 22. Relative Erosion Rates displayed by Parameter for Alternatives 1, 2 and 3 for the Jackson Project.*



Treatment	Alternative	RER value by year in Tons/sq.mi./yr											
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Roads	alt1	13.34	13.34	13.33	13.33	13.33	13.32	13.32	13.31	13.31	13.31	13.30	13.30
	alt2	16.43	20.81	13.00	11.35	10.97	10.85	10.76	10.71	10.69	10.68	10.68	10.68
	alt3	16.43	20.81	13.00	11.35	10.97	10.85	10.76	10.71	10.69	10.68	10.68	10.68
Harvest	alt1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	alt2	6.06	15.34	8.91	6.55	3.88	1.82	0.73	0.00	0.00	0.00	0.00	0.00
	alt3	4.96	12.83	7.44	5.47	3.25	1.52	0.61	0.00	0.00	0.00	0.00	0.00
Fuels	alt1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	alt2	0.00	0.00	0.21	0.22	4.48	5.84	5.51	5.51	5.50	0.71	0.15	0.02
	alt3	0.00	0.00	0.65	0.76	3.67	3.95	3.30	3.24	3.23	0.41	0.08	0.01
Totals	alt1	13.34	13.34	13.33	13.33	13.33	13.32	13.32	13.31	13.31	13.31	13.30	13.30
	alt2	22.49	36.15	22.12	18.11	19.33	18.50	16.99	16.23	16.19	11.39	10.83	10.70
	alt3	21.39	33.64	21.09	17.59	17.89	16.32	14.67	13.95	13.91	11.09	10.77	10.69

*The intended use of this model is to compare alternatives, not for predicting specific quantities of sediment yield (USFS 1981).

In addition to roads, stream crossing also have the potential to deliver sediment, however they are not included in the RER analysis model. A majority of crossings have been identified and are displayed in Tables 62 and 63. The set of practices listed in the Chapter 2, Design Features, have been used in planning and/or are to be used during layout and implementation.

The number of skid trail crossings across class IV (intermittent) streams for both summer and winter harvest units were estimated for each action alternative. The estimated numbers of crossings are based on the assumption that there are approved and/or existing crossings which occur 500-800 feet apart. This may also include longer skid distances (up to ¼ mile) in order to reduce the number of actual crossings. The actual number of crossings may be less than estimated numbers as portions of units would potentially get dropped during sale layout and implementation. For example, if there is a small portion of a unit that is inoperable due to adverse skidding, then it would be dropped rather than skidding across the class IV stream. Crossings may also be reduced where field checks during sale layout result in a situation where an existing temporary road can be used to skid to a system road rather than crossing a stream channel to a landing on the other side of the unit boundary. A review of proposed harvest units for Alternative 2 and Alternative 3 resulted in the following estimated skid trail crossings on class IV (intermittent) streams:

Table 62. Skid Trail Crossings for the Jackson Project.

Alternative 2					
Summer Skid Trail Crossings					
Unit	Treatment Notes	Acres	Stream Crossing (count)		Resource Notes
			Max.	Min.	
180		16	2	0	No Name class IV trib to Deep Creek
214 & 214c		25	1	1	No Name class IV trib to Deep Creek
	ASPEN	4			
224c		12	3	1	No Name class IV trib to East Fork Crazy Creek
313		79	2	0	No Name Class IV trib to Deep Creek
334a	ASPEN	22	1	0	No Name Class IV trib to Deep
334c		24	2	0	No Name Class IV trib to Deep
443a		9	2	0	No Name class IV trib to West Fork Thornton creek
537	ASPEN	13	3	1	Thornton Creek class IV
604	ASPEN	8	2	0	No Name class IV trib to Happy Camp Creek
605	ASPEN	5	3	1	Little Summit Creek class IV. (incorrectly mapped as class III)
	Subtotals	216	21	4	
Winter Skid Trail Crossings					
299		9	2	1	Buck Hollow Creek class II/IV
299a	ASPEN	4	2	1	
310a		77	6	3	No Name class IV trib to Buck Hollow.
357		30	2	0	No Name class IV trib to Big Springs Creek
357a	ASPEN	3	1	1	No Name class IV trib to Big Springs Creek
360		33	1	0	No Name class IV trib to No Name class IV trib to Big Springs
393a	ASPEN	3	1	0	No Name class IV trib to Little Summit Creek
465		56	2	1	No name class III trib to Little Summit Creek
501		10	2	0	west fork No Name class IV trib to Thornton Creek
501a		6	1	0	west fork No Name class IV trib to Thornton Creek
502		52	2	0	east fork No Name class IV trib to Thornton Creek
	Subtotals	282	22	7	

Alternative 3					
Summer Skid Trail Crossings					
Unit	Treatment Notes	Acres	Stream Crossing (count)		Resource Notes
			Max.	Min.	
180		15	2	0	No Name class IV trib to Deep Creek
214 & 214c		22	1	1	No Name class IV trib to Deep Creek
	ASPEN	3			
224c		9	2	1	No Name class IV trib to East Fork Crazy Creek
313		75	1	0	No Name Class IV trib to Deep Creek
537	ASPEN	9	3	1	Thornton Creek class IV
604	ASPEN	5	2	0	No Name class IV trib to Happy Camp Creek
	Subtotals	138	11	3	
Winter Skid Trail Crossings					
299		4	1	0	Buck Hollow Creek class II/IV
299a	ASPEN	4	1	0	
310a		65	6	4	No Name class IV trib to Buck Hollow.
357		20	2	0	No Name class IV trib to Big Springs Creek
357a	ASPEN	2	1	0	No Name class IV trib to Big Springs Creek
360		29	1	0	No Name class IV trib to No Name class IV trib to Big Springs
393a	ASPEN	2	1	0	No Name class IV trib to Little Summit Creek
501		7	1	0	west fork No Name class IV trib to Thornton Creek
501a		4	1	0	west fork No Name class IV trib to Thornton Creek
502		48	2	0	east fork No Name class IV trib to Thornton Creek
	Subtotals	185	17	4	

Temporary Road crossings have been identified by unit and logging season. They are displayed in Table 63. Each of these crossings would be individually identified on the ground for site specific design according to Project Design Features. The potential for sediment delivery is discussed in the Direct and Indirect Effects section.

Table 63. Temporary Road Crossings for the Jackson Project.

Alternative 2				
Summer Temporary Road Crossings				
Unit	Treatment Notes	Acres	Stream Crossings	Resource Notes
107		8	1	No Name class IV trib to Jackson Creek; existing crossing location on decom/temp road, 4250-613
134		14	1	No Name class IV trib to Jackson Creek; existing crossing location on decom/temp road, 4250-612
334b		9	1	No Name class IV trib to Deep Creek; existing crossing location, 4270-251/210
454a		20	1	No Name class IV trib to West Fork Thornton Creek; existing crossing location on decom/temp road, 4272-634
528		30	1	No Name class IV trib to Little Summit Creek; existing crossing location on decom/temp road 1200-120
	Subtotals	81	5	
Winter Temporary Road Crossings				
300		9	1	No Name class IV trib to Buck Hollow Creek; existing crossing location on decom/temp btwn units 300 & 299, 4200-608
465		56	4	No Name class IV trib to Little Summit Creek; existing crossing locations on decom/temp road 4276-040
	Subtotals	65	5	
Alternative 3				
Summer Temporary Road Crossings				
Unit	Treatment Notes	Acres	Stream Crossings (count)	Resource Notes
107		8	1	No Name class IV trib to Jackson Creek; existing crossing location on decom/temp road, 4250-613
134		14	1	No Name class IV trib to Jackson Creek; existing crossing location on decom/temp road, 4250-612
334b		9	1	No Name class IV trib to Deep Creek; existing crossing location, 4270-251/210
454a		20	1	No Name class IV trib to West Fork Thornton Creek; existing crossing location on decom/temp road, 4272-634
	Subtotals	51	4	
Winter Temporary Road Crossings				
300		9	1	No Name class IV trib to Buck Hollow Creek; existing crossing location on decom/temp btwn units 300 & 299, 4200-608
465		56	4	No Name class IV trib to Little Summit Creek; existing crossing locations on decom/temp road 4276-040
	Subtotals	65	5	

In addition to the identified skid trail and temporary road crossings listed here, for both action alternatives there may be up to 45 other existing Level I and/or II roads that have stream crossing locations on class IV streams that may require improvement according to Project Design Features, depending upon site conditions.

Direct and Indirect Effects

Alternative 1

This alternative would allow for a gradual recovery of closed roads, temporary roads, and previously disturbed areas within the sediment delivery zone. Hydrologic recovery would provide decreased

stream turbidity, decreased embeddedness, and a lower percentage of fine sediment within spawning gravels and pool habitats.

Since there are no proposed ground disturbing activities within this alternative, this alternative would be consistent with standards and guidelines in the Ochoco LRMP and INFISH and would be consistent with the Clean Water Act and Executive Orders 11988, 11990, and 12088. There would be no expected measureable effects due to sediment from this alternative.

Alternative 1 has no proposed treatments and would result in no additional disturbance. Consequently, there would be no cumulative effects resulting from this alternative.

Alternative 2

From an RER modeling perspective, the primary activities that may affect sediment delivery within this project area are from harvest and temporary road building activities. In terms of the overall watershed, this alternative proposes harvest treatments, prescribed fire, and temporary road building as summarized in Chapter 2. A portion of those activities are proposed to occur in RHCAs (see Table 61 for treatment type acres by class/category of stream and subwatershed). As discussed previously, it is the acres treated and roads within 200 feet of stream channels that have the most potential to deliver sediment.

The RER analysis of Alternative 2 shows a potential maximum increase in the year 2013 of 22.81 tons/sq. mile/year over background (Figure 22). Natural sediment delivery from undisturbed areas can range from zero to 160 tons/sq. mile/year (Elliot et al, 2010). Within the project area, natural sediment contributions to streams is estimated to be between 5 and 30 tons/sq. mile/year, however with the existing disturbance it can be 60+ tons/sq. mi./yr. The projected increase for this alternative comes from a combination of commercial harvest, prescribed fire, and roads associated with the project.

Alternative 2 proposes to commercially harvest 107 acres within the RHCA. This is 1.9% of the total RHCA area within the project. Within RHCAs, these would be the only acres that would be mechanically treated and would have the greatest potential to generate sediment over other non-mechanized methods.

Besides the limited number of acres within 200 feet that would be harvested by mechanical means, BMPs and additional design criteria would be implemented in order to decrease the potential sediment delivery to streams. On the Idaho Panhandle National Forest, standard BMPs that are similar to those that would be implemented on this project (see Project Design Features) were shown to be at least moderately effective (75%) at reducing effects to soil and water (USDA, 2006). Precipitation regimes within the project area are at least one third that of northern Idaho, so effectiveness rates would be anticipated to be higher in this area.

In addition, integrated design features for vegetation treatments are incorporated for additional protection. Some of these features include:

- Commercial harvest only occurring further than 50 feet from class I,II,III streams and wetlands greater than 1 acre.
- Ground based mechanical activity associated with commercial harvest within the RHCA would be confined to existing roads and skid trails.
- Crossings would be limited to:
    - Existing roads with culverts for Class I and II streams
    - Existing roads that cross dry channels, using a temporary crossing, and in accordance with appropriate Forest Service specifications such as culverts, rock fords, or logs for Class III streams

- Limiting crossings to as few as possible and using temporary structures in accordance with appropriate Forest Service specifications, such as culverts, rock fords, or logs for Class IV streams.

- Removal of structures would include rehabilitation to preharvest condition as necessary including revegetation with riparian species.
- No new landings permitted within RHCAs and the reuse of existing landings would need prior approval by a fisheries or hydrology specialist.

Through the combination of BMPs and project design criteria, the redundancy of conservation activities would reduce the potential for sediment delivery from commercially harvested areas to nonexistent or non-measurable quantities.

The intent of the harvest and fuels treatment activities is to reduce the amount of area susceptible to high intensity wildfire and at high risk from insects and disease through commercial, noncommercial, and fuels treatments. While prescribed fire has the potential to increase RER values, the amount could be potentially less than if the areas remain untreated (as in Alternative 1 or excluded portions of Alternative 3) and experienced a widespread high intensity wildfire. If this were to occur, the risk of sediment delivery would vary depending on the extent and intensity of wildfire (see the Fire and Fuels Report).

Here too, integrated design features and BMPs would serve to reduce actual sediment contributions from fuels treatment units. Although not quantifiable, levels are expected to be reduced to levels considerably lower than those predicted using the RER model. Some of the additional project features designed to reduce impacts to soils and water include:

- Generally in RHCAs, there would be no intentional ignition within 100’ of stream channels. Fire would be allowed to back into the RHCAs and burn in a mosaic pattern. This criterion may be modified on a site-specific basis if:
  - There is a road or other existing fuel break within 100’ of the stream channel that would provide a logical boundary to the burn unit; in this case, ignition may take place up to the fuel break, but not between the fuel break and the stream channel.
  - Site-specific conditions exist such that intentional ignition within 100’ of the stream channel would be desirable.
    - EXAMPLE: Excessive amounts of conifer seedlings within 100’ of a stream channel are detrimental to the development of riparian hardwoods and fire is determined to be the tool of choice to remove them.
    - EXAMPLE: Large fuels accumulations within 100’ of the stream channel exist and fire is determined to be the tool of choice to reduce them.
- Where necessary, fireline would be constructed within RHCAs.
  - Fireline would be dug by hand or with a garden plow pulled by a four-wheeler or a small rubber-tired farm tractor.
  - Fireline would be a fuel break to mineral soil, 12-24 inches wide.
  - Fireline in RHCAs would not be constructed within 25’ of streambanks.
  - The end of the line would fishhook away from the stream channel and stop on the contour.

        - Fireline would be rehabilitated following completion of activities; waterbars would be constructed on hand line, and sod or slash would be replaced on plow line.

    - Sensitive areas within each RHCA would be identified and site-specific plans to protect each area during burn operations would be developed; site-specific plans would become part of each burn plan, and would be completed prior to approval of the burn plan.
        - EXAMPLE: A particular reach may contain down wood that is acting to prevent the progress of a headcut; site-specific plan would be developed to ensure retention of that piece of wood.
        - EXAMPLE: A given stream might be so deficient in down wood that the retention of all in-channel down wood in a unit might be necessary.
            - The assumption would be that where these criteria are applied, retention of in-stream down wood would be at about 80% or greater throughout the project area; percent shade and sediment delivery to streams would not be measurably changed. The intent of INFISH and Forest Plan standards would be met.

BMP measures related to prescribed fire on the Idaho Panhandle National Forest were found to be highly effective (> 90%) in conserving soil and water resources (USDA, 2006). Because of the redundancy of conservation activities, actual sediment generated from fuels treatment areas are expected to be non-measurable.

In addition to vegetation treatment related sediment effects, the RER assessed potential sediment effects from roads. To facilitate harvest, this alternative would propose road activities within 200 feet of stream channels as outlined in Table 64.

Table 64. Miles of Proposed Road Activities within 200 feet of Stream Channels for Jackson Project.**

Road Activity	Miles
Reopen Level 1 Road	19.8
Use Existing Level 2 Road	19.6
Use Existing Level 3 Road	4.1
Use Existing Temporary Road	2.8
Construct New Temporary Road	1.4
Reconstruct Existing Road	0.1

**Miles of road are approximate and similar for Alternatives 2 and 3, and do not include skid trails.

The amount of roads located in the vicinity of streams is not uncommon for this watershed due to the nature of the scab stringer landscape. A majority of the resources, like streams and timber are located in the stringers, which has resulted in a network of roads in close proximity to streams. These roads account for 56 percent of the overall potential increase calculated using the RER model. These values are modeled as an extreme scenario, in that the first sale's harvest is prolonged and the second sale's harvest starts early, resulting in 100 percent of the planned roads open and in use at once. The opposite scenario of the first sale's harvest starting early and the second sale's harvest starting late is suspected to only result in a slightly less overall increase in sediment delivery with a possible delay to recovery. Additionally, the RER model is assuming that for 200 feet on either side of a stream, all of a road is contributing sediment when in reality there could be less. For instance, a break in slope, a water bar, or other run-off dissipating/ erosion prevention feature could be within the 200 feet and as a result, the potential for sediment delivery is overestimated. Because these slope breaks and design

features regularly occur on roads within the project area, actual sediment delivery rates would be substantially lower than predicted.

The greatest potential for sediment contributions to streams would be associated with crossings. Fortunately, this project has planned the best management practices practical (see Project Design Features). When implemented, these practices have high effectiveness, and they would come close to eliminating potential sediment delivery during operations. However, effectiveness is essentially dependent upon onsite expertise to ensure proper design and implementation to conform to local site characteristics. Hence, Forest Service specialists would be intimately involved during implementation and rehabilitation so as to achieve maximum effectiveness. Some of these practices Forest Service specialist would oversee are listed here.

- Crossings would be designed, implemented, and rehabilitated according to the Project Design Features (PDC) listed so as to limit disturbance to bed and banks.
- Approaches and upland sections would be designed, implemented, and rehabilitated according to the Project Design Features listed in the PDC in order to have adequate relief drainage so that there would not be concentrated flow. On approaches, depending on site specific conditions, gravel, corduroy roads, slashmats, or other suitable structures /designs would be used. The objective of these practices is to distribute the weight of machinery more broadly and decrease the potential for rutting, thus decreasing the potential for compaction, as well as providing an operating surface that would reduce to potential for soil displacement. It also provides surface cover and roughness that reduces the potential for overland flow from upland areas and the delivery of sediment to the channel.
- Upland sections of roads may have waterbars, dips, slope limitations, dust abatement, etc. These features are going to reduce effects by
    - Maintaining the natural drainage pattern of the area
    - Controlling, collecting, detaining, treating, and dispersal of stormwater runoff
    - Diverting surface runoff with appropriate energy dissipation and sediment delivery buffers

Existing temporary roads, new temporary roads, and re-opened closed roads within the RHCA and sediment delivery zone (200 feet of Class I-IV streams), utilized during implementation are to have adequate practices (see PDC) conducted after the completion of harvest activities in order to minimize the long-term potential for sediment delivery as modeled in Figure 22. Even though the best management practices are planned for use during operations, there would still be sediment produced associated with crossings during the installation and rehabilitation of these crossings. There would be an increase with the first sale, over the first sale's area, the first year, after the completion of commercial harvest activities and rehabilitation. This would be a temporary increase to occur mainly with the initial spring melt and is not expected to persist though the length of the season. Then there would be an increase with the second sale, over the second sale's area, the second year, after the completion of commercial harvest activities and rehabilitation. This also would be a temporary increase to occur mainly with the initial spring melt and is not expected to persist though the length of the season.

It is estimated that each crossing has the potential to produce, at the most, approximately 0.5 cubic yards of sediment per crossing which roughly equates to 0.625 tons each. Based on these figures it is estimated that Alternative 2 could produce a maximum of 6.75 tons of sediment. This is the amount displayed in the "Total" row of Table 65. In addition to the identified skid trail and temporary road crossings, there may be up to 45 "Other" existing Level I and/or II roads that have stream crossing

locations on class IV streams that may require improvement according to Project Design Features, depending upon site conditions. There is limited data on these "Other" crossings and this is why there is a "Sub-Total" row which is the minimum in the range of maximums for potential sediment production due to stream crossings.

Table 65. Stream Crossing Summary with Estimated Potential Sediment Production

	Alt 2				Alt 3			
Road crossing type by season	Stream Crossing (Count)		Potential Sediment Produced (tons)		Stream Crossing (Count)		Potential Sediment Produced (tons)	
	max.	min.	max.	min.	max.	min.	max.	min.
Summer skid	21	4	1.31	0.25	11	3	0.69	0.19
Winter skid	22	7	1.38	0.44	17	4	1.06	0.25
Summer temp	5	5	0.31	0.31	4	4	0.25	0.25
Winter temp	5	5	0.31	0.31	5	5	0.31	0.31
Sub-Total	53	21	3.31	1.31	37	16	2.31	1.00
Other	45	0	2.81	0.00	45	0	2.81	0.00
Total	**98**	**21**	**6.13**	**1.31**	**82**	**16**	**5.13**	**1.00**

Alternative 2 may potentially produce a maximum amount of sediment ranging from approximately 1.31 to 6.13 tons due to stream crossings which is approximately 0.31-1 ton more than Alternative 3. This is assuming the worst case scenario. Actual anticipated sediment produced would be less because local site conditions vary, ranging from sites that are well armored to sites that are more sensitive and susceptible to disturbance. Sensitive areas would be avoided. Examples of sensitive areas are: channels that have bed and banks composed of finer material; channels that have a high bank height; channels that have a vertical bank angle; all of which would be susceptible to bank erosion, compaction, collapse and/or channel widening. Conversely, there are areas that are naturally armored and would not require as much (if any) structural improvement, hence less susceptible to disturbance. These types of areas are channels whose bed and banks are well armored by large cobble, boulders and/or bedrock, whose bank angle and bank height are low enough to provide a smooth transition through the channel, thus not requiring the installation of a structure that would have disturbance associated with it, and are channels that are dry for portions of the season.

Minor amounts of sediment would be produced during the installation and/or removal of crossing structures, improvements, or fords; which can also contribute to temporary increases in turbidity during spring melt. Immeasurable amounts could be produced during operations. During commercial harvest operations, stream crossings and roads within the sediment delivery zone could potentially contribute to an approximate maximum increase in the range of 24.12-28.94 tons. The 1.31-6.13 tons increase beyond that which is model in RER is not expected to persist beyond the years which the commercial harvest activities are to occur, 2013-2014. It is the intention of the Project Design Features and practices to prevent sediment production and delivery where practical, to reduce the potential for sediment delivery to minimal or somewhat negligible amounts, and to restore areas that otherwise could have the potential to contribute so that the ground is left better than it is, in the long-term.

In terms of road related sediment, this alternative has the potential to improve conditions over the existing condition. With both action alternatives (road activities are essentially the same in Alternative 3), project associated design criteria would include BMPs, but may also include hydrologic stabilization and/or culvert removal, decompaction of all temporary roads, skid trails, and re-opened closed roads within the RHCA and sediment delivery zone, as well as seeding and applying slash. Many of the riparian roads that would be reopened for temporary use under an action alternative are currently in a bare and compacted condition, are in various stages of disrepair, and may be accessible by motor vehicles. While the opening and use of these roads for project

implementation may result in small, short term (< 5 years) sediment generation, the long term field condition of these roads would be much improved. As much as 24.1 miles of roads may be rendered hydrologically inert, resulting in a decrease in RER. Sediment delivery would be decreased by 1.9 tons/sq. mi./year by the year 2021. This alternative would be consistent with standards and guidelines in the Ochoco LRMP and INFISH RMOs, the Clean Water Act and Executive Orders 11988, 11990, and 12088.

Alternative 3

This alternative proposes many of the same treatments summarized in Chapter 2. However, there would be no commercial treatment (107 acres) within RHCAs in Alternative 3. The noncommercial treatments within RHCAs are summarized in Table 61.

RER predictions for Alternative 3 indicate a potential elevation in sediment in the year 2013 by 20.30 tons/sq. mile/year over background level. The RER difference in values between Alternatives 3 and 2 is 2.51tons/sq. mile/year. The value for Alternative 3 is lower due to no commercial harvest in RHCAs.

From a thinning and fuels treatment perspective, the input of sediment to adjacent stream channels would be non-measureable since the treatment area within RHCAs would be small and excludes commercial harvest. Because similar design criteria and BMPs discussed above in association with Alternative 2 would also be implemented with Alternative 3, impacts to soil and water resources are expected to be non-measureable.

In regards to roads, sediment delivery and their effects for Alternative 3 are identical to those of Alternative 2 with the exception of a slightly different haul route in Alternative 3, in which there is 6.74 less miles that would have an immeasurable difference. See Alternative 2 for a complete discussion of sediment effects from roads.

In regards to stream crossings, sediment delivery, and the effects of Alternative 3 are similar to those of Alternative 2. Alternative 3 may potentially produce a maximum amount of sediment ranging from 1.00 to 5.13 tons due to stream crossings which is 0.31-1 ton less than Alternative 3 (see Table 65). This is assuming the worst case scenario where all crossings require the maximum amount of improvement as guided by the Project Design Features. See Alternative 2 for a complete discussion of sediment effects from crossings.

During commercial harvest operations, stream crossings and roads within the sediment delivery zone could potentially contribute to an approximate maximum increase in the range of 21.03-25.16 tons. The 1.00-5.13 tons increase beyond that which is model in RER is not expected to persist beyond the years which the commercial harvest activities are to occur, 2013-2014.

Alternative 3 would be consistent with standards and guidelines in the Ochoco LRMP and INFISH RMO's, the Clean Water Act and Executive Orders 11988, 11990, and 12088. There would be no expected measureable adverse effects from sediment due to this alternative. In regards to sediment effects, this alternative would have slightly less potential for effects than Alternative 2.

Cumulative Effects Common to Alternatives 2 and 3

As discussed previously, past activities such as beaver trapping, domestic livestock grazing (sheep and cattle), fire suppression and prescribed burning, timber harvest, road construction and maintenance, recreation, and special uses have produced much of today's hydrologic condition. These conditions include reduced riparian plant diversity, composition and vigor, down cut and degraded stream channels, changes in upland vegetation, and altered stream flows. Although many of the historic practices have been halted or modified, streams still show evidence of these practices. Past harvest activities as they pertain to sediment delivery are considered part of background levels, but are non-measureable and not displayed in Figure 22.

Current and reasonably foreseeable activities within the Jackson project area include

- **Wheeler Aspen**- This small 19 acre timber sale would have a very small, short term, non-measurable effect on RER
- **Westside EA**- While livestock grazing can affect sediment delivery, in the Jackson project area, their primary impact appears to be on riparian vegetation and channel condition. Livestock grazing managed through the allotment plan would continue to have an effect that is not a component of the RER analysis.
- **Deep Restoration EA**- The implementation of restoration activities is expected to have beneficial long-term cumulative effects to sediment yield. It is estimated that most of the sediment load in the Jackson Project area is coming from in-channel erosion such as cutbanks, headcuts, and scour with a total of at least 60+ tons of sediment per year. Ongoing restoration in the Deep Creek Watershed, since 2004 and prior has reduced sediment delivery and it is reasonably foreseeable that it would continue. It is estimated that the accomplished activities listed in Chapter 3, Cumulative Effects, would have reduced sediment yield by 10.24 tons per year, which is 27 percent of the predicted outcome for the project. The additional riparian pasture and road closures are estimated to reduce sediment yield by another 15+ tons/year. (Estimates are based upon WEPP calculations in the Deep Restoration EA).
- **Travel Management Plan**-The Plan limits vehicle traffic by regulation and if adhered to by the public it could result in decreased peak flows.
- **Ochoco Summit Trail**-The Ochoco Summit Trail is planned to limit OHV use to an established route. The creation of an established route could create new disturbance and disturb and hinder the progress of recovering areas but sensitive areas would be protected.

While RER and stream crossing analysis for Alternatives 2 and 3 shows an increase in sediment delivery values above background levels, the implementation of specific design criteria and BMPs would limit the potential for actual sediment delivery to a level that is little to no direct or indirect effects expected. Because of integrated project design features for roads, there is a potential for a long term net decrease in sediment of 2-3 tons/sq. mi./yr below that of background levels of the no action alternative following the implementation of the project. Because of the low potential for direct and indirect effects related to sediment from the project, there are also no expected cumulative effects to sediment from either of these alternatives.

Aquatic Species

The following section is summarized from the Aquatic Species Report, which is located in the Jackson project file at the Paulina Ranger District, Prineville, OR.

Affected Environment

Management Indicator Species (MIS)

Ochoco National Forest LRMP - Brook and Rainbow Trout

Fish species identified as management indicator species are listed in the FEIS for the Forest Plan. These species are rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). In the past, these fish have been stocked by the Oregon Department of Fish and Wildlife (ODFW) on the Ochoco National Forest. However, there are no known records of brook trout stocking that occurred

in the Deep Creek watershed. Rainbow trout are no longer stocked in streams in the Jackson Planning Area but naturally reproduce in many streams.

Sensitive Species

Effects to the following sensitive aquatic species will not be discussed in this document because there are no known populations or habitat in the Jackson project area. For more information, refer to the Aquatic Species report in the Jackson project file, Paulina Ranger District, Prineville, Oregon.

1. West-slope cutthroat trout

West-slope cutthroat trout, *Oncorhynchus clarki lewisi*, may occur southeast of Paulina Ranger District in the John Day basin. There are no known populations or habitat in the Jackson Planning Area (ODFW 1996). No further evaluation will be discussed.

2. Mid-Columbia River spring chinook salmon

Mid-Columbia River spring Chinook salmon, *Oncorhynchus tshawytscha*, or habitats are not known to occur in the Jackson Planning Area. No further evaluation will be discussed.

3. Pristine springsnail

The pristine springsnail, *Pristinicola hemphilli* is not known to be located in Crook or Wheeler Counties. The pristine springsnail will not be discussed further.

4. Shortface lanx

The shortface lanx *Fisherola nuttalli*, is not known to be located in project area. Found in cold, unpolluted, well-oxygenated, permanent medium-sized streams to large rivers, at least 30 meters and up to 100 meters wide. Habitats are cobble-boulder diatom covered substrate in the main channels, or close to fast-flowing water (rapids), often co-occurring with *Fluminicola columbiana* (Neitzel and Frest 1989, 1990). Medium sized streams to large rivers (30 to 100 meters wide) are not present in the Jackson project area. The shortface lanx will not be discussed further.

Redband trout (R6 Sensitive)

The Jackson project area contains populations of redband trout in Class I and II streams such as Deep, Crazy, Jackson, Little Summit, Double Corral, and Happy Camp Creeks. Redband trout (*Oncorhynchus mykiss*) is the only salmonid species known to occur within the project area. Modification to fish habitat, as well as loss of fish habitat, have had an effect on redband trout density and condition within the project area. Redband trout occur within the Jackson project area. Riparian Management Objectives (RMOs) used in this analysis define redband trout habitat (Table 66).

Columbia spotted frog (R6 Sensitive, ESA Candidate)

The Jackson project area contains populations of Columbia spotted frogs (CSF). Stream surveys have identified CSF in Deep, Crazy, Jackson, Little Summit, Double Corral, and Happy Camp Creeks (USDA 2010). Additional habitat exists although formal surveys have not been completed. Spotted frog habitat would be protected in Alternatives 2 and 3 through Riparian Management Objectives determined for RHCAs for redband trout and the project design criteria (PDCs) in the Programmatic Biological Assessment (USDA/USDI 2010-2013).

Essential Fish Habitat

Magnuson-Stevens Fishery Conservation and Management Act Public Law 94-265

The Pacific Fishery Management Council designated EFH (Essential Fish Habitat) for chinook salmon on September 27, 2000. This designation included current and some historic habitat in the Deschutes Basin. Historical habitat above Pelton Round Butte Dam was included. For the Ochoco

National Forest, EFH is not included above Bowman Dam (built in 1961) that is a migration barrier. The Jackson Planning Area is located above Bowman Dam on Prineville Reservoir. No further evaluation of EFH will be discussed.

Threatened and Endangered Species

Endangered Species Act 1973

This Biological Evaluation (BE) documents possible effects of proposed activities on threatened and endangered species in the project area. There are no endangered species known or suspected to occur on the Ochoco National Forest. Threatened aquatic species that are known or suspected to occur on the Ochoco National Forest include bull trout and mid-Columbia River steelhead trout. Potential effects to these species were analyzed and the analysis is summarized in this Biological Evaluation. This project would have no effect to bull trout or mid-Columbia River steelhead trout. Consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service is not applicable for the Jackson project area.

Threatened Species – Not Discussed Further

Two aquatic species are federally listed threatened and known to occur on the Ochoco National Forest and Crooked River National Grassland. These species are: bull trout, *Salvelinus confluentus*, and Mid-Columbia River steelhead trout, *Oncorhynchus mykiss ssp*.

Anadromous fish currently are not present in the project area due to downstream blockages at dams that do not provide fish passage facilities. Dams that block fish passage include: Opal Springs Dam constructed in 1921 and Bowman Dam in 1962. Stocks of summer steelhead *may* have occurred in the Jackson project area before dams were built on the Deschutes River and the Crooked River but there are no known records of anadromy within the watersehd. Consultation with National Oceanic and Atmospheric Administration (NOAA) is not applicable. In the spring of 2008, steelhead trout were reintroduced into the Crooked River and Ochoco Creek on private land and on Lookout Mountain Ranger District in McKay Creek. Again, Bowman Dam does not have fish passage facilities and blocks migration to this project area.

Bull trout are known to occur in Whychus (formerly called Squaw) Creek on the Crooked River National Grassland. There are no bull trout or habitat in the Jackson project area. Consultation with the U.S. Fish and Wildlife Service (USFWS) is not applicable. Mid-Columbia River steelhead trout and bull trout are not discussed further.

PACFISH

PACFISH (1994) provides interim direction to protect habitat and populations of anadromous fish habitat in eastern Oregon, eastern Washington, Idaho, western Montana, and portions of Nevada. There are no anadromous fish species or habitat in the Jackson project area. No further evaluation will be discussed as PACFISH does not apply to the Jackson project area.

INFISH

INFISH (USDA 1995) provides direction to protect habitat and populations of resident native fish outside of anadromous fish habitat and is applicable to the Jackson project area. The INFISH delineated Riparian Habitat Conservation Areas (RHCAs) where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. These RHCAs include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems. These areas would be managed to maintain or restore water quality, stream channel integrity, channel processes, sediment regimes, in stream flows, diversity and productivity of plant communities in riparian zones, and riparian and aquatic habitats to foster unique genetic fish stocks that evolved within the specific region. RHCAs run through and are

overlaid on other allocations. For the Jackson project area, INFISH provides protection for redband trout.

Riparian Habitat Conservation Areas (RHCA)

For streams, the width of an RCHA is determined by whether it is fish-bearing, perennial or intermittent. There are estimated to be 5,661 acres of RHCAs in the project area. In addition to streams, RHCAs also occur around ponds, lakes, reservoirs, wetlands, landslides, and landslide-prone areas. RHCAs for these areas have not been mapped and are not included in the estimated acres of RHCAs in the project area. As noted in the design criteria in Chapter 2, seeps, springs, and landslide areas would have RHCAs around them with restrictions as described in INFISH.

Category I streams are fish bearing, perennially flowing streams (Class I and II streams) with RHCAs extending 300 feet slope distance from the stream channel (600 feet wide), including both sides of the stream channel. There are approximately 21 miles of Category I stream in the Jackson project area. The RHCAs for the Category I streams encompass 1,348 acres.

Category II streams are non-fish bearing, perennially flowing streams (Class III streams) with RHCAs extending 150 feet slope distance from the stream channel (300 feet wide), including both sides of the stream channel. There are approximately 34.2 miles of Category II streams in the Jackson project area. The RHCAs for the Category II streams encompass 2,282 acres.

Category III RHCAs are located along ponds, lakes, reservoirs, and wetlands greater than one acre (possibly fish-bearing) with RHCA buffer area extending 150 feet slope distance from the water. Category III RHCAs are 300 feet wide including both sides of the stream channel. There are approximately 19.8 miles of Category III streams in the Jackson project area. The RHCAs for the streams encompass 759 acres.

Category IV streams are seasonally flowing or intermittent streams (Class IV streams) and wetlands less than one acre and have RHCAs extending 50 feet slope distance for the water. Category IV RHCAs are 100 feet wide including both sides of the channel. There are approximately 100 miles of Category IV streams that encompass approximately 1,272 acres of RHCA in the Jackson project area.

Riparian Management Objectives (RMO)

INFISH established landscape-scale interim Riparian Management Objectives (TM1b INFISH p. A-7) that will be applied to watersheds with inland native fish. INFISH recognized that in many cases interim Riparian Management Objectives will not be met instantaneously, but will be achieved over time (INFISH A-2). There are no Riparian Management Objectives that specifically address riparian vegetation; however, riparian vegetation does affect pool frequency, water temperature, large woody debris (LWD), width-to-depth ratios, and bank stability. All habitat features described in the interim Riparian Management Objectives are inter-related.

Table 66. Riparian Management Objectives applicable to the Jackson Project (INFISH 1995).

Habitat Feature	Interim Objective
water temperature	No measurable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period).
large woody debris (forested systems)	See Table 68: Natural amounts of large, woody material in the Blue Mountains
pool frequency (all systems)	See Table 67: Spacing between pools by channel type
bank stability (non-forest systems)	>80 percent stable banks (*Jackson planning area is a forested system)*

lower bank angle (non-forested systems)	>75 percent of banks with >90 degree angle (i.e., undercut) (*Jackson planning area is a forested system)*
width/depth ratio (all systems)	<10, mean wetted width divided by mean depth See Table 69: Width/depth ratio by channel type

Riparian Management Objectives for Redband Trout

Riparian Management Objectives (RMOs) describing good habitat were developed to describe desired condition for fish habitat. RMOs have been refined to better reflect conditions that are attainable in the Jackson project area. To meet RMOs, implementation of projects are designed to not "retard" the rate of recovery of habitat (INFISH p. A-6). Tables 67, 68 and 69 describe the habitat feature standards for pool frequency, water temperature, large woody debris, bank stability, lower bank angle, width/depth ratio, spacing of pools, and large wood.

Table 67. Spacing between pools by channel type (Rosgen 1996).

Channel Type	Channel Slope	Spacing Between Pools X Bankfull Widths
A	0.04 - 0.10	3.5 - 4.0
A	0.10+	1.5 - 2.0
B	0.02 - 0.04	4.0 - 6.0
C	0.001 - 0.02	5.0 - 7.0
E	<0.02	5.0 - 7.0

Table 68. Natural amounts of large, woody material in the Blue Mountains (Cordova 1995).

	Number of pieces per 100 feet		
Large Woody Material Size	**Channel Type A**	**Channel Type B**	**Channel Type C**
>21 inches dbh, >35 feet long	0.4	0.6	0.8
>12 inches dbh, >35 feet long	1.5	1.3	1.7
>6 inches dbh, >35 feet long	3.4	3.4	4.5

Table 69. Width to Depth Ratio by Stream Type (Rosgen; Silvey 1998)

Width/Depth Ratio	A	B	C	D	DA	E	F	G
	<12	>12	>12	>40	<40	<12	>12	<12

Existing Condition of Streams

Historically, the Jackson project area provided higher quality aquatic habitat than it does today. Over-time, channel alterations have occurred resulting in a loss of quality pools, spawning gravel, cold-water refugia, back-water rearing areas and hydrologic function. Riparian vegetation has been altered on most streams through direct impacts or indirectly through the loss of soil moisture retention characteristics. Thus, the current types of densities of riparian vegetation lack the same capacity as historic vegetation to control bank stability, maintain channel stability, supply woody debris to streams and provide shade. Historically, streams in this area were once populated with aspen, willow, black cottonwood, red osier and dogwood. Today, forested riparian areas are dominated by coniferous tree species in their overstories and vegetative structure is dominated by the small tree category (9-20.9" dbh). Riparian shrubs such as willow and alder are present, however their distribution is widely scattered and localized. Other shrub species, such as snowberry and serviceberry can be found. However, most shrubs show signs of heavy pressure from browsing animals. Meadow systems are dominated by grasses and forbs, with some areas having sedges and rushes along their wetted edge.

Across the project area, the Forest standard of 80 percent surface shade is not being met. Currently, an average of only 3 percent of the existing riparian shade is contributed by deciduous shrubs (ONF 2011). Riparian vegetative potential (and associated stream shade) is assumed to be much greater than what currently exists.

With the advent of effective organized fire suppression, natural fire return intervals have been greatly increased, resulting in higher vegetation densities. Riparian areas exhibit high stocking densities above historic levels within the watershed. During the summer months, warmer temperatures reduce fuel moistures and increase the chance of large scale stand replacement fire. Drainages with north aspects have denser vegetation and a higher moisture regime than southern aspects.

Factors contributing to changes in riparian vegetation communities with the Jackson project area include timber harvest, road building, fire suppression, reduction in beaver activity, and livestock grazing.

Channel morphology and condition data for streams in the watershed are presented in Table 70. Limited data of stream channel conditions makes it difficult to establish trends for most habitat parameters. Still, the Ochoco National Forest has conducted Bottom Line Surveys (BLS), Level II Surveys, and other stream inventories or surveys in the major drainages on Forest Service lands. Survey data provides comparative information on parameters such as width/depth ratios, entrenchment, shade, cut banks, woody debris and pools by channel type.

Channel typing was based on the Rosgen stream classification system and is widely used for this purpose because it permits easy communication of channel characteristics and provides a method for interpretation of channel development and stability (Rosgen, 1996). In general terms, A-type channels are relatively steep, straight, and narrow (e.g. mountain stream), B-type channels are transitional between the A and C-type channels, and C-type channels are relatively low-gradient, with wide meanders in larger floodplain areas. E-type channels tend to be relatively narrow and deep while meandering even more than C-type channels. F and G-type channels are generally degraded channel forms that can roughly be described as troughs and gullies, respectively; refer to Figure 23.

Table 70. Stream channel survey data on drainages in the Jackson Project area

Reach	Class	Miles	Channel Type	LWD/ Per Mile	LWD per 100' (>0.38)	LWD/ mile all size classes	Cutbank %	Shade %	Width to Depth (<10)	Avg. BFW/Avg. BFD	Pools per 100 feet (1.8)	Pools / mile
Deep 1999 (Level II)												
1	I	1.6	C	8.4	**0.16**	21.40	7.6	**30**(100%)	**23.6**	44.4	**0.1**	6.49
2	I	2.1	B	2.5	**0.05**	8.0	0.1	**40**(80%)	**20.5**	32.5	**0.0**	2.49
3	I	1.9	B	9.0	**0.17**	23.2	0.3	**44**(80%)	**17.9**	38.6	**0.0**	1.58
4	I	2.5	B	7.5	**0.14**	33.1	N/A	**42**(80%)	**26.9**	23.4	**0.1**	5.5
1	I	1.6	C	8.4	**0.16**	21.40	7.6	**30**(100%)	**23.6**	44.4	**0.1**	6.49
Little Summit 2010 (Level II)												
1	I	1.7	B	13.11	**0.25**	28.96	3.4	**44.8**(80%)	N/A	23.6	**0.5**	26.78
2	I	2.6	C/E	4.87	**0.09**	41.88	8.59	**25.7**(80%)	N/A	**11.1**	**1.0**	51.3
Jackson Creek 2010 (Level II)												
1	I	2.4	C	25	0.47	74.6	6.325	**29.2**(80%)	N/A	33.4	**0.3**	13.71
2	I	2	C	20.2	0.38	84.14	10.9	**33.2**(80%)	N/A	28.8	**0.3**	16.83
3	I	1.6	C	16.75	**0.32**	88.32	10.5	**19.4**(80%)	N/A	18.5	1.4	71.57
4	I	1.5	E	5.97	**0.11**	27.61	6.905	**42.2**(80%)	N/A	11.5	**0.6**	31.34
Crazy 2010 (Level II)												
1	I	1.9	B	20.09	0.38	33.49	1.98	**59.6**(80%)	N/A	40.6	**0.4**	21.53
2	I	1.7	C/E	11.32	**0.21**	21.38	17.87	**43** (100%)	N/A	22.9	**0.3**	16.98
Chamberlin 1994 (BLS)												
1	II	2.2			*1.6*		15.5	**53**	**15.3**		**0.4**	
E Fk Crazy 1994 (BLS)												
1	II	1.6			*1.0*		1.2	**59**	6.6		2.0	
2	IV	0.7			*1.5*		1.6	**38**	4.9		**0**	
W Fk Crazy 1994 (BLS)												
1	II	1.7			*1.7*		5.2	**46**	8.6		1.8	
2	III	1.1			*1.6*		**24.6**	**36**	5.0		**0.1**	
Thorton 1994 (BLS)												
1	II	0.6			*1.2*		**27.7**	**17**	12		2.8	
2	II	0.7			*6.1*		10.1	**28**	8.8		4.1	
3	II	1.1			*1.5*		14.0	**49**	**19.0**		**0**	
4	II	0.7			*3.6*		4.6	**49**	8.9		**0**	
5	II	1.7			*2.5*		11.6	**15**	5.1		**0.5**	
6	III	1.5			*1.0*		17.9	**64**	**12.8**		**0**	
Happy Camp 1992 (BLS)												
1	II	1.1			*1.25*		0	**53**	**11.0**		**1.4**	
2	II	1.6			*1.13*		3	**39**	10.0		**1.3**	
3	II	0.9			*0.44*		8	**18**	7.9		**1.2**	
4	II	3.2			*0.78*		15	**32**	8.3		**1.7**	
5	IV	1.1			*0.48*		19	**45**	**16.5**		**1.4**	
Double Corral 1994 (BLS)												
1	II	2.8			*3.0*		**20.5**	**33.4**	9.9		3.5	
2	II	2.5			*0.5*		15.5	**17.0**	9.0		**1.6**	
Toggle 1998 (BLS, some Level II)												
1	II	0.8			*1.1*		6.0	**31.1**	**14.0**		**1.1**	
2	II	1.9			***0.21***		17.2	**19.1**	**11.2**		**1.4**	
3	II	1.3			*0.73*		7.6	**22.5**	9.6		**1.4**	
4	IV	1.9			*0.54*		13.6	**18.2**	**20.7**		**1.2**	

*values highlighted in bold do not meet FP standard.

Redband Trout and Columbia Spotted Frog Habitat Features

Affected Environment

The following is a discussion on redband trout, Columbia spotted frog, and their habitat. Habitat features discussed for redband trout and Columbia spotted frog include, stream substrate, water temperature, large woody debris (LWD), bank stability, and width-to-depth ratio that could be affected by proposed treatments. This section identifies and describes analysis measures, provides context through description of affected environment and documents existing and desired conditions.

Status of redband populations, habitat requirements and factors affecting populations

Approximately 75 miles of perennial streams exist in the watershed; approximately 60 miles contain resident fish populations. There are no documented historical or anecdotal accounts of anadromy within the watershed. The lower and upper falls of the North Fork Crooked River are considered impassable to migrating steelhead trout and Chinook salmon. Bowman Dam currently prohibits the migration of steelhead and salmon to the upper Crooked river basin. Redband trout, sculpins, speckled and longnose dace are the fish species found within the watershed. The majority of fish habitat in the Deep Creek Watershed is in Deep, Happy Camp, Jackson and Little Summit Prairie Creeks (ODFW 1996).Table 71 lists the lengths of streams by stream class I and II within the project area.

Table 71 Stream class by subwatershed in the Jackson Planning Area.

Subwatersheds	Stream Class (Miles)				Total Miles
	1	2	3	4	
Crazy Creek-Deep Creek	7.9	6.1	11.7	20.5	46.3
Jackson Creek	6.7	17.9	4.7	40.1	69.4
Little Summit Prairie Creek	6.4	10.1	3.4	39.1	59.1
Total Miles	21.0	34.2	19.8	99.8	174.8

The perennial streams equate to Forest Service Class I through Class III streams. Class I and II streams may be intermittent if they are used by fish part of the year. During dry years, the lower reaches of several streams may go spatially intermittent prior to entering Deep Creek.

Most of the resident salmonid habitat in the project area can be categorized as low gradient (<4%) or moderate gradient (<6%) Rosgen (Rosgen 1996) A, B, C and E stream types. With the exception of Deep and Lower Jackson Creeks (15-25 feet wide), project area streams are 10-15 feet wide at their widest and decrease in size in headwater areas where three foot wide stream channels would be common. Smaller streams provide important habitat for rearing juvenile salmonids. Smaller streams with functioning ecological processes are often disproportionally important as related to the persistence of sensitive cold-water fish (Rosenfeld and Hatfield, 2006; Rosenfeld, Porter, and Parkinson, 2000).

Existing redband trout population information for the project area includes an ODFW study (see below), presence/absence surveys (USDA 1992, 1994, 1998, 1998, 1999 and 2010) by Forest Service personnel and a study conducted by (Stuart et al. 2007). Some population data has been collected or synthesized by Stuart et al. (2007) and is presented below. In 1997, ODFW initiated a redband trout study to assess population condition and migratory behavioral patterns and was implemented throughout the Deep Watershed and is currently ongoing (Grover and Hodgson 1999). Data collection for the study has continued biannually from 1999 through 2009 (ODFW 1999, 2001, 2003). Data from recent surveys (after 2003) has yet to be incorporated into a report (personal communication M. Harrington (ODFW), 2011). Preliminary population estimates show Deep Creek, Little Summit Creek, Happy Camp Creek and Double Corral Creek to have higher densities of individuals. Due to low tag retention levels, seasonal migration data suggest redband movement to be very little or after

seasonal spawning migrations occur. Also, adult fish may return to the same resident pools (ODFW 2003).

Historically, redband trout may have occupied more aquatic habitat within the watershed than presently. This further increases risk for localized extinctions and can limit the long-term sustainability of these native trout populations. As described in the 2010 Deep Creek Watershed Analysis Update, modification to fish habitat as well as loss of fish habitat have had an effect on redband trout density and condition within the project area (USDA 2010); streams within the watershed that have been affected by management activities, tend to be warmer, have less pools and habitat complexity, and become intermittent sooner in the summer. The quality and quantity of stream habitat has been degraded. Surveys also indicate that redband trout utilize intermittent streams when they have water, and fish readily recolonize those habitats when water re-occurs. During drought years or periods of exceptionally hot weather an entire year's juvenile production may be lost in some streams.

Channel stability and the ability of the channel to transport the flows and sediment of its watershed effectively is another important component of quality salmonid habitat. Today, much of the historic spawning habitat has been lost due to sedimentation from past activities in RHCAs; reference Environmental Consequences—Cumulative Effects and Existing Condition discussion below. Excessive bank erosion, due to accelerated lateral (side to side) channel migration may increase sedimentation. Substrate (gravel) embeddedness would decrease if there was an increase in vegetation that could filter sedimentation. With less embeddedness (fine sediment in substrates), spawning success could potentially increase. In many project area streams, segments lack riparian shrubs and shade, are dominated by early seral vegetation, and have numerous headcuts. Riparian vegetation needs to improve in the open areas to improve bank stability and reduce sedimentation; reference cumulative effects discussion, measure 1).

Where habitat is in relatively good condition, with cool water temperatures and good riparian and instream conditions, redband populations exhibit a mixture of age classes and comprise a bulk of the fish populations. Tributaries which exhibit poorer riparian and instream conditions have a higher proportion of non-game fish species, particularly dace. Those streams that exhibit the best remaining habitat and provide the coolest waters have become disproportionately important for the viability of healthy redband populations in the watershed.

Redband trout populations are currently depressed reflecting degraded habitat conditions within the Jackson Planning Area. However, existing populations are generally in fair condition, based on age distribution and condition factors (ODFW 1996). As described above, degradation of instream habitats are likely reasons for past decreases in salmonid production. Additional threats to the Redband trout are expansion of warm water tolerant species and reduced range of this sensitive species. Still, Deep Creek watershed represents the most interconnected habitat for redband trout in the Upper Crooked Basin.

Measure 1 addresses direct effects to fish and frogs including physical interaction at stream crossings and thinning operations within RHCAs *and* indirect effects to fish and frogs from sediment delivery via proposed actions. Specific actions that have the potential to deliver sediment to stream systems include a combination of commercial harvest, prescribed fire, roads and stream crossings including activities in RHCAs associated with the project. Sediment delivered to stream systems can translate to increased suspended sediment and turbidity that can affect aquatic life. Fine sediments in streams can also degrade channel form; these potential effects are addressed in Measures 4 and 5.

Indirect effects include potential sediment delivery to streams that are inhabited by fish and frogs from overland flow during and after harvest activities and associated temporary road construction, road utilization and stream crossings. Increases in fine sediment in streams can negatively affect salmonids and other aquatic biota (Meehan, 1991; Rhodes et al., 1994). The extent to which hillslope

and riparian soils are disturbed and mobilized to the stream channel can decrease the survival of incubating salmonid eggs (Reiser and White 1990). Elevated turbidity and suspended sediment levels can impair sight feeding by fish and, at higher levels, causes gill damage in fish (Rhodes et al., 1994). Gravel embeddedness of less than 20% is essential to maintain healthy salmonid population, especially in those areas identified as potential or existing spawning areas (Bjorn and Reiser 1991). If sediment exceeds 20%, the spaces between the rocks in the substrate can be filled leading to less available oxygen for fish eggs. Also, changes in timing or peak flow magnitudes may scour redds or embed them.

The majority of sediment from timber harvest activities is related to roads and road construction (Chamberlin and others 1991; Megahan and Hornbeck 2000) and associated increased erosion rates (Beschta 1978; Meehan 1991; Rhodes and others 1994). Serious degradation of aquatic habitat can result from poorly designed, constructed, or maintained roads (Furniss and others 1991; MacDonald and others 1991; Rhodes and others 1994). Road networks interact with stream networks and lake basins at the landscape scale and affect biological and ecological processes in stream and riparian systems (USDA 2010). Roads and associated ditch systems increase watershed drainage networks, intercept overland flow, and shift timing of peak flows. During precipitation events, fine sediments can be washed from the road surface into streams. This is especially true for poorly maintained roads. Roads constructed in close proximity to streams constrain the stream channel and eliminate the stream's access to its floodplain. Sediment delivery is analyzed in hydrologist report.

Prescribed burning has the potential to cause some short-term adverse effects on salmonids and their habitats. However, it is reasonably certain that individual fish behavior would not be affected directly by the patchy low-intensity fires caused by low to moderate behavior prescribed fires (Minshall and Brock 1991). Recent research (Beche, et al., 2005) indicates that fuels management in riparian areas can produce short-term (within the year) changes in water chemistry, macroinvertebrate composition and decreases in periphyton. These changes are unlikely to pose major threats to aquatic species because of the limited sizes of prescriptive burns, their short duration and low intensities (NMFS 2007). In a recent study, (Arkle and Pilliod 2010) found no detectable changes in periphyton, macroinvertebrates, amphibians, fish and riparian and stream habitats when comparing burned and unburned controls three years after a prescribed fire treatment.

Streams that have the following characteristics are the most sensitive to increases in fine sediment: steep terrain, granitic geology, significant mass erosion, snow melt dominated hydrology, relatively arid climates, low gradient streams, and low frequency of large woody debris (Everest et al., 1987). Habitat for redband trout in the planning area, has several of these characteristics, primarily the latter, and therefore, may be, generally more susceptible to increases in fine sediment. Similarly, potential negative effects of mechanized fuels treatments may be worse in areas where riparian conditions are already degraded by a variety of past and ongoing activities including grazing, logging, and roads (Leopold 1937;, USFS et al; Henjum et al; Moyle, 1996a; b; Espinosa et al., 1997; NRC, 1996; 2002; and Beschta et al 2004). Habitat degradation has also compromised the ability of riparian areas to buffer the effects of upslope disturbance (Rhodes et al 1994). Dwire et al in (USDA 2010), notes the lingering effects of land management prior to the establishment of buffers are likely to influence the structure and composition of riparian areas for decades to centuries (Young and others 1994). Legacies of past management within watersheds could potentially confound responses to fuel reduction treatments (USDA 2010).

Existing Condition (fine sediment in project area streams)

Cobble embeddedness is a filling of the interstitial spaces of stream bed materials with fine sediment. As exhibited by surveys conducted in 2010, fine sediment varies tremendously across the watershed and even within streams. Lows of 5% fine sediment and highs of 75% show that variability. In Deep Creek, bedload data shows fine sediment (particle sizes < 2 mm) making up 40 percent of the desired

spawning material (gravels); reference Aquatic Species Report. Average % fines <2mm were recently analyzed for several major tributaries in the project area: see below.

Sediment (embeddedness) is not identified in the RMOs for INFISH but is an important habitat feature for fish and is defined as an Ochoco National Forest Plan Monitoring Action (ONFLRMP section 5-3). For purposes of this analysis (same as used in ONF MIS analysis), average % fines <2mm, is being used as a surrogate for % embeddedness. The National Marine Fisheries Service (NFMS) defines a range of sediment relative to functional categories (Properly Functioning, Functional at risk and Nonfunctional) for use in analysis of effects to salmon and steelhead trout[6]. Though the project area does not contain T&E species (salmon or steelhead trout), these 'thresholds' provide a useful surrogate for effects to redband trout. When comparing the most recent (2010) survey data (Wolman pebble count) referenced above on some of the major tributaries in the project area, Jackson Creek (18.3%) and Crazy Creek (15%) would rate as Functional –At – Risk and Little Summit Creek (27.1%) would rate as Not - Properly - Functioning.

Table 72. Matrix of pathways and indicators for sediment in the Jackson project area.

PROPERLY FUNCTIONING	AT RISK	NOT PROPERLY FUNCTIONING
< 12% fines (<0.85mm) in gravel, turbidity low	12-20% fines, turbidity moderate	>20% fines at surface or depth in spawning habitat, turbidity high

Pacfish/Infish Biological Monitoring (PIBO) data (Table 73), on Little Summit Creek (the only PIBO site in the Deep Creek Watershed), indicates that average % fines <2mm is moderate (6.54%). It is important to note that these data were the result of a single survey in a single location. The same survey recorded streambank stability to be nearly 100% up from 84% in 2001. However, this survey reach, or portions of, may be located in an exclosure, i.e., not accessible to potential effects of livestock and not reflective of general stream conditions in the project area. In addition, bank stability measured on a portion of project area streams is rated as relatively stable (91%) and approaching a properly functioning condition.

Table 73 PIBO monitoring data on streams within Deep Creek 5th field WA.

Stream	Yr	HUCNUM6	WDRif	PlFn2 (average % fines)	Stab	LWfreq	LWvol
Little Summit	2001	170703040402	19.6		84.09	34.2	137.89
Little Summit	2006	170703040402	20.84	**6.54**	100	76.9	102.69
Little Summit	2006	170703040402			95.24	57.4	107.34

Water Temperature and Stream Shade

Temperatures of 60 degrees F are considered ideal for rapid growth of rainbow trout (Leitritz and Lewis 1980). For the Jackson project area, water temperatures are above 60 degrees F during the hottest time of the year (July and August) and are below 56 degrees F during the cooler months of October to March prior to fish spawning. Females are most productive when they are in water where temperatures do not exceed 56 degrees F for six months before spawning (Leitritz and Lewis 1980). It is generally understood that inland rainbow (redband) trout are most successful in habitats with temperatures of 70 degrees or slightly lower, but can survive if there is cooler, well-oxygenated water into which they can retreat as the surface waters warm over 70 degrees F. Water temperatures of 70 degrees F or higher, except under otherwise ideal conditions may cause stress to fish, which may lead to disease or in some cases death for all age categories.

[6] NFMS uses 0.85mm to define fine sediment.

Regular monitoring of stream temperatures during the past decade in the Jackson project area has established that summer maximum water temperatures exceed the statutory standard of the State of Oregon in Deep Creek, Crazy Creek, East Fork Crazy Creek, West Fork Crazy Creek, Little Summit Creek, Happy Camp Creek, Jackson Creek, Double Corral Creek, Toggle Creek, and Derr Creek (Table 75). The Oregon DEQ stipulates that, for support of resident fish, the average of the daily maximum stream temperature during any seven consecutive days shall not exceed 64°F (ODEQ 1995). Furthermore, the average of the daily maximum stream temperature during any seven consecutive days shall not exceed 55°F in times of spawning and shall not exceed 50°F in waters that support bull trout *(Salvelinus confluentus*). The seven-day means of the daily maximum stream temperatures in the named streams (Table 75) have consistently surpassed the 64°F standard. (http://www.deq.state.or.us/wq/assessment/rpt2010/results303d10.asp)

The temperatures in the INFISH Interim Riparian Management Objectives are based on bull trout presence or potential. The Ochoco National Forest has incorporated design criteria to not measurably increase the 7-day moving average daily maximum water temperature on any adult holding habitat or spawning or rearing habitats in the planning area based on these interim RMOs. The state water quality standards more accurately reflect attainable conditions and target species (redband trout) found in the project area. The state standards (340-041-0028, approved by EPA Mar 2004) say the seven-day-average maximum temperature of streams identified as having salmon and trout rearing and migration should not exceed 18.0ºC (64.4ºF). The state of Oregon assumes that waters meeting this standard would provide water temperatures suitable for redband trout spawning.

Stream surveys and fish sampling (ODFW and USFS) have confirmed that redband trout are the only salmonid currently present in the watershed. The Oregon Department of Environmental Quality did not identify any bull trout habitat in the planning area. Even though streams in the Deep Creek watershed are not required to meet the state steelhead spawning standards, it appears streams that are meeting the 18.0ºC (64.4ºF) threshold should be meeting the spawning threshold (13.0ºC (55.4ºF) between January 1 and May 15). Water temperatures over the 18.0ºC (64.4ºF) threshold are not to be increased further except in accordance with Water Quality Standards direction. As a surrogate for stream temperature, stream shade can be a useful indicator. The Ochoco LRMP (1991) requires that shade along streams would generally correspond to provisions for more than 80% of the surface shaded. Where this cannot be attained, 100% of the potential for shade is the standard.

Natural channel stability is achieved by allowing stream systems to develop a stable dimension, pattern, and profile such that, over time, channel features are maintained and the stream system neither aggrades nor degrades (Rosgen, 1996). Many stream channels within the Deep Creek watershed have lost stable dimension, pattern, and profile and are now wide and shallow; reference Deep Creek Water Quality Restoration Plan (Deep WQRP 2004). It has been shown that channels with greater surface areas (high width to depth ratios) would heat faster than streams that are narrower and deeper (Brown 1972).

Ten streams within the Deep Creek watershed are on Oregon DEQ's 303(d) list due to elevated summer water temperature (Table 74). All water quality limited streams within the Deep Creek Watershed are perennial, fish-bearing streams and provide habitat for redband trout and other resident species. Degradation of instream habitat resulting from high road densities, overstory tree removal, livestock grazing, and recreational fishery management are reasons for decline in salmonid production (Deep WQRP 2004 and Deep WA 2010). Elevated stream temperatures in the project area are likely a result of altered habitat parameters discussed in the Deep Creek Watershed Analyses (1999 & 2010), Deep WQRP 2004 and continual habitat inventory and monitoring data (USFS 1994-2010).

Table 74. 303(d) Listed Streams in the Jackson Project Area.

Location	Listing Parameter	Segment
Deep Creek	Temperature and Habitat Modification	Mouth to Headwaters
Crazy Creek	Temperature and Habitat Modification	Mouth to Headwaters
East Fork Crazy Creek	Temperature and Habitat Modification	Mouth to Headwaters
West Fork Crazy Creek	Temperature and Habitat Modification	Mouth to Headwaters
Little Summit Creek	Temperature and Habitat Modification	Mouth to Headwaters
Happy Camp Creek	Temperature and Habitat Modification	Mouth to Headwaters
Jackson Creek	Temperature and Habitat Modification	Mouth to Headwaters
Double Corral Creek	Temperature and Habitat Modification	Mouth to Headwaters
Toggle Creek	Temperature	Mouth to Headwaters
Derr Creek	Temperature	Mouth to Headwaters

Table 75 shows the 7 day average maximum water temperatures for stations in the Jackson project area measured from 1995 through 2008. Water temperatures over threshold are indicated by bold lettering. Water temperatures from 1995 through 2008 are on file at the Paulina Ranger District.

Table 75. 7 Day Average Max. Water Temperatures (℃) 1995-2008 for streams in the Jackson project area.

Stream Name	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2007	2008
Crazy					**20.8**			**29.0**					
Deep	**23.0**	**23.8**	**23.3**		**23.3**	**25.4**	**21.4**	**20.7**	**38.1**	**19.4**	**20.2**		
Derr				**23.1**	**22.2**		**18.4**	**24.6**					
Double Corral					**24.4**			**25.8**					
East Fork Crazy				16.3									
Happy Camp				**23.3**	**20.3**	**24.8**		**22.6**		**28.7**	**28.1**	**24.4**	**21.1**
Haypress					**22.1**		**24.5**						
Jackson				**21.6**	**25.0**	**24.1**		**37.9**		16.2		**19.1**	**23.4**
Little Summit	**21.8**	**20.9**	**19.8**	**22.2**	**29.8**	**21.3**		**21.8**		**21.4**	**30.4**	**22.6**	**19.9**
Toggle				**21.7**	**22.9**				**22.2**		**25.9**		

*yellow indicates, potential inaccuracy with data, e.g., thermistor found dry, repositioned, etc.

PacFish/InFish Biological Opinion (PIBO) monitoring trend data indicate that temperature is relatively constant over the monitoring period and that the number of days the weekly maximum temperature greater than 18°C (WMT18) increased substantially over time (between 2001 and 2006) in Little Summit Creek. However, this is a very limited data set and factors that might affect temperature on any given year are not readily available for the PIBO data, e.g., precipitation and climate data.

Table 76. PIBO temperature data for streams in the Deep Creek 5th Field watershed.

Stream	Year	Temp Days	WMT days	StartDate	EndDate	Avg. Temp	WMT 12	WMT 18	WMT 22
Little Summit	2001	48	42	15-Jul-01	31-Aug-01	12.07	42	**9**	0
Little Summit	2006	48	42	15-Jul-06	31-Aug-06	16.28	42	**36**	11

Most recent stream survey data show that the 80% Forest Standard for shade is not being met in the watershed (Table 77). Furthermore, small-diameter conifers provide most of the shade in the watershed with a much smaller degree of shade provided by shrubby, riparian vegetation. In non-forested riparian communities shade producing shrubs are sparse. Table 77 includes the most complete record of stream shade data for the planning area.

Table 77. Most recent shade and W/D ratio data for Class 1 and II streams in the Jackson project area.

Stream	Year	Class @ mouth	Stream Surveyed (Miles)	Shade/ 100' (%)	(Average) W/D Ratio (feet)
Deep	1999	I	6.6	38	20.7
Little Summit	2010	I	4.3	35.3	17.4
Jackson	2010	I	1.9	30.1	23.1
Chamberlain	1994	II	2.2	53	15.3
Crazy	2010	II	1.8	51.2	31.7
E. Fork Crazy	1994	II	2.3	48.5	5.8
W. Fork Crazy	1994	II	2.8	41	6.8
Thornton	1994	II	6.3	37	11.1
Happy Camp	1992	II	7.9	37.4	10.7
Double Corral	1994	II	5.3	25.2	9.5
Toggle	1998	II	5.9	22.7	13.9

Prolonged warming of stream water or high stream temperatures can be harmful to fish (Beschta et. al. 1987). Stream temperature affects egg development, rearing success, species composition, and migration (Beschta et. al. 1987). No measurable increase in water temperatures resulting from management practices are allowed in the Jackson project area under state water quality standards because Deep Creek and all major tributaries are on the State 303d list of Water Quality Limited Water Bodies for summer water temperature. The state standard is a floating 7-day maximum average of 18ºC (64.4°F). Water Temperature Standards were adopted by the Oregon Environmental Quality Commission (EQC) on December 9, 2003 and approved by EPA in March of 2004.

The water temperature criteria for natural lakes, oceans and bay, Borax Chub and cool water species was revised by the EQC in February 2007. Contributing to the increased water temperatures in the project area is the loss of shade and solar protection in the form of riparian vegetation such as willow, alder, and aspen. Loss of these important hardwood species also has negatively affected stream bank stability. Some riparian planting has occurred in recent years-see above and in cumulative effects discussion. Shrub survival, growth and development is challenging due to conifer cover, grazing by livestock and big game, and drop in water table heights.

The number and size of pools has a direct effect on water temperature as well. In a channel with a low number of pools, the ratio of surface area to volume of water is high, and water in the channel tends to heat and cool rapidly. This causes variations in daily temperatures as much as 15 to 20 degrees F. Pools increase the volume of water in the channel without markedly increasing the surface area, thus providing a buffer against wide swings in water temperatures. Generally, the project area streams are not meeting pool RMOs, see discussion below.

Approximately 56.2 miles (most recent survey) of stream have been surveyed in the project area, of which none of the streams surveyed meet the desired condition for total shade when averaged across the stream. Of the 11 streams surveyed hardwood shade values averaged 32%, less than half of the PACFISH/INFISH RMO.

Desired Condition

There is a need to manage vegetation to promote the growth of hardwoods (e.g., aspen, willow, alder) in riparian areas to increase the amount of stream shade. The desired condition for stream shade is to provide greater than 80 percent shaded surface, or 100 percent of the site potential (Forest Plan, p. 4-240).

Large Wood (number of large wood pieces/100')

Large woody material provides an important interaction with episodic disturbances creating aquatic habitats and shade for streams. Redband trout, like many other salmonids have evolved in stream systems in which large woody material helps retain organic and inorganic particulate matter that is important for channel stability, biological diversity and productivity (Nakamura and Swanson 1993). Large woody debris can influence habitat for fish and other aquatic organisms by serving as energy dissipaters, flow deflectors, and dams. These down trees also reduce grazing and browsing impacts on bank stability by reducing accessibility to the riparian vegetation. The amount of large woody material in forested streams would reflect differences in physical processes that shape valley floor landscapes and the succession of terrestrial plant communities on these geomorphic surfaces. Large woody material in streams and the adjacent flood plain provides streambank stability, decreases flow velocities, increases storage time (decreases downstream flood risk), stores sediment, and forms pools in the stream channel. The deep water of the pools lowers water temperature. Fish use pools for hiding cover from predators, to seek refuge in cooler water during the summer months and as resting areas while feeding. Typically, higher densities of LWD within the bankfull channel have led to increased pool frequency, cutbank protection and fish densities.

Levels of LWD are influenced by living, dead and dying trees within, and potentially outside, the riparian corridor. Trees with a height to distance from stream ratio of greater than one would directly influence the stream if they fall towards the stream channel. In western Oregon and Washington, the probability that a falling tree would enter the stream is low at distances greater than about one tree height away from the stream channel (McDade and others 1990; Van Sickle and Gregory 1990). Similarly, the effectiveness of upland forests to deliver large wood to riparian areas is expected to decline at distances greater than about one tree height from the upland forested edge and depends on steepness of slope. However, timber harvest adjacent to riparian buffers can eliminate large wood recruitment to the riparian area while increasing the potential for windthrow (Grizzel and Wolff 1998).

Approximately 56.2 miles (most recent survey) of stream have been surveyed in the project area. However, accurate LWD counts are only available for 23.5 miles of streams surveyed since 1996 because of a change in the way LWD is measured. Of the 23.5 miles of stream, 25% meet INFISH standards, none meet reference standards. Stream segments within the watershed that are currently meeting these standards include: portions of Deep Creek, Crazy Creek, W.F. Crazy Creek, Happy Camp Creek, Jackson Creek, Chaimberlain Creek, Little Summit Creek, and Thornton Creek.

Desired Condition

There is a need to manage vegetation to maintain and promote the growth of large trees in riparian areas to increase the amount of LWD. The desired condition for LWD is to provide > greater than 20 pieces/mile (0.38/100'); >12 inch diameter, 35 feet long (INFISH DN, p. A-4). Desired amounts, which are considerably higher, range from 1.8/100' in A channel types (see below) to 2.3/100' in C

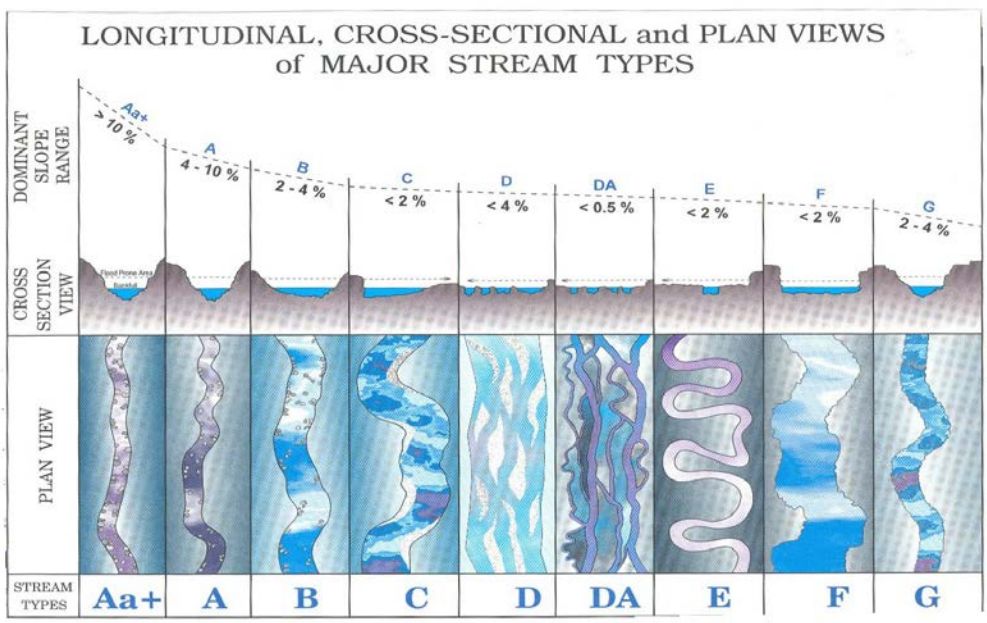
channel types (see below and Rosgen 1996). Desired amounts were determined from INFISH and a study of unmanaged, mixed conifer, Blue Mountain streams (Cordova 1995), Table 68.

Pool Frequency (pools/100') / Pool Quality/ Sediment

Large woody debris and beaver dams create slow water habitats, side-channels, and off-channel alcoves critical for winter fish rearing and amphibian breeding ponds. The frequency and area of pools is dependent on stream gradient and drainage area, generally as stream size (order) increases, pools become larger but more infrequent. In smaller order channels, large wood in the stream channel increases pool frequency (Montgomery and Buffington 1993). Pool depth and complexity is also a function of the abundance of woody debris and sediment routing. Large pulses of sediment moving through a stream system can restrict pool depth and ultimately limit habitat capability. The bankfull width/depth ratio, a primary indicator of channel dimension, is also directly related to both pool quantity and quality. An inverse relationship between width and pool spacing has been well documented by Rosgen (1996).

Pool densities within the Deep Creek watershed are variable, but are typically low as stream courses transition through different channel types (Figure 23). Channel types within the watershed such as A, C and E typically have higher pool frequencies (with narrower and deeper pools) due to their morphological dimension, pattern and profile. On the other hand, B stream types in the watershed support lateral scour pools associated with boulder/bedrock substrate, rootwads and LWD.

Figure 23. Rosgen Stream Type Characteristics



Across the Deep Creek watershed, pool densities are low (< 1.0 per 100') due to the increased W/D ratios and lack of LWD mentioned above. Stream survey data indicate that of the 56.2 miles of stream surveyed (most recent survey), nearly 86% do not meet the desired condition for pool frequency (INFISH standard); none meets reference standards. Exceptions include lower reaches of Thorton and parts of Crazy Creek, including the east and west forks. However, these streams were surveyed in the early 90's and may not be a reflection of current conditions. Previous stream survey data indicates that Deep Creek has exhibited a 30% loss of pool density over the past several decades as width/depth ratios have increased (Deep Watershed Analysis 2010). This trend is also evident in other stream segments across the watershed. Furthermore, past timber management activities removed some of the historic LWD that existed in many channels, which has led to further reduction of pool habitat and channel stability. Some restoration activities including LWD placement have been and are being

implemented including under the Deep Restoration EA (reference cumulative effects discussion in Environmental Consequences section below).

Desired Condition

There is a need to manage vegetation to maintain and promote the growth of large trees and reduce competing vegetation that would accelerate the recruitment of LWD and other riparian vegetation (See Measures 1: and 2: above). These actions would indirectly increase pool development in the long term, improve pool quality and trap and sort sediment. The desired condition varies by channel width (INFISH DN, p. A-4) and more recently by channel type (Table 67).

Streambank Condition (% stream bank stability, channel width-to-depth ratio)

Although the Jackson project area is generally a forested system, bank stability is an important habitat feature for redband trout and CSF. Increasing the density of LWD long term (5-100 years) via RHCA treatments and Rx burning would contribute to improving bank stability. Improving bank stability through activities such as improvement of willow or aspen stands reduces sedimentation from streambanks and allows for increasing hardwoods along streams that filter sediment and provide root strength to streambanks.

The width-to-depth ratio is often used as an index of cross-sectional shape, where both width and depth are usually measured at the bankfull level. Both width and depth can respond rapidly to changes in sediment load and/or discharge. Whether a stream erodes downward or outward is influenced by both local shear stresses and whether the bed or banks are the most easily eroded. Bank vegetation also increases the resistance to erosion through its binding effects on banks, with erosion decreasing as the percentage of roots in the soil increases, such as improving aspen stands, and this leads to narrower channels than would otherwise be expected. The effect of vegetation on channel shape is more pronounced in smaller streams (Gordon et.al. 1992). Changes in width/depth ratios are also a result of wood recruitment within RHCAs. Wood embedded in the stream channel and streambanks narrows the channel, slows velocity, catches sediment, and creates pools. An improvement in large wood recruitment would result in improvement in width-to-depth ratios. Narrower, deeper stream channels result in cooler water temperatures, thus improving habitat for fish.

Stream survey data indicates that of the 56.2 miles of stream surveyed (most recent survey), nearly 91% met the desired condition of 80% bank stability (Table 70). Exceptions include reaches of W. F. Crazy, Double Corral and Thorton Creeks. However, these streams were surveyed in the early 90's and may not be an accurate reflection of current conditions.

The watershed has a significant amount of Rosgen C and E stream types that occur throughout 60% of the watershed (upper channel reaches). These stream types are heavily dependent on riparian vegetation for bank stability due to higher sinuosity traits and associated critical shear stress. As riparian vegetation (i.e. sedges, rushes, willow, alder, etc.) along stream banks and adjacent floodplains become less prevalent from existing land management activities (e.g. livestock grazing) many of these Rosgen E and C stream types evolve to exhibit D, G, and F conditions. Currently, 41% of the historic C and E stream types (high quality fisheries habitat) have been converted to degraded D, G, and F types that are typical of high bank erosion and lateral instability. This situation occurs in areas throughout Happy Camp Creek, Jackson Creek, Thornton Creek, Little Summit Creek, Toggle Creek, and Haypress Creek. Rosgen A and B stream types occur predominantly in the lower third of the watershed. Rosgen A stream types exist in small contributing tributaries along Deep Creek, while B stream types occur in Deep Creek, Happy Camp Creek, Jackson Creek, and Little Summit Creek. Although A stream types rarely exhibit bank instability due to geologic factors, B stream types within the watershed display lateral movement associated with bank sloughing. This situation occurs in areas throughout Happy Camp Creek, Double Corral Creek, Crazy Creek, Little Summit Creek, and Deep Creek. It is estimated that between 60 – 70% of all class II, III, and IV drainages within the watershed

are severely incised or laterally unstable as a result of channel evolution (i.e. E → G, C → F, etc.); reference Deep Creek WQRP 2004).

Width/depth ratio (W/D) has generally increased due to the lateral instability of many of the streams in the watershed. As the channel widens and becomes shallower (increasing W/D) streams typically experience increased suspended sediment, undesired adjustments in channel bedload, increased stream temperatures, and loss of pool habitat for fish. This ratio largely depends on the stream type, which is determined by the shape of the stream, features that form the stream, and other factors. As stream banks erode due to various reasons, the width-to-depth ratio usually increases, which results in increased water temperatures, reduced ability of the stream to store water, and less pool habitat for aquatic species. Changes in channel type such as these fall within a morphologic evolutionary pattern typical of a drainage network that has been/is degrading.

In Deep, Crazy, Little Summit and Jackson Creeks (23.5 miles of stream), 92% of streams reaches have width-to-depth ratios appropriate for their existing stream type. However, this does not account for their current condition relative to their historic potential as described above. The exception includes: Little Summit Creek R2. In the remaining streams (Chamberlin, E. and W. Fork Crazy Creek, Thorton, Happy Camp, Double Corral and Toggle), comprising of 32.7 miles of stream, only 36% of stream reaches met the desired condition (INFISH standard). Stream survey data are summarized in Table 70.

Desired Condition

There is a need to manage vegetation to promote the recovery of deep-rooted, riparian vegetation (e.g. willows and sedges) to protect banks from erosion, capture sediment, and control channel pattern, profile, and dimension. The desired condition is to have greater than 80% bank stability (Forest Plan, p. 4-237, INFISH DN, p. A-4). Additionally, there is a need to manage vegetation in the project area to promote the recovery of stream channel pattern and morphology, specifically width-to-depth ratio, toward the ONF-LRMP and PACFISH/INFISH standard.

Environmental Effects, Direct and Indirect

Columbia spotted frogs and Redband trout

Alternative 1

Alternative 1 is the No Action alternative. No vegetation or fuel management activities would be implemented to accomplish project goals. This alternative serves as a baseline for comparison of the effects of all of the alternatives. Routine activities such as road maintenance and suppression of unplanned fires would continue. Activities authorized under separate decisions would also continue. These activities include livestock grazing and noxious weed treatments, watershed restoration, recreational use of the area, including camping, hunting and motorized and non-motorized use, would continue.

There would be no stand density management treatments or associated road (temporary) construction. Stands would continue to incur mortality and large diameter trees would continue to be at risk of loss due to competition among trees. LOS stands would remain multi-strata with dense stand conditions causing competition for resources among trees. Large diameter trees, such as ponderosa pine, would remain at a high risk of mortality. Aspen stands, riparian and upland grass and shrub communities would continue to decline (see Silviculture and Range Reports).

There would be no fuels reduction treatments. Areas would continue to accumulate fuels with the potential for a wildfire causing unwanted damage to forested stands, wildlife habitat, soils, and water quality (reference specialist reports).

Measure 1: Disturbance to individuals and effects related to water quality (sediment)

Under this alternative, redband trout and spotted frogs that inhabit the aquatic habitat in the project area would continue to have low growth rates, low spawning and rearing survival rates, and depressed population densities induced by inadequate water quality and low abundance of quality spawning/breeding and rearing habitat (ODFW 1996, Deep WA 2010, ONF MIS report 2011 and Stuart et al 2007). However, short-term (<2 years/project duration) risks from implementation activities specifically, road and harvest associated sediment delivery and exposure to direct impacts (frogs at stream crossings) would not occur.

Measure 2: Water temperature and stream shade

Due to past management of RHCAs in the project area, few stream reaches are currently meeting INISH standards for shade. Under this alternative, most streams would continue to be below the shade RMO and summer water temperature would remain above allowable Oregon DEQ and Ochoco National Forest standards. Aquatic habitats would remain in this condition due to the low densities of hardwoods, over-grazing of hardwoods that are present, and the overstocked densities of conifers inhibiting expansion and establishment of riparian plants. Riparian vegetation (hardwood) recovery would slowly occur (up to 15 years) as grazing conditions incrementally improve from changes in management activities due to Westside AMP EA. The Westside AMP EA was completed in 2005 and encompasses grazing allotments in the Deep Creek WA; reference Range Report. However, conifers would continue to suppress hardwoods. Also reference discussion on W/D ratios below for effects related to stream temperature. Short-term (<5 years) risks from implementation activities, specifically RHCA treatments would not occur.

Measure 3: Large Wood (number of large wood pieces/100’)

No change to fish or spotted frog habitat provided by LWD would occur as a result of this alternative allowing natural and human induced processes to continue. Densities of LWD would continue to be below RMO minimums established by INFISH until budworm-killed trees (mostly small diameter trees) in the watershed begin to fall into the stream over the next 10 to 15 years. In the long-term (20-50 years), this LWD would eventually catch sediment, develop pool habitat and reduce the width-to-depth ratio.

Increasing stand density and accumulating fuels both in the uplands and within RHCAs increase fire hazard and reduce growth on individual trees. Severe wildfire could reduce the availability of future large trees if riparian areas burn even though it would initially create a large pulse in available down wood. Growth and development of large trees greater than 21 inches dbh requires 100 to 120 years on these sites. Potentially, there could be a shortage of future large wood available in the event of stand replacing fire. On the other hand, stand replacement fire would stimulate development of shrubby vegetation. Shade would be reduced in a stand replacement fire and would recover over 15 to 20 years. In dense young stands, development of large wood would be retarded due to inter-tree competition (see Silviculture section).

Measure 4: Pool Frequency (pools/100’) / Pool Quality/ Sediment

Under this alternative, there would be no short-term (1-10 years) changes to pool frequency and quality. Pool habitat would continue to be insufficient and would likely become scarcer as the channels continue to widen. Pool frequency would not change because no actions would be taken to change large wood recruitment (in the near future) to form pools; the rate of pool development would remain slow. Conversely, there would be no negative short-term (< 2 years/project duration) effects to pool quality in the Jackson project area because no change would occur to the riparian vegetation, channel processes or utilization of roads.

Measure 5: Streambank Condition (% stream bank stability, channel width to depth ratio)

In streams where hardwoods exist in closed canopy forests, expanding conifer cover would prevent growth and development of hardwood riparian vegetation. As a result, stream banks would continue to lack well rooted riparian plants that stabilize banks, reduce sedimentation and can prevent further increases in width-to-depth ratios and subsequent increases in temperature (WQRP 2004). Conversely, there would be no negative short-term (< 2 years) effects to streambank conditions in the Jackson project area because no change would occur to the riparian vegetation, channel processes or utilization of roads and crossings.

Determination for Redband trout and Columbia spotted frog

There would be 'No Impact' to redband trout and Columbia spotted frog species or habitat because there is no vegetation treatment and associated road construction or utilization proposed in this alternative in RHCAs or in the uplands. As described above, no potential short-term (<2 years/ project duration) negative effects to individual fish and frogs and RMO's would occur but no long-term (5-100 years) benefits to RMOs and fish and frog populations would occur either.

Alternative 2

This alternative proposes 5,744 acres of commercial thinning and 7,779 acres of non-commercial thinning across the entire project area. Refer to the DEIS (chapter 2) for complete description of Proposed Action. Commercial harvest is proposed to occur under this alternative in an effort to move the forest ecosystem (upland and riparian areas) towards meeting RMOs and Forest Standards and Guides in the short-term and long-term future. Commercial harvest (including within RHCAs) in this alternative would benefit the forest by increasing large late and old structure forest types, recruiting large woody debris and increasing hardwood plant composition within RHCAs, moving the Fire Regime Condition Class toward its historic range of variability which maintained low intensity fire conditions thus decreasing high intensity fire conditions across the project area. Harvest activities would be done with low-impact, ground based equipment (e.g. rubber-tired skidders) during the low-flow season (July, August, and September). Furthermore, the following mitigations (Project Design Criteria, PDC) listed in Appendix C and Hydrologist report (BMPs), and outlined under the Programmatic BA (Aquatics Report), would be implemented to minimize negative effects on fish/frog populations in the area:

1. There would be a no equipment zone within 50 feet of class I, II & III streams and within 50-100 feet, equipment would be limited to existing disturbance (Figures 1 PDC for commercial thinning in RHCAs); limiting ground disturbing activities would decrease potential for soil erosion.
2. There would be no equipment within 20 feet of class IV streams, equipment limited to existing disturbance (Figure 2 PDC for commercial thinning in RHCAs); limiting ground disturbing activities would decrease potential for soil erosion.
3. No whole tree yarding in RHCAs; whole tree yarding increases landing size, thus increasing disturbance area (soil compaction and exposed areas).
4. Do not mark trees on slopes greater than 35%; reduces soil erosion.
5. Flag existing skid trails and do not permit equipment to operate off of them; reduces soil compaction and potential for erosion.
6. Stipulate no new landings and flag the perimeter of existing old ones. Do not have landings within 100 feet of Class I-III streams; reduces soil compaction and potential for erosion.

7. Do not place landings or slash piles in ephemeral draws and swales; reduces potential for soil erosion.
8. Pull back/flatten out berms to reestablish drainage and reseed disturbed skid trails; reduces potential for soil erosion. Also reference Soils Report for complete soils PDC and BMP.

Additionally, activities requiring work in the stream such as replacing stream crossings, would be implemented in accordance with the Oregon guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources (June, 2008). For the project area, the in-water work time is July 1 through October 31.

Fuels treatments (prescribed underburning, hand piling, and grapple piling[7]) and non-commercial thinning is proposed in portions of 193 units [8] including units with proposed commercial harvest (107 acres) and is proposed to occur within 1,580 acres of RHCAs. Table 78 displays the area treated non-commercially (non-commercial thinning, fire/fuels or both) outside of commercial harvest units by drainage for Alternative 2.

Table 78. Alternative 2, non-commercial thinning and fuels treatment by RHCA stream class (303d listed streams are highlighted in bold).

		Stream Class				
Stream Name	**Units**	**1 /Category I RHCA**	**2 /Category II RHCA**	**3 /Category II RHCA**	**4 /Category IV RHCA**	**Total Treatment Acres / Total Acres RHCA in Drainage**
Big Spring Creek	328, 329, 340 355, 357, 357a, 721		57.7(89)	2.9(24)	16.3(38)	76.8(113)
Buck Hollow	299, 299a, 300, 301, 302a, 302b, 303, 306, 306a,307, 315, 327, 347, 348, 720				112.7(25)	112.7(280)
Crazy Creek (includes East and West Forks)	191, 194, 202, 202a, 202b, 202c, 203a, 205b, 232, 244, 675, 678, 681, 215b, 224b, 224c, 226, 263, 264, 212, 218, 231, 236, 266, 267		29.9(303)	54.4(125)	38.2(131)	122.5(558)
Deep Creek	184a, 189, 197, 201, 259, 313, 314a, 315, 317, 318, 318a, 319, 320, 321, 333, 341, 374, 62, 719	118.9(567)		0.8(18)	61.6(157)	181.3(784)
Derr Creek	123a, 125, 130a, 136, 3, 6, 63, 7, 70, 712, 713, 9		10.6(158)	2.4(52)	9.3(46)	22.3(256)

[7] Grapple piling is proposed within <19 acres of RHCA's, in the outside edge of the RHCA buffer off existing disturbance (old road, etc.).
[8] Units with >1 acre of proposed activity

		Stream Class				
Stream Name	**Units**	**1 /Category I RHCA**	**2 /Category II RHCA**	**3 /Category II RHCA**	**4 /Category IV RHCA**	**Total Treatment Acres / Total Acres RHCA in Drainage**
Dicer Meadow	122, 637		1.0(116)		0.7(28)	1.7(145)
Double Corral Creek	16, 18, 18a, 55, 707		11.4(285)		8.7(55)	20.2(371)
Happy Camp Creek	220, 223b, 237a, 237b, 247, 248, 262, 269, 41, 43, 44a, 604, 635, 636, 687, 688, 689, 691, 692, 768, 769		88.7(418)		37.7(123)	126.4(540)
Haypress Creek	162a, 18, 701			6.4(53)	8.2(13)	14.6(66)
Jackson Creek	134, 17, 19, 29, 40, 59, 634, 679, 684, 685, 686, 737, 738, 739, 742, 743, 745, 753, 754, 756	171.9(429)	23.4(187)		23.1(103)	218.5(659)
Little Summit Creek	342, 358, 375, 386, 387, 388, 388a, 393a, 395, 396, 397a, 398, 399, 399a, 400, 402, 415, 417, 419, 424, 436a, 437, 465, 467, 510, 511, 605, 639, 640, 641, 642, 644, 645, 649, 650, 662, 663, 667, 670, 671, 726, 733	48.2(307)	153.4(275)	11.3(147)	91.5(320)	304.3(955)
Thornton Creek	428, 473, 478a, 535, 537, 651, 660, 23, 26, 427, 443a, 444, 655, 658, 659, 71, 73, 74		97(400)	5.8(28)	31.5(145)	134.3(573)
Toggle Creek	119, 160, 30, 718	14.7(45)		0.8(27)	7.8(68)	23.3(303)
Totals		**353.7** (1,348)	**473.1** (2,282)	**197.5** (759)	**334.5** (1,272)	**1359(5661)**

Commercial harvest in alternative 2 would occur in portions of 42 units[9] equaling 107 acres within RHCAs (Table 79). Riparian treatments were developed with an IDT (interdisciplinary team) with the goal of improving RMOs and reducing catastrophic wildfire; also reference Purpose and Need. However, in many cases, proposed treatments would occur within the RHCA but in the outer-most zone (200-300 feet) of the RHCA, e.g., upslope of a road. Commercial harvest of conifers is combined with non-commercial thinning and underburning to promote the attainment of Forest

[9] Units with >1 acre of proposed activity.

Service standards and guides for forest and stream health. When combined with non-commercial thinning, commercial harvest[10] can lead to increased conifer tree growth which would increase future recruitment of large woody material. Commercial harvest and associated treatments would also benefit riparian-associated trees along streams, meadows and wetlands; to accomplish vegetative treatments, 25 miles of temporary roads would be constructed (15 miles on existing disturbance); 0.6 miles of new temporary roads would be constructed in RHCAs. Stream crossings are addressed below.

Table 79 Alternative 2 commercial harvest by RHCA stream class (303d listed streams are highlighted in bold).

		Stream Class				
Stream Name	**Units**	**1 /Category I RHCA**	**2 /Category II RHCA**	**3 /Category II RHCA**	**4 /Category IV RHCA**	**Total Treatment Acres / (Total Acres RHCA in Drainage)**
Big Spring	355, 357, 357a			2.9 (24)	8.3 (38)	11.1 (113)
Buck Hollow	299, 299a, 300, 302a, 306, 327			23.2 (25)		23.2 (280)
Crazy Creek (including East and West Forks)	202c, 224c, 226			2.2 (125)	7.4 (131)	9.7 (558)
Deep Creek	313, 318				6.4 (157)	6.4 (784)
Derr Creek	3, 70			1.0 (52)	1.4 (46)	2.4 (256)
Happy Camp Creek	237b, 43, 44a, 604, 636		5.3 (418)		4.6 (123)	10.0 (540)
Haypress Creek	146			5.2 (53)		5.2 (66)
Jackson Creek	134	0.9 (429)			4.7 (103)	5.6 (659)
Little Summit	388, 400, 415, 417, 465, 605	3.4 (307)	4.2 (275)	3.3 (147)	10.0 (320)	20.9 (955)
Thornton Creek	71, 537, 443a			4.9 (28)	6.7 (145)	11.7 (573)
Totals		**4.3 (1,348)**	**9.5 (2,282)**	**42.8 (759)**	**49.5 (1,272)**	**~107 (5,661)**

[3] Units with >1 acre of proposed activity

Measure 1: Fish and frog populations – disturbance/effects to individuals and sub-populations

Direct and Indirect Effects

Proposed activities within RHCAs are planned to improve fish and frog habitat features and meet RMOs (INFISH 1995). In RHCAs, commercial harvest activity would occur on 107 acres but would not occur within 50 feet of the edge of the streams on class I, II and III streams. As part of the PDC developed for the project, mechanized equipment would be limited to existing disturbance beyond the 50 foot no equipment zone. Adjacent class IV streams, equipment would be limited to within 20 feet of stream channels (see applicable design criteria, figures 1 & 2). Within RHCAs, a minimal amount

[10] Reference PDC (Silvicultural activities in RHCAs and Figure 5 & 6)

of potential sediment delivery to streams from commercial thinning and prescribed fire may occur. However, due to PDC and implementation of BMPs this amount is expected to be negligible; reference Hydrologist Report and proceeding discussion. Non-commercial thinning is proposed to occur within 1,358 acres of RHCAs but would not involve any ground disturbing activities; therefore no sediment delivery from these activities is anticipated.

As part of the PDC, this project would be implemented during low-flow periods (July, August, and September), or in some cases in winter (over frozen ground), to avoid effects to spawning fish or incubating embryos and fry as well as breeding frogs. In addition, the majority of commercial treatments in RHCAs would occur in class/category IV streams which are not fish bearing or primary frog habitat, only summer frog foraging habitat (reference Programmatic PDC in Aquatics Specialist Report and Appendix C). Class IV streams are intermittent and would be dry during project implementation. If treatment activities do disturb frogs, individuals would likely relocate to another part of the stream to seek refuge.

Within RHCAs, potential *direct effects* to frogs are possible where felled trees may strike individual frogs during thinning operations. However, risk would be extremely low due to the limited scope of operations (small amount of thinning adjacent wet areas and application of PDC (thinning in RHCAs). Risk to sub-populations would be especially low when considering the size of the proposed action in relation to the size of the watershed; 107 commercial acres out of 5,661 acres. PDC are included to protect frogs; such as prohibiting operations within the channel migration zone (outside of March 1st – May 31st). However, mortality of frogs may occur on haul routes and stream crossings when adult frogs are traveling to new feeding/breeding locations are driven over by vehicles.

There are approximately 47.8 miles of road within 200 feet of streams within the project area (table 64 Hydrologist Report). Potential interactions with frogs at stream crossings would pose the highest risk to frogs. Roads have been implicated in reducing amphibian dispersal (Gibbs 1998), increased mortality (Fahrig and others 1995), and reduced genetic diversity (Reh and Seitz 1990). In the Jackson planning area, road densities are high in RHCAs ranging from 7.7 (miles per square mile) in the Jackson Creek sub-watershed to 8.1 in the Crazy Creek-Deep Creek sub-watershed. No new permanent/system roads would be constructed in the project area. However, currently open roads, roads that are closed (would be reopened) and 25 miles of temporary roads would be constructed (15 miles on existing disturbance). Using small spur roads within RHCAs would prevent building new roads or opening longer segments of roads that would increase potential of more sediment entering the stream and reducing vegetation.

Table 80 Road density in RHCAs in the Jackson Planning area.

Sub-watersheds (6th field)	Square Miles	Existing Road Density (Miles per square mile)	New temporary roads in RHCA	Proposed Road Density (miles per square mile)
Crazy Creek-Deep Creek	2.6	8.1	**0.4**	8.1
Jackson Creek	3.7	6.6	**0**	6.6
Little Summit Prairie Creek	2.6	7.9	**0.2**	7.9

Amongst these crossings, class IV streams would pose the highest risk because many are unimproved. Within the project area, there are numerous stream crossings that would be utilized associated with existing and proposed roads including: 10 stream crossings on existing temporary roads (there would be no new stream crossings on new temporary road), up to 45* on closed roads proposed for re-use and up to 43 skid trail crossings that may occur during harvest activities that may impact frogs, primarily during summer foraging; reference (table 63 - proposed stream crossings) and hydrologist report.

Table 81. Estimated number of unimproved stream crossings on class IV streams proposed in project area.

Class IV stream Crossings	Alt 2 current DEIS	Alt 3 current DEIS
Temp. Roads (Existing)	10	9
Closed roads (Level 1 & 2), 64 miles*	45	45
Harvest Activities (skid-trails)	43(high range) 11(low range)	28(high range) 7(low range)

*It is estimated that up to 45 crossings are unimproved, i.e., have no existing structure (culvert, etc.), (personal communication with district hydrologist.

This additional amount of road and stream crossings during project implementation would incrementally increase exposure of CSF to mortality, but the effects would be short-term when considering the temporary nature (1-3 years) of road utilization, timing, and the amount of currently open roads. No direct effects to fish are anticipated because unimproved stream crossings (temporary roads and skid trails) would dry during implementation (reference PDC).

Indirect effects include potential sediment delivery to streams that are inhabited by fish and frogs from overland flow during and after harvest activities, temporary road construction, re-use of closed roads, open road utilization including associated stream crossings and prescribed fire (see below). Elevated sediment delivery to streams increases suspended sediment and turbidity levels, fine sediments in streams can degrade channel form; reference below for effects to channel form measure 4 (pools) and 5 (streambank condition). As described above, increases in fine sediment in streams can negatively affect salmonids and other aquatic biota (Meehan, 1991; Rhodes et al., 1994; Waters 1995.) and may be more problematic in degraded systems. However, unlike many other land uses that disturb soil for long periods, any increase in sediment yields from timber management activities is usually short-lived. Surface soil disturbances provide a sediment supply, but once the finer materials are transported and revegetation occurs, the site is less apt to continue eroding. Sediment yields or measured suspended sediment concentrations decrease over time as a negative exponential (Beschta 1978).

Analysis conducted in the hydrologist report indicates that Alternative 2 could potentially elevate ‘sediment delivery’ during the first year of implementation via project activities by 22.81 tons/sq. mile/year over background. Potential sediment delivery would be correspondingly reduced in subsequent years and would fall to below background levels within 10 years because of measures described below. Natural sediment delivery from undisturbed areas can range from zero to 160 tons/sq. mile/year (Elliot et al, 2010). Within the project area, elevated sediment levels are likely occurring to due past watershed management. As referenced in the hydrology report, natural sediment contributions to streams is estimated to be between 5 and 30 tons/sq. mile/year, however with the existing disturbance it can be 60+ tons/sq. mi./yr. The projected increase for this alternative comes from a combination of commercial harvest, prescribed fire, and roads associated with the project. Potential sediment delivery is modeled as an extreme scenario and the potential for sediment delivery is overestimated. Actual sediment delivery and potential effects would be mitigated through the implementation of design criteria and BMPs (see discussion below and – Hydrologist Report).

Overall, roads (temporary and level 1-4 haul route routes) contribute 58% of the potential sediment increase modeled. Closed and temporary roads would be rehabilitated after the project has occurred, thus the minor increase in road density, and therefore effects, would be short-term (<2 years/project duration). Long-term, Alt. 2 has the potential to improve conditions over existing condition because all reopened closed roads (within RHCA and PSDZ) would be closed and rehabilitated (reference PDC). Some roads that do not receive recurring maintenance, primarily low standard roads (ML 2)

would see some improvements in their ability to handle surface runoff and the resultant sediment; this would result in an improvement over the existing condition. For example, an armored drain dip would be constructed at jct. of road 30 and 3000650.

Up to 24.1 miles of road would be re-closed/rehabilitated and could decrease sediment delivery by 1.9 tons per year (reference hydrologist report). Associated benefits include the following: eliminating or reducing erosion and mass-wasting hazards associated with roads; eliminating or reducing human access and use-disturbance associated impacts to aquatic systems. Actions such as subsoiling or ripping of road surfaces, outsloping, waterbarring, fill removal, sidecast pullback, re-vegetating with native species and placement of large woody material and/or boulders may be included. There may be a short-term (<2 years/project duration) increase in sediment from implementing closure and rehabilitation but, PDC are included to reduce the potential for these types of adverse effects from occurring. Additionally, BMPs related to roads include road location, road design, time of use, road construction and maintenance, and road obliteration would be applied; reference Hydrologist Report. In the long-term (upon project completion), re-closing and rehabilitating temporary roads would decrease watershed drainage networks, eliminate some stream-road crossings, and reduce areas of soil compactions improving watershed function and habitat conditions for fish and frogs.

As acknowledged in the hydrologist report, temporary road construction, and reopening of closed roads for temporary use near streams would have short-term construction related effects (<1 up to 3 years) or during duration of implementation (1-10 years) that would include short-term (< 5 years) increases in turbidity and fine sediment inputs to streams. These are likely to happen during high flow events within the drainage as fine sediments would only be moved during summer thunder storms or during spring snow melt.

All stream crossings would be limited to roads over culverts on class I and II streams and on existing roads that cross *dry* channels of class IV streams over a temporary culvert or an armored ford. There are no known class III stream crossing. The greatest potential for sediment contributions to streams would be associated with class IV crossings. Sediment contributions would be negligible and short-term (<2 years/project implementation); reference hydrology report. To minimize effects, as few crossings as reasonable would be used in these streams and crossings would be rocked or a temporary culvert would be placed to reduce sediment transport. After proposed activities are completed, any placed culverts would be removed and the channel would be restored.

Since channels in class IV streams would likely be dry during the project, minimal amounts of sediment would be moved into the channel. The addition of sediment, via dust and rain-induced erosion at road crossings may attribute to the movement of fine silt downstream during high flows. This may disturb individual redband trout or Columbia spotted frogs on a short-term basis (duration of activity, several days to weeks), but would not adversely affect them because of the relatively minor additional amounts and limited scope and duration of activities. In general, sediment that is displaced into streams would be dispersed through the streams during fall, winter and spring runoff events and would not adversely affect spawning/breeding or rearing redband trout and Columbia Spotted frogs. However, some sediment may accumulate in low gradient reaches and intermittent features (pool tail outs, channel margins, etc.) within the project area, but would likely be immeasurable.

Prescribed fire (1,580 acres) and non-commercial thinning (1,465 acres) treatments are designed to reduce smaller fuels within RHCAs and can be used to reduce stocking of conifer seedlings, and to rejuvenate grass and shrub cover. The primary beneficial effect of reducing fuel loads in riparian areas is reduced chance for wildfire. Prescribed burning has the potential to cause some short-term adverse effects on salmonids and their habitats.

In general, effects from low to moderate intensity prescribed burns would be much less severe than the effects of intense wildfires considered by Gresswell (1999) and observed by Rinne (1996).

Although dead salmonids have been discovered after severe wildfires (Minshall and Brock 1991), it is reasonably certain that individual fish behavior would be not be affected directly by the patchy low-intensity fires caused by this proposed activity. Indirect effects such as reduced forage for juvenile salmonids would be minor and last for a maximum of approximately one to two years after burning. Over time, juvenile salmonids that receive less food have lower body condition and smaller size at smoltification. However, low-intensity fires should not result in effects this severe.

Prescribed burning would be implemented over approximately 10 years and in different seasons resulting in reduced potential for sedimentation. Fuels treatments would occur in the spring and fall. Hand piles would be burned later in the year after the first snow. Residual slash and the unharvested areas are expected to filter loosened sediment before it reaches the streams. Sedimentation, as a result of implementing fuels projects, would be filtered through vegetation along the streambanks and throughout the RHCAs during overland flows due to the mosaic fire patterns in the area. Egg deposition occurs for frogs soon after snowmelt. Eggs are normally deposited in water at temperatures of approximately 57.2 degrees F. Fire does not burn well in wet, humid areas along streams and springs. Hand-dug firelines would be avoided through these areas. Summer foraging areas would not be affected by fuels treatments which would take place in the spring and fall.

Erosion resulting from prescribed burning is generally less than that resulting from roads, skid trails, and site preparation techniques that cause soil disturbance, which are often a necessary component of prescribed burn projects (EPA 2005). Application of PDC (PDC-Rx burning in RHCAs) would likely mitigate risk from these activities. Therefore, effects from prescribed fire activities are not expected to adversely impact fish or frogs or measurably affect fine sediment delivery to streams. Also reference Measure 2, shade and stream temperature effects discussion below.

As described above (chapter 2-affected envt.), limited information is available to measure fine sediment in the project area. Therefore, it is difficult to assess the existing condition and potential effects of the proposed action on aquatic resources. However, it would appear that, where data is available, project area streams may be approaching a ‘threshold’ for the amount of percent fines (<2mm) in the substrate. This project has the potential to elevate fine sediment in gravel substrates towards undesirable amounts.

However, due to the temporary nature of effects and through application of the PDC and BMPs, it is anticipated that effects to substrate embeddedness and any potential negative effects to fish would be minimal and short-term (<2years/project implementation) in duration. Closing and rehabilitating roads would reduce sediment related impacts long-term; sediment levels would return to background levels upon project completion (<2 years/project implementation). Individual streams and reaches would return to below background levels as projects in those areas are completed.

Lastly, a change in timing or peak flow magnitudes may affect fish via scouring redds or embedding them. Hydrologic analysis indicates that EHA values could increase up to 45%, but would still be well below the Forest Plan Standard of 25% for the project area (Deep Creek Watershed), during the initial phases of implementation (year 2) and decrease over the course of project implementation. This increase in EHA illustrates the potential to increase peak flows. However, through the application of the PDC and BMPs there are no expected measureable adverse effects to flow (reference Hydrologist report). Though the potential for increases in peak flow and overland flow from road and skid trail crossings are acknowledged, potential effects would be largely mitigated for using BMPs and Design Criteria. Therefore, increases in peak flows are not expected to negatively impact fish and fish habitat (substrate).

BMP effectiveness

In USDA 2010, Stednick (chp. 8), notes that the implementation of BMPs would minimize or eliminate potential for water quality effects. Belt et al. (1992) note that implementation of BMPs and

establishment of riparian buffers have generally decreased the negative effects of forest harvest activities on surface water quality. However, even the relatively minor effects of many projects, particularly during a short time period, might still substantially change downstream habitats. Consequently, most of the concern with respect to forestry in watersheds is with cumulative effects (USDA 2010). The effectiveness of BMPs in mitigating the impacts of land management varies considerably depending on local conditions, management guidance and practices, and the stream or riparian feature of concern (Belt and others 1992; Weller and others 1998), in USDA 2010.

Whereas riparian buffers and BMPs would likely assist in mitigating some impacts of upland fuel reduction treatments, additional precautions and actions may be necessary to protect particular riparian functions e.g., short-term storage of surface water, maintenance of high water table, retention and transport of sediments; riparian vegetation decreases streambank erosion, riparian vegetation provides source of organic carbon (allochthonous inputs to streams; organic matter inputs to soils), transformation and retention of nutrients and pollutants, maintenance of streamside microclimate, contribution to overall biodiversity and biocomplexity, and contribution to aquatic habitat; provision of large wood (CWD/LWD inputs) (USDA 2010). In the project area, PDC were specifically developed to address the protection of riparian functions. There is also a relationship between the amount of area disturbed and the amount of potential erosion, thus the amount of disturbed area should be minimized (USDA 2010). In the Jackson planning area, PDC were developed to minimize the amount of disturbed area (FEIS chapter 2).

In summary, minor, short-term (<2 years/duration of project) direct impacts to frogs could occur from project implementation activities at stream crossings; primarily at unimproved crossings on intermittent channels during summer foraging. Long-term effects would be incrementally decreased upon completion of project activities (closed roads). Project implementation would not be expected to directly affect fish. Short-term (<2 years/duration of project), indirect effects to fish and aquatic habitat (substrate) could occur from elevated sediment delivery during project implementation activities. Effects to fish, and aquatic habitat (substrate) from inputs of fine sediments are very difficult to measure. Nonetheless, project activities may produce localized effects to redband trout immediately below project sites. However, PDC and BMPs including timing and magnitude of these localized effects are not expected to result in measurable effects to fish and aquatic habitat (substrate). Upon project completion, effects to fish and aquatic habitat (substrate) would improve as as sediment levels are reduced below the existing condition (pre-project) from closure and rehabilitation of roads in RHCAs (Reference Hydrologist Report). In addition, long-term (3-100+ years), sediment production would decrease increase due to large trees falling into the channel, capturing sediment and developing pool habitat including pool tailouts (spawning substrate). The proposed action would move the measure towards the desired future condition.

Cumulative Effects

The area of analysis for cumulative effects is the project area. Past, Present and Reasonably Foreseeable projects are summarized in chapter 3 and have been analyzed in the Jackson Hydrology Report. In summary, the treatment history in the project area has affected the ability of these watersheds to provide vigorous and stable riparian habitat; elevated background levels of sediment are likely occurring due to past watershed management activities. Specifically, Present and Reasonably foreseeable future projects that may negatively affect fish and frogs directly or via sediment delivery in the project area include: livestock grazing under the Westside Allotments EA, Ochoco Summit OHV trail, Deep EA, district firewood program and fishing.

The Ochoco Summit OHV trail system project could potentially affect sediment via numerous stream crossings but impacts would be mitigated by overall project design (avoidance of sensitive areas including fish bearing streams) and PDC, including armored crossings and utilization of bridges. Livestock grazing under the Westside Allotments EA has the potential to add cumulatively to the

Jackson project via trampling of young fish and frogs and localized fine sediment delivery. In general, grazing conditions are incrementally improving from changes in management activities due to Westside AMP EA. The Westside AMP EA was completed in 2005 and encompasses grazing allotments in the Deep Creek WA. Reference Range Resource Report, specifically environmental effects, existing condition trend and monitoring data and Measure 2 & 5, for additional discussion on effects from livestock grazing. Implementation of restoration projects under the Deep EA may cause occasional mortality of fish and frogs (1-3 months year/10 years) from in-channel physical disturbance (mechanized equipment) and would also result in short-term, localized sediment delivery.

As described above, a minimal number of mortalities of Columbia spotted frog (CSF) could result from project activities. Because the project area is located within and near streams, there are substantial ongoing human activities including vehicular traffic (project and non-project related) that may occasionally result in mortalities of individual frogs. Livestock grazing exists within portions of the project area so there is potential for an occasional frog to be trampled inadvertently by cattle. Under Alternative 2, this project could add cumulatively to these incidental deaths; the likelihood being greatest under Alternative 2 since more activities would occur within frog and fish habitat. However, the project duration is short term (1-2 years/10 years) and of small area within RHCAs, limiting any potential cumulative effects to CSF.

There are several dispersed camping sites located along streams throughout the project area that are used during the summer and fall months. Rock dams are often constructed at these sites which often result in fish barriers and reduction of stream flow. Furthermore, fishing is permitted within streams and ponds within the project area during the summer months. These activities coupled with implementation of the project treatments may impact individual fish or habitat for short periods of time (days to weeks), but would not likely contribute to any long-term (months to years), negative trends in population dynamics.

Projects with the potential to reduce sediment delivery in the project area short and long-term include the Deep EA Restoration EA (closing/decommissioning roads, headcut stabilization, riparian planting, riparian grazing exclosures, etc.) and implementation of the Ochoco Travel Management Rule (TMR). Both projects would reduce sediment delivery and reduce peak flows long-term through active restoration in the Deep EA (reference Hydrology report for estimation of amount of potential sediment reduction by activity) and restriction of vehicle access in the TMR. These projects would help to reduce scour-related mortality (and increase survival) of eggs and alevins, reduce involuntary downstream movement of juveniles during freshets, increase substrate interstitial spaces used for refuge by fry, restore timing of discharge-related life cycle cues (e.g., migrations), and increase spatial structure. In the case of the Deep EA, project work would be done during the summer low-flow period, redband trout spawning season (May and June) or frog breeding season would not be affected.

Still, the project would add cumulatively to increasing the risk of mortality to frogs. Also the project would increase fine sediment delivery in the short-term (<2 years/10 years) from project implementation activities including: commercial and non- commercial thinning including within RHCAs, Rx burning, road construction and stream crossings. In the long-term (>10 years), it is anticipated that sediment would be decreased to below baseline levels due to conclusion of project activities and closure of roads; therefore decreasing potential effects to fish, frogs and aquatic habitats.

Alternative 2 would be consistent with the applicable INFISH and ONFLRMP standards and guidelines. Alternative 2 would not be consistent with all PDC in the Programmatic BA, specifically sediment: (C.2, C.4 and C.6); reference Aquatic Specialist Report, FEIS Appendix C). However, BMPs and project design criteria developed for the project area would provide protection of water quality and avoid adverse effects of sediment to frogs and frog habitat and also fish.

Project monitoring actions are included in Chapter 2 of FEIS.

Measure 2: Water Temperature and Shade

One aspect of INFISH is to ensure maintenance and improvement of water quality through the development of RHCAs. However, since the Forest Service began managing stream corridors with buffers zones along aquatic habitats, Forest managers have been reluctant to continue to actively manage RHCAs (USFS and BLM 2010). As a consequence, most of the RHCAs within the Jackson project area have become overstocked with small diameter conifers and in several areas are at in increased risk for wildfire; reference Fuels Report. The overstocked densities of conifers in the RHCAs prevent hardwoods such as alder, willow, aspen, and other shrubs from expanding due to competition for sunlight, nutrients and water. This competition for resources makes it difficult for hardwoods to reestablish. Without the hardwood component, stream banks lack strong root masses that can stabilize banks, make channels narrower, reduce water velocity during high flow events as well as provide quality habitat for aquatic species such as trout and amphibians.

A recent study found that stream shade provided by conifers comes from a primary and a secondary shade zone and trees could be thinned, and continue shading the stream, from RHCAs as long as the critical shading vegetation is left (USFS and BLM 2010 and table 82). The Northwest Forest Plan Temperature Total Maximum Daily Load (TMDL) Implementation Strategies (2010) also identifies that thinning which reduces stream shade may lead to a short-term increase in temperature, but would ultimately lead to a long-term benefit in shade production by hardwoods, and a long-term decrease in stream temperature, if given adequate protection from grazing. Additionally, INFISH (1995) says to prohibit timber harvest within RHCA unless silvicultural practices can be used to acquire desired vegetation characteristics that would aid in attainment of RMOs while avoiding adverse effects to inland native fish species. Considering these findings and Forest Service guidelines, vegetation management would occur inside the RHCA buffer zones described in INFISH to commercially and non-commercially harvest conifers under Alternative 2 on a very limited scale.

Table 82. Minimum Width of Primary Shade Zone (feet) based on Slope (percent) and Tree Height (average height of stand in feet) (USFS & BLM. 2010).

Height of Tree	Hill Slope <30%	Hill Slope 30 to 60%	Hill Slope >60%
Trees < 20 feet	12	14	15
Trees 20 to 60 feet	28	33	55
Trees >60 feet to 100 feet	50	55	60
Trees >100 to 140 feet	70	75	85

The height of trees, at various slopes and distances that provide shade during the period when peak temperatures occur, were calculated and incorporated into detailed design criteria (Appendix C Aquatic Species Report, Table A-1 &2. With the exception of specific known hardwood stands identified in table 83, only trees not providing shade would be thinned from units along perennial streams. Shade was not a consideration along intermittent streams since they should not affect peak water temperatures, but implementation of design elements and RMOs would result in maintaining some shade in treated intermittent streams also.

In addition, RHCA thinning protocols developed on the ONF for fish bearing and perennial non fish bearing streams have been utilized since 1998, preceding the NWFP TMDL Implementation Strategy (USFS and BLM 2010). Solar Pathfinder shade monitoring of non-commercial thinning within Category 1 & 2 RHCAs in 1998 using ONF thinning guidelines, found less than a one (1) percent change in within channel shade readings from pre-treatment observations (Fontaine, 1998).

Proposed activities within RHCAs are planned to improve fish and frog habitat features and meet RMOs (INFISH 1995). In Alternative 2, commercial harvest would occur in parts of 42 units totaling 107 acres in RHCAs in addition to the fuels treatments. There are 4.3 acres of commercial thinning

proposed in class I streams, 9.9 acres in class II streams. Within in class I & II streams there are five 'areas' that would receive different treatment types. There are portions of 38 units of class III and IV streams that would have two 'areas' of differing treatment (reference PDC - FEIS chp. 2). Of the 107 acres, 24 acres (11 units[11]) would specifically target suppressed riparian hardwood stands to thin out encroaching conifers. A list of units with commercial hardwood treatments by RHCA class is shown in Table 83. Commercial thinning is proposed within RHCAs in 7 units that are 303(d) listed for water temperature; no hardwood thinning is proposed along class I streams, and <2 acres are adjacent class II streams. However, it is important to note that not all proposed treatments would occur immediately adjacent stream channels in these units. The majority of treatments would occur in the outside edge of the RHCA where shade would not be affected.

Table 83. proposed commercial hardwood treatments (conifer thinning) along streams including streams on 303(d) list for water temperature; 303d streams highlighted in bold.

			Stream Class				
Streams	**303 D listed**	**Unit**	**1**	**2**	**3**	**4**	**Total (acres)**
Big Spring Creek		357a				1.1	1.1
Buck Hollow		299a			*1*/3.5		3.5
		302a			<*1*/1.7		1.7
Crazy Creek	**X**	**202c**				**1.3**	**1.3**
	X	**224d**				**0.6**	
Happy Camp Creek	**X**	**237b**		*0*/**1.9***			**1.9**
	X	**604**				**2.7**	**2.7**
	X	**636**				**1.9**	**1.9**
Little Summit Creek	**X**	**393a**				**0.9**	
	X	**605**			**<2/3.0**	**1.1**	**4.1**
Thornton Creek		537				4.1	4.1
Grand Total				0/1.9	<4/8.3	13.8	24

*Figures in italics represent how many acres out of total (X/X) are within primary shade recruitment zone, i.e., would not impact shade (USFS/BLM 2010).

Commercial harvest in Class I, II and III RHCAs is not expected to reduce shading on perennial streams, with the exception of removal of conifers around incidental hardwoods encountered during implementation. The number of incidental hardwoods that would be encountered is expected to be low and spatially infrequent. Therefore, no measureable effect to shade is anticipated, especially considering the scope of activities (83 acres, (107 total minus 24 acres of hardwood treatments)) verses total RHCA acres (107) proposed for treatment. Removing conifers from hardwood stands to improve alder or willow production in commercial units may reduce shade but should not result in a measurable increase in water temperatures.

In Alternative 2, non-commercial thinning would occur in 1,358 acres of RHCA. Non-commercial thinning would occur to within five feet of stream channels. With the application of shade 'setbacks', only trees that do not provide shade or provide bank stability would be removed so that the existing amount of stream shade is maintained with the exception of removal of conifers around incidental hardwoods encountered during implementation. Similar to above, the number of incidental hardwoods that would be encountered is expected to be low and spatially infrequent. Therefore, no measureable effect to shade is anticipated. Non-commercial thinning would reduce the competition

[11] Units with >0.5 acre(s) of proposed activity

between riparian-associated species and conifers resulting in more woody, shrubby species. Non-commercial thinning would result in increased growth rates for both conifers and riparian shrubs.

Of the 1,358 acres proposed for non-commercial thinning in RHCAs, 89 acres (26 units[12] or parts thereof) would specifically target suppressed riparian hardwood stands to thin out encroaching conifers. Of those 89 acres, 82 acres (22 units) would occur adjacent 303d listed streams. Non-commercial thinning would occur on 8.1 acres along class I streams and 10.5 acres are along class II streams and 45 acres along Class III streams adjacent 303d listed streams (Table 84). Removing conifers from hardwood stands or to improve alder or willow production in these non-commercial units may reduce a minor, short-term (<5 years) amount of shade but should not result in a measurable increase in water temperatures. No measureable increase in temperature is anticipated, especially considering the scope of activities in relation to the size of the watershed.

Table 84. Proposed non-commercial hardwood treatments along streams including streams on 303(d) list for water temperature; 303d streams highlighted in bold.

			RHCA Category				
Streams/drainages	**303d listed**	**Unit number**	**1**	**2**	**3**	**4**	**Total (acres)**
Crazy Creek	**X**			**2.0**	**39.0**	**0.7**	**41.7**
	X	**675**		**1.0**			**1.0**
	X	**678**		**1.0**			**1.0**
	X	**218**			**39.0**	**0.2**	**39.2**
Derr Creek	**X**			**1.0**		**0.5**	**1.5**
	X	**712**		**1.0**			**1.0**
Double Corral Creek	**X**					**5.0**	**5.0**
	X	**707**				**4.6**	**4.6**
Happy Camp Creek	**X**			**1.3**		**6.2**	**7.5**
	X	**237a**		**1.3**		**1.0**	**2.3**
	X	**635**				**1.0**	**1.0**
	X	**687**				**1.0**	**1.0**
	X	**688**				**1.2**	**1.2**
	X	**689**				**1.2**	**1.2**
Haypress Creek					1.0		1.0
		701			1.0		1.0
Jackson Creek	**X**		**4.9**	**1.2**		**0.2**	**6.3**
	X	**634**		**1.2**			**1.2**
	X	**679**	**1.0**				**1.0**
	X	**684**	**1.0**				**1.0**
	X	**685**	**1.0**				**1.0**
	X	**686**	**1.9**				**1.9**
Little Summit Creek	**X**			**5.0**	**4.5**	**7.4**	**17.0**
	X	**639**			**1.0**		**1.0**
	X	**641**		**1.0**	**3.3**		**4.3**

[12] Units with >1 acre(s) of proposed activity

			RHCA Category				
Streams/drainages	**303d listed**	**Unit number**	**1**	**2**	**3**	**4**	**Total (acres)**
	X	**642**		**1.9**			**1.9**
	X	**644**		**0.8**		**0.2**	**1.0**
	X	**645**		**1.0**			**1.0**
	X	**662**				**3.5**	**3.5**
Thornton Creek				3.6			3.6
		651		1.0			1.0
		658		0.9			0.9
		659		1.7			1.7
Toggle Creek	**X**		**3.0**				**3.0**
	X	**718**	**3.0**				**3.0**
Grand Total			**8.1**	**14.1**	**44.7**	**22.0**	**89**

Prescribed fire is proposed in 1,580 acres of RHCAs. There is a risk that application of prescribed fire could reduce shade in RHCAs short-term. Although fire can have a wide range of effects on aquatic ecosystems ranging from minor to severe, prescribed burns are planned for spring and fall when fuel moisture and relative humidity are high. Under these conditions, burns in riparian areas tend to occur in a mosaic pattern, leaving considerable unburned area and resulting in low tree mortality. Areas with the highest moisture levels, immediately adjacent to streams, tend to receive the least damage from fire (USDA 2010/GTR-231). Potential effects from low to moderate intensity prescribed fire in riparian areas include minor short term (<1 year) reductions in stream shade that would not measurably increase water temperatures, (Reiman et al. 2003). Effects from low to moderate intensity prescribed burns would be much less severe than the effects of intense wildfires considered by Gresswell (1999) and observed by Rinne (1996).

The application of prescribed fire proposed in Alternative 2 would be consistent with the Programmatic BA for CSF (See Aquatics Specialist Report /Appendix C) that includes the following design criteria (c.1-5): underburning would occur within the RHCA but outside the riparian vegetation. Ignition of burns would occur outside of RHCA, but could be allowed to creep into riparian vegetation. Ignition of burns would occur outside of RHCA (except hand piles) and no fireline construction in the RHCA. Reference design criteria for Rx burns in RHCAs in Chapter 2.

To meet RMOs, fire prescriptions for RHCAs would provide for a mosaic of burned and unburned areas to retain sufficient soil cover for infiltration and maintain vegetation that provides shade. In general, burning in RHCAs would be expected to burn 10-50% of the riparian area, while exposing less than 5% mineral soil. Mineral soil exposure would be expected to last less than one year. The above ground growth of grasses and shrubs in the burned areas would be killed but would respond with new growth within the first growing season after the burn. Observations of similar prescribed fire treatments show burned grasses begin to sprout with new growth within one to three months of the first growing season. Within the first year after burning, shrubs and grasses would be rejuvenated. The Jackson Project Fuels Report contains a discussion of fire effects specific to common shrubs in the project area. Based on this discussion most shrubs produce basal sprouting following disturbance or require mineral soil exposure to germinate and establish new plants. Prescribed fire and associated harvest and non-commercial thinning would reduce fire hazard and the potential for severe wildfire within the RHCA and reduce competition for resources between hardwoods and conifers. There would a risk of prescribed fire reducing shade, however short-term increases in temperature (up to 6

months) are allowed even on streams over threshold during riparian restoration activities to restore riparian vegetation (Oregon Water Quality Standards 340-041-0004(5)(a)).

Post treatment prescribed fire monitoring of the Lower North Fork Crooked River Fuels Reduction Project in 2004 found that ignition outside the RHCA and allowing the fire to back in resulted in less than a 10 percent burn in Category 1 and 2 RHCAs which does not meet objectives (fuels) (LOM district files). However, ignition may still be started outside the RHCA and allowed to back in if determined to better meet riparian objectives. Reasons for fire ignition in RHCAs include meeting mosaic and intensity objectives, to protect old growth trees, to protect TE&S plants and meet other botany concerns, to break up fuel continuity, move fire across a road running parallel to a stream, and meeting other RMOs. Burning within meadow systems adjacent to creeks, to retard conifer encroachment, would be coordinated with the District Botanist, Fisheries Biologist, and/or Hydrologist.

With application of design criteria and BMPs , any reduction of stream shade would be spatially intermittent and short-term (<5 years) and would not be expected to measurably increase water temperatures. Long-term, it is anticipated that shade would increase over the next 5-10 years due to higher vigor of existing (and recently planted) hardwoods once some of the conifer canopy and understory is removed and/or consumed via implementation activities (CT, PCT and Rx burning within RHCAs). Increased shade from the hardwoods would lead to incrementally lower temperatures in streams which is a critical element fish need for survival during low flow periods when air temperatures increase in the summer months.

Temporary road construction (existing and new) and re-use of closed roads would not measurably affect shade or stream temperature because the majority of roads occur outside the primary shade recruitment zone and in most cases would not have mature vegetation tall enough to affect shade. Similarly, no new crossings are planned for class I, II or III streams. Several stream crossings (reference Measure 1, on existing disturbance would occur on class IV streams throughout the preojct area but would not measurably affect existing shade or temperature because of their limited number, intermittent spatial distribution across the project area and application of PDC and BMPs. Selection of stream crossing locations would be coordinated with fish/hydro/soils and would be located in the least impactful areas where minimal disturbance would occur, typically on previous disturbance. Stream crossings would be rehabilitated upon completion of activities; reference design criteria.

Increases in width/depth ratio can also increase summer water temperatures (Beschta et al., 1987; Rhodes et al., 1994). Bartholow (2000) estimated that the increases in channel width documented by Dose and Roper (1994) significantly increased summer water temperatures, even in the absence of any reduction in stream shading. Increases in channel width/depth also increase the rate of heat loss from streams during the winter periods, rendering streams more susceptible to freezing (Platts, 1991; Rhodes et al., 1994). Anchor ice can cause complete mortality of most aquatic life within the stream substrate (Platts, 1984).

As discussed in the Hydrology Report and summarized under Measure 1, some minor, short-term (<2 years/10 years) delivery of sediment would be expected at stream crossings during project implementation, but inputs would largely be mitigated by design criteria and BMPs. Therefore, no measurable effects to temperature should result from implementation of the project from changes in channel morphology; reference Measure 5 for additional discussion.

In summary, through the application of PDC , there would be no measurable increase in water temperatures resulting from any proposed activities (commercial and non- commercial thinning, Rx burning, road construction and stream crossings, or from elevated sediment). A minor amount of shade would be reduced short-term (<5 years) in the aspen/hardwood RHCA units (portions of) and potentially through Rx burning, but no measurable increase in water temperatures resulting from

these activities is anticipated. The proposed action would move the measure towards the desired future condition.

Cumulative Effects

Numerous streams in the project area are on the state 303(d) list of Water Quality Limited Water Bodies for summer water temperature. The maximum 7-day floating average water temperatures in these streams and most of its tributaries range from the upper 60's to mid-70's. Water temperatures in these ranges are higher than the preferred range for salmonids and retard growth. Lower shade readings are primarily attributable to meadow systems, past timber harvest and thinning practices, roading, and livestock and wildlife grazing, but may also have resulted from fire, firewood gathering, mortality from insect and disease, dispersed recreation, and loss of beaver. Past logging, roading, and grazing have reduced shading in the planning area. This has been offset in some drainages by increased shading from dense overstocked stands of conifers.

The area of analysis for cumulative effects is the project area. Past, Present and Reasonably Foreseeable projects are summarized in chapter 3-environmental consequences. Specifically, Present and Reasonably Foreseeable projects that may affect stream shade and temperature include: the proposed Ochoco Summit OHV Trail (Draft EIS) and ongoing livestock grazing authorized under the Westside Allotments EA. The Ochoco Summit OHV trail system project is not expected to measurably effect stream shade or temperature because project design criteria stipulate that no shade producing vegetation would be removed during to construct trails and crossings; reference Ochoco Summit OHV Trail DEIS.

Historic grazing practices contributed to the removal of deciduous woody vegetation and compaction of alluvial terraces. Livestock grazing continues in the project area, but levels have been reduced from historic amounts and riparian vegetation is improving, but is still below desired conditions. Activities within some RHCAs would likely attract livestock because removing small trees as well as surface and ladder fuels would remove barriers to livestock movement. In other areas higher slash levels and downed trees retained in RHCAs may impede cattle access to the streams. Increasing sunlight to the ground by removing some of the canopy cover would also increase growth of grasses, shrubs, and hardwoods. This would increase the amount of forage available which would attract livestock. Livestock are expected to continue to use riparian areas and are expected to consume some of the increased forage. However, more strict grazing management criteria are being implemented within the Westside Range Analysis (Westside) as discussed in the Range Specialist Report. Under Westside implementation, riparian species have more protection from being overly utilized by cattle and would likely exhibit more vigorous growth due to the increased resources from thinning. Furthermore, several treatment units have remnants of old livestock exclosures around portions of riparian areas. Riparian planting has occurred in some (~5 miles) of these areas, but the young plants can be subject to browsing in areas that are not caged. Repairing old exclosures (chpt. 3-environmental consequences), along with planting and caging new young hardwoods along stream channels, would help restore/reestablish hardwoods in the proposed treatment units.

Additional projects that may have the potential to impact shade include implementation of the Ochoco TMR and, Deep EA and Deep EIS. Implementation of the Ochoco TMR may incrementally reduce negative impacts to riparian vegetation from motorized vehicles short and long-term buy restricting access of vehicles to the open road network (reference transportation section for more information on TMR. Implementation of the Deep EIS (2001-2011) included 634 acres burning and 634 acres PCT, respectively (primarily in category II and IV RHCAs). Personnel observation from site visits to approximately 50% of these stands suggests that these actions did not measurably impact shade producing riparian vegetation due to implementation of design criteria similar to what is proposed for this project. The Deep EIS also included approximately 5 miles or riparian planting (hardwoods and shrubs) throughout the planning area that is and would continue to improve shade in

the near future and also long-term (5-100 years). Implementation of the Deep EA (ongoing) includes/included a number of beneficial activities in the watershed that would improve stream shade short and long-term (1-10/1-100 years) and indirectly reduce water temperatures including: riparian planting, LWD placement, headcut stabilization and meadow restoration, cutbank revetments, spring developments, channel reconstruction, grazing exclosures, and construction of riparian pastures - accomplishments are documented above in Chapter 3, Cumulative Effects).

Still, the project would incrementally add cumulatively to decreasing shade in the short-term (1-15 years) by thinning out competing conifers in hardwood stands but on a very limited scale; 4 acres along Class III streams (no fish bearing streams) distributed across the watershed. Additionally, shade may be impacted by application of limited prescribed burning activities within RHCAs (1,580 acres) but effects would likely be short-term (<1 year). In the long-term (5-100 years), it is anticipated that shade would be improved due to increased growth of riparian hardwoods or increased growth rates of residual trees. However, there should not be any measurable increase in water temperatures in any fish bearing or non-fish bearing perennial streams in the planning area. There is a very low potential to increase water temperature and reduce shade (up to 14 acres) in intermittent non-fish bearing streams (Class IV) when they are flowing, but this should not result in a violation of state water quality standards because these streams typically go dry before peak water temperatures occur in the watershed.

Alternative 2 would be consistent with the Programmatic BA, and applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report).

Project monitoring actions are included in Chapter 2 of FEIS.

Measure 3: Large Wood (number of large wood pieces/100')

Commercial harvest in alternative 2 is proposed in portions of 42 units[13] totaling 107 acres within RHCAs. Riparian treatments were developed with an IDT (interdisciplinary team) with the goal of improving RMOs and reducing catastrophic wildfire. Within category I & II RHCAs, treatments would occur within the RHCA but in the outer-most zone (150-300 feet) of the RHCA, e.g., upslope of a road. One exception would be unit 400, which contains 3.4 acres of CT within the RHCA, approximately 2 acres of this unit is located within 150' of stream channels. For purposes of this analysis, the LWD recruitment zone is defined as up to 150 feet of stream channels (>1 site potential tree height) (USDA 2010/GTR-231). There would be no reduction in the amount of LWD as a result of proposed thinning activities due to application of INFISH RHCAs and PDC (Appendix C).

Commercial harvest of conifers is combined with non-commercial thinning and underburning to promote the attainment of Forest Service standards and guides for forest and stream health. When combined with non-commercial thinning, commercial harvest[14] can lead to increased conifer tree growth which would increase future recruitment of large woody material. Commercial harvest and associated treatments would also benefit riparian-associated trees along streams, meadows and wetlands. Commercial harvest in RHCAs would reduce competition among conifers by thinning overstocked, live trees, which would lead to increased growth rates of the trees that remain (post-harvest basal area would be 60-80 feet).

Trees that remain would contribute to stream LWD over the long-term (present-100 years) as they mature to greater size, die and blow/fall over into the stream. In units adjacent stream reaches that are deficient in LWD (e.g. Deep R1-4, Little Summit R1-3, Jackson R3 and 4, and Crazy R2), trees that are currently of a large enough size (6" + diameter) and located such that they contribute large wood to the stream channel would be retained during commercial harvest activities to maintain RMOs. This

[13] Units with >1 acre of proposed activity.
[14] Reference PDC (Silvicultural activities in RHCAs and Figure 5 & 6)

would only apply to one commercial unit (unit 400) but would apply to several PCT units. This zone would be limited to the primary recruitment zone, ~100 feet out from the stream bank. However, due to application of PDC 'shade setbacks'(see measure 2) this would only apply to trees between 50 and 100 feet because PDC limit harvesting trees greater than 9" within 50 feet of stream channels (class I-III). In class IV streams, harvesting of trees may be reduced relative to class I-III streams because PDC are less restrictive. In streams where LWD amounts are unknown or data is insufficient, a field review would be conducted and a determination would be made as to fall wood in the stream. A fisheries biologist/hydrologist would make the determination and it would occur prior to project implementation.

Prescribed fire (1,580 acres) and non-commercial thinning 1,465 acres (includes commercial harvest) treatments are designed to reduce smaller fuels within RHCAs and can be used to reduce stocking of conifer seedlings, and to rejuvenate grass and shrub cover. Prescribed fire, commercial and non-commercial thinning would reduce fire hazard and the potential for severe wildfire within the RHCA (reference Fuels Report). Reducing fuels protects large wood on the ground and standing trees for future large wood recruitment needed for fish habitat and riparian function. While some large wood may be consumed, fire would be expected to kill some standing trees that over time would be recruited as LWD in to streams. Reducing competition would promote the growth of residual trees that would be future large woody debris. LWD creates slow water habitats, side-channels, and off-channel alcoves critical for fish rearing and amphibian breeding. With more pool habitat, water temperatures can decrease (due to reduction of surface area compared to riffles) and more complex habitat is created for fish and frogs. Redband trout, like many other salmonids have evolved in stream systems in which large woody material helps retain organic and inorganic particulate matter that is important for channel stability, biological diversity and productivity (Nakamura and Swanson 1993). Additionally, humidity created by the increase in cover (e.g. LWD, hardwoods, and riparian forbs) and the increase in pool numbers would improve habitat conditions for frogs.

The application of prescribed fire would be consistent with the Programmatic BA (Appendix C)that includes the following PDC: underburning would occur within the RHCA but outside the riparian vegetation. Ignition of burns would occur outside of RHCA, but could be allowed to creep into riparian vegetation (PDC C.4.) Ignition of burns would occur outside of RHCA (except hand piles (PDC C.3) and no fireline construction in the RHCA (PDC C.5).

As described in Aquatic Species Report (environmental consequences) and in measure 1, fire can have a wide range of effects on aquatic ecosystems ranging from minor to severe (Reiman et al. 2003); prescribed burns would be planned for spring and fall when fuel moisture and relative humidity are high. Under these conditions, burns in riparian areas tend to occur in a mosaic pattern, leaving considerable unburned area and resulting in low tree mortality. Areas with the highest moisture levels, immediately adjacent to streams, tend to receive the least damage from fire. Potential effects from low to moderate intensity prescribed fire in riparian areas include minor short term (<1 year) reductions in large woody debris recruitment. However, in some cases, large woody debris levels would increase due to prescribed fire (Chan 1998).

Temporary road construction and re-use of existing temporary roads (0.6 miles within RHCAs), re-use of closed roads (19.8 miles) could affect LWD recruitment (short and long-term >150 years) by limiting recruitment from these areas via vegetative disturbance, i.e., road clearing and improvement. However, when considering that vegetation on closed roads is typically small in size due to the age of past road construction (20-50 years old) and subsequent regeneration, most of the trees would not be of sufficient size to be recruited as LWD >12" dbh. Potential effects from construction of temporary roads on LWD recruitment would be limited by the scope and scale of proposed activities: 42 acres within 200' of streams, less acres within LWD recruitment zone. Therefore, LWD recruitment is not anticipated to be measurably affected via road construction and utilization. In regards to stream crossings, LWD could be increased short-term (duration of project-up to 10 years) if crossings need

to be improved and displaced trees would be used upon rehabilitation of crossings. PDC state LWD would be incorporated, where possible, into the rehabilitation of the disturbed areas (reference PDC in Appendix C).

In summary, through application of PDCs, and the effects described above, effects to LWD and long-term recruitment would be favorable. There may be a short and long-term increase as some thinned material (small (<6" dbh) and medium (12-15"dbh) size classes) is recruited to the stream including areas where standards are not currently met from PCT thinning. Underburning may cause minor reductions (PDC limit to <20% loss) in LWD (short-term (1-10 years/project implementation) but would be off-set with an increase due to recruitment of fire killed trees and wind-throw (including thinning) over time (short-term (1-10 years/project implementation) and long-term (10-100 years). Long-term (duration of avg. fire return interval) fire resiliency would be increased in all treatment areas. The proposed action would move the measure towards the desired future condition; reference Aquatic Species Report.

Cumulative Effects

The area of analysis for cumulative effects on large wood is the project area. RHCAs are deficient in large standing trees due to past harvest emphasis on overstory removal. Potential cumulative effects are referenced above (Environmental Consequences Section). Specifically, Present and Reasonably Foreseeable projects that have the potential to negatively affect LWD (in channel and recruitment) include the District/Forest Firewood Program. Illegal firewood cutting has likely reduced LWD recruitment within the project area and has occasionally removed in-channel LWD (personal observation).

Projects that include potential beneficial effects to LWD include: 1) Implementation of the Ochoco TMR which would restrict access to designated open roads and, in theory, could reduce illegal firewood cutting in RHCAs, and 2) Implementation of the Deep Creek Watershed Restoration EA (2004) that includes LWD placement on 3.6 miles of streams in the planning area; 1.5 miles of LWD placement has occurred to date. Implementation of alternative 2 would allow for increased growth rates of large trees that are within the area of recruitment of LWD to streams (100-120 feet) which would help attain the RMO for LWD in the future.

Still, the project could add cumulatively to decreasing LWD (minor amounts) in the short-term (1-10 years/project implementation) from application of prescribed fire, along 1580 acres of RHCAs. However, impacts would be relatively minor when considering scope of the project area, timing of implementation and distribution of activities across the watershed. These potential impacts would be off-set by short and long-term recruitment from prescribed fire and riparian thinning from proposed vegetation management activities and implementation of DEEP EA, and Ochoco TMR but somewhat diminished from illegal firewood cutting activities.

Alternative 2 would be consistent with the Programmatic BA, and applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report).

Project monitoring actions are included in Chapter 2 of FEIS. Proposed monitoring would include COFMS Riparian Fire Effects monitoring program and R6 Level II Stream Survey monitoring.

Measure 4: Pool Frequency (pools/100') / Pool Quality/ Sediment

Pool densities are low (< 1.0 per 100') on streams across the project area due to increased W/D ratios, sedimentation from accelerated bank erosion and lack of LWD. As described in more detail in the Aquatic Species Report, elevated sediment delivery reduces the quality and volume of pools and impedes pool development via several mechanisms. Fine sediment tends to be deposited and sequestered in pools during low flows, reducing pool volume and quality (Buffington et al., 2002).

Increased sediment delivery increases stream width and decreases stream depth in depositional reaches (Dose and Roper, 1994), which is also associated with reduced pool dimensions (Buffington et al., 2002). The loss of pool volume and quality can negatively affect native salmonids. Pools provide multiple habitat functions and are an essential habitat feature of native salmonids at a variety of life stages (McIntosh et al., 2000). Furthermore, studies have repeatedly shown that salmonid production is positively correlated with pool quality, volume, and frequency (Meehan, 1991; McIntosh et al., 2000).

The extent to which hillslope and riparian soils would be disturbed and mobilized to the stream channel would potentially reduce pool habitats (McIntosh and others 1994, 2000). The proposed treatments inside RHCAs would not likely affect pool frequency or quality due to the mandatory buffer zones (PDC) and limited scope of activities. Residual slash and the unharvested areas are expected to filter loosened sediment before it reaches the streams. Sediment transport as a result of implementing fuels projects would be filtered through vegetation along the streambanks and throughout the RHCAs during overland flows due to the limited scope of treatments and their proximity to streams (reference Hydrologist Report). For areas outside of RHCAs, analysis conducted in the Hydrologist Report indicates that Alternative 2 could potentially elevate sediment delivery during project implementation.

Project implementation has the potential to affect pool quality, but with application of PDC and BMPs this fine sediment inputs are expected to be minor and likely negligible (reference Hydrologist report). Reconstruction of roads within RHCAs and potential sediment delivery zone (PSDZ) would improve drainage and reduce sedimentation from the existing condition via installation of temporary culverts and/or armored drainage dips. Some of the road reconstruction or improvements would occur at stream crossings; reference Measure 1. Sediment transport as a result of implementing fuels projects would be filtered through vegetation along the streambanks and throughout the RHCAs during overland flows due to the mosaic fire patterns in the area. Prescribed burning would be implemented over approximately 10 years and in different seasons resulting in reduced potential for sedimentation; reference Measure 1.

In summary, minor, short-term (<2 years/project implementation period) impacts to pool frequency and quality could occur in streams across the project area from elevated sediment delivery during project implementation but effects would likely be negligible and immeasurable; reference Measure 1. In some areas, pool frequency and quality would be expected to *increase* in the short-term (1-3 years), due to restoration work at stream crossings after project implementation and with limited tree felling in areas where hardwood treatment would occur. After completion of the project, pool frequency and quality would improve as sediment levels are reduced below the existing condition (pre-project) from closure and rehabilitation of roads in RHCAs (Reference Hydrologist Report). Reducing the density of conifers within the RHCAs would likely lead to an increase in density of riparian species that can reduce sediment transport and create additional refuge for fish, thus improving quality and the quantity of pool habitat for aquatic species. In addition, long-term (3-100+ years), pool frequency and quality would increase due to large trees falling into the channel, capturing sediment and developing pool habitat. The proposed action would move the measure towards the desired future condition; reference Aquatic Species Report.

Cumulative Effects

The area of analysis for cumulative effects on pools is the project area. RHCAs are deficient in pools due to past riparian management. Potential cumulative effects are referenced above (Environmental Consequences Section-Chapter 3). Specifically, Present and Reasonably foreseeable future projects with the potential to decrease pool frequency and quality include: livestock grazing under the Westside Allotments EA, Ochoco Summit OHV trail and the Forest/District Firewood Program.

Similar to Measure 1, the Ochoco Summit OHV trail system project could potentially affect sediment via numerous stream crossings but impacts would be mitigated by overall project design (avoidance of sensitive areas including fish bearing streams) and PDC, including armored crossings, use bridges, etc.

Livestock grazing under the Westside Allotments EA has the potential to add cumulatively to the Jackson project via localized fine sediment delivery. However, in general, grazing conditions are incrementally improving from changes in management activities due to Westside AMP EA. Reference Range Resource Report, specifically environmental effects, existing condition trend and monitoring data and Measure 2 & 5, for additional discussion on effects from livestock grazing. Implementation of restoration projects under the Deep EA may result in short-term, localized sediment delivery but fine sediment inputs are expected to be minimal and short-term (1-3 months/10 years) considering small scope, limited duration of activities and PDC and BMPs.

Projects that may improve pool frequency and quality include implementation of the Ochoco TMR and Deep EA. Implementation of the Ochoco TMR would restrict access to designated open roads and, possibly reduce illegal wood cutting. Implementation of the Deep EA includes LWD placement on 3.6 miles of streams in the planning area; 1.5 miles of LWD placement have occurred to date. LWD placement would facilitate the development of pools short (1-5 years/project implementation) and long term (5-100 years); Additionally, the Deep EA proposes to close or decommission 47.1 miles of road; 40.9 miles have been accomplished to date. Reference hydrologist report for estimate of amount of sediment reduced from above activities.

Still, this alternative may add cumulatively to increasing, minor, short-term (<2 years/project implementation period) impacts to pool frequency and quality from elevated sediment delivery during project implementation. However, impacts would be relatively minor when considering the scope of the project area, duration of implementation (up to 10 years), and distribution of activities across the watershed. Long-term (post project completion), pool frequency and quality would improve as sediment levels are reduced below the existing condition (pre-project) from closure and rehabilitation of roads in RHCAs. In addition, potential negative impacts would be off-set by short and long-term recruitment of LWD from thinning (PCT) hardwood stands, prescribed fire and implementation of the DEEP EA, and Ochoco TMR but somewhat diminished from illegal firewood cutting activities. The proposed action would move the measure towards the desired future condition; reference Aquatic Species Report.

Alternative 2 would be consistent with applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report). Alternative 2 would not be consistent with all PDC in the Programmatic BA, specifically sediment: (C.2, C.4 and C.6); reference in Fisheries Specialist Report, FEIS Appendix C). However, BMPs and project design criteria developed for the project area would provide protection of water quality and avoid adverse effects of sediment to frogs and frog habitat and also fish.

Measure 5: Streambank Condition (% stream bank stability, channel width to depth ratio)

The proposed treatments inside RHCAs and across the project area would not likely affect streambank stability and channel width-to-depth ratios. In RHCAs, treatments would not affect bank stability or channel width-to-depth ratios because of the limited scope of activities and proximity to streambanks. PDC stipulate that all logging equipment and off road vehicles would be kept at least 50 feet away from stream banks on class I, II and III streams and at least 20 feet from the banks on class IV streams. In class I, II and III streams, mechanized equipment would be limited to existing disturbance, only existing skid trails, crossings and landings between 50 and 100 feet from stream channels.

There would be a short-term (<2 years/duration of project) reduction in bank stability at stream crossings associated with project activities (reference measure 1) but effects would be minimized by placing temporary culverts or armoring crossings and restoring banks through planting, seeding and placing structures such as log-veins or upstream rock-v's to reestablish banks and narrow the stream channel (reference PDC, soil and water, transportation chapter 2).

Pulling the trees out of the RHCA would cause a temporary removal of vegetation from the top of the soil for the first one to three months until vegetation regrows. Vegetation would return (after one full growing season) to the disturbed sites eventually restabilizing any disturbed areas. The vegetation along the stream would filter sediment that may move as a result of harvest as it would not be disturbed during activities. Furthermore, bank stability would increase due to denser stands of hardwoods and other riparian plants along the stream channel once the conifer canopy is reduced. With an increase in hardwoods and other riparian plants (over the next 5-15 years) the width-to-depth ratio would decrease as the channels narrowed (over the next 10-20 years) due to sediment being captured by the reestablishing riparian plants and other woody debris. Non-commercial thinning would not cause soil or bank disturbance. Impacts from prescribed fire activities are not expected to impact bank stability.

Elevated sediment delivery to streams can also degrade channel form, i.e., width-to-depth ratios; increased sediment delivery increases stream width and decreases stream depth in depositional reaches (Dose and Roper, 1994). Both width and depth can respond rapidly to changes in sediment load and/or discharge. Whether a stream erodes downward or outward is influenced by both local shear stresses and whether the bed or banks are the most easily eroded. As described in Measure 1 and 2, potential, (short-term) effects from elevated sediment delivery and increase in peak flows may occur but would be not be expected to affect width to depth ratios in the project area (see Hydrologist Report for assumptions on timing of peak flows and sediment delivery).

In summary, minor, short-term (<2 years/during project implementation), impacts may occur to bank stability at stream crossings and potentially via elevated sediment delivery and, to a lesser extent, higher peak flows. Similarly, small, incremental changes to w/d ratios in localized areas may occur during project implementation but would not likely be measurable. Long-term improvements (post implementation) to bank stability and width-to-depth ratios would occur overtime as crossings are rehabilitated, improvement of riparian vegetative condition, roads are closed and rehabilitated, peak flows and potential elevated sediment delivery reduces to below background levels, and LWD is recruited and channels narrow. The proposed action would move the measure towards the desired future condition; reference Aquatic Species Report.

Cumulative Effects

The area of analysis for cumulative effects on streambank conditions is the project area. Width-to-depth ratios are consistently below Forest Plan standards across the watershed due to past riparian management. However, streambanks are generally stable and meet FP standards (where data is available). Harvest and other management history on National Forest lands are summarized in the Jackson Vegetation Report. Cumulative effects of past harvest and the proposed activities have been analyzed in the Jackson Hydrology Report. Potential cumulative effects that may affect streambank condition are included in Environmental Consequences Section-Chapter 3. In summary, the treatment history in the project area has affected the ability of these watersheds to provide vigorous and stable riparian habitat; stream channel width and depth can respond rapidly to changes in sediment load and/or discharge.

Specifically, Present and Reasonably Foreseeable future projects that may decrease streambank condition include: livestock grazing under the Westside Allotments EA, Ochoco Summit OHV trail and the Forest/District firewood program. Minor, short-term construction related effects (armored crossings, use bridges) to streambank stability from the Ochoco Summit OHV trail System Project

may occur. Long-term (>5 years) impacts would be mitigated by overall project design (avoidance of sensitive areas including fish bearing streams) and PDC, including armored crossings and utilization of bridges.

Reference Range Resource Report, specifically environmental effects, existing condition trend and monitoring data. Livestock grazing in the project area has a primary influence on stream bank condition due to bank trampling and removal of streamside vegetation (e.g. willows, aspen, and sedges). Based on stream survey data, bank conditions (w/d ratios) where cattle have been grazing are not meeting RMOs (Forest Plan) and in some cases for their potential stream channel type. By treating uplands and reducing canopy closure in forested stands, sunlight reaching the forest floor would result in a subsequent increase in forage in upland areas. In treated areas the newly sprouted vegetation would increase forage palatability and nutrient levels for the first three years which would make it easier to attract cattle away from riparian areas to uplands. The previously burned vegetation would then return to a normal level of nutrients as it became part of the landscape, leading to increased riparian plant growth and bank stability. This may alleviate some grazing pressure and trampling in RHCAs, but bank stability would not likely improve significantly until existing and planted hardwood communities are protected from grazing through construction of exclosures or changes in local range management practices.

In general, grazing conditions are incrementally improving from changes in management activities due to Westside AMP EA. Under Westside implementation, riparian species have more protection from being overly utilized by cattle and would likely exhibit more vigorous growth (due to the increase in available resources from thinning) which would lead to increased bank stability.

Projects that may improve streambank condition include implementation of the Ochoco TMR and the Deep EA. Implementation of the Ochoco TMR would restrict access to designated open roads and possibly reduce illegal wood cutting and access to sensitive areas. Implementation of the Deep EA includes LWD placement on 3.6 miles of streams in the planning area; 1.5 miles of LWD placement have occurred to date. LWD is expected to narrow stream channels over time, thus incrementally reducing w/d ratios and potentially increasing bank stability. Additionally, the Deep EA proposes to close or decommission 47.1 miles of road; 40.9 miles have been accomplished to date. Reference hydrologist report for estimate of amount of sediment reduced from above activities. Peak flows and potential elevated sediment delivery reduces to below background levels, and LWD is recruited and channels narrow therefore reducing impacts to streambank stability and width-to-depth ratios short and long-term (5-100 years).

Still, this alternative may add cumulatively to increasing, minor, short-term (<2 years/during project implementation) impacts to streambank condition, specifically at stream crossings and from elevated sediment delivery; reference Measure 1. However, impacts would be relatively minor when considering the scope of the project area, spatial and temporal distribution of activities (up to 10 years and across the watershed) and application of PDC and BMPs. Long-term (> 10 years/post project completion), streambank condition would improve as sediment levels are reduced below the existing condition (pre-project) from closure and rehabilitation of roads in RHCAs. In addition, potential impacts would be off-set by short and long-term recruitment of LWD from, thinning hardwood stands, prescribed fire and implementation of the DEEP EA, and Ochoco TMR, but somewhat diminished from illegal firewood cutting activities.

Alternative 2 would be consistent with the Programmatic BA, and applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report).

Alternative 3

Alternative 3 was designed to minimize commercial harvest and equipment in RHCAs following the guidelines of INFISH. Class I and II streams would have 300 foot buffers on each side of the stream. Class III streams would have 150 foot buffers and Class IV streams would have 50 foot buffers (Figures 7 and 8). Heavy equipment would not be allowed in these zones, except at stream crossings. Prescribed underburning and non-commercial thinning is proposed in a total of 51 units is proposed to occur within 113 acres of RHCAs. Table 85 displays the area treated non-commercially (non-commercial thinning, fire or both) by drainage for alternative 3. Treatments proposed under this alternative are in effort to move the forest ecosystem (upland and riparian areas) towards meeting RMOs and Forest Standards and Guides in the short-term and long-term future. PCT would benefit the forest by increasing large late and old structure forest types, recruiting large woody debris and increasing hardwood plant composition within RHCAs, moving the Fire Regime Condition Class toward its historic range of variability which maintained low intensity fire conditions thus decreasing high intensity fire conditions across the project area. Harvest activities would be done with low-impact, ground based equipment (e.g. rubber-tired skidders) during the low-flow season (July, August, and September). Furthermore, the following mitigations (Project Design Criteria, PDC, BMPs), would be implemented to minimize negative effects on fish/frog populations in the area:

1) No whole tree yarding in RHCAs.
2) Do not mark trees on slopes greater than 35%.
3) Flag existing skid trails and do not permit equipment to operate off of them.
4) Stipulate no new landings and flag the perimeter of existing old ones. Do not have landings within 100 feet of Class I-III streams.
5) Do not place landings or slash piles in ephemeral draws and swales.
6) Pull back/flatten out berms to reestablish drainage and reseed disturbed skid trails.

Activities requiring work in the stream, would be implemented in accordance with the *Oregon guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources* (June, 2008). For the project area, the in-water work time is July 1 through October 31.

Columbia spotted frogs and Redband trout

Noncommercial thinning and prescribed underburning and is proposed to occur within 113 acres of RHCAs. Table 85 displays the area treated non-commercially (non-commercial thinning, fire or both) by drainage for Alternative 3). Activities requiring work in the stream would be implemented in accordance with the *Oregon guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources* (June, 2008). For the project area, the in-water work time is July 1 through October 31.

Table 85. Alternative 3 non-commercial thinning and fuels treatment by RHCA stream class.

		Stream Class				
Stream Name	**Units**	**1**	**2**	**3**	**4**	**Total Area in RHCA (acres)**
Big Spring Creek	357a, 357b				1.1	1.2
Buck Hollow	299a, 302a			5.3		5.3
Crazy Creek (includes West and East Forks)	190a, 202d, 206, 241, 675, 678, 681		2.0	39.0	2.7	43.7
Deep Creek						
Derr Creek	712, 713		1.0	0.0	0.5	1.5
Dicer Meadow	637				0.5	0.5
Double Corral	707				5.0	5.0

		Stream Class				
Stream Name	**Units**	**1**	**2**	**3**	**4**	**Total Area in RHCA (acres)**
Creek						
Happy Camp Creek	237a, 237c, 604a, 635, 636a, 687, 688, 689, 691, 692		3.2		10.9	14.1
Haypress Creek	701			1.2		1.2
Jackson Creek	634, 679, 684, 685, 686	4.9	1.2		0.3	6.4
Little Summit Creek	393b, 605b, 639, 640, 641, 642, 644, 645, 649, 650, 662, 663, 667, 670,	0.3	5.0	7.6	9.1	22.0
Thornton Creek	537a, 651, 660, 658, 659		3.6		5.7	9.3
Toggle Creek	718	3.0				3.0
Totals		**8.2**	**16.1**	**53.1**	**36.1**	**113**

As proposed in alternative 2, 115 acres of "natural fuels units" are proposed in RHCAs, approximately 14 acres would occur in the outer zone of class I streams, the remainder would occur within Class II, III and IV RHCAs in the outer area of the RHCA between the stream and a fuelbreak, e.g., a road. Natural fuels is prescribed burning that would be implemented as an independent action, i.e., not associated with any thinning activities. There are 6,332 acres of RHCA in the project area. Proposed activities would affect approximately <2% of the RHCAs in the project area, 24 acres (27%) of treatment occurring within class I and II streams (see table 85 above). Similar to Alt. 2, 25 miles of temporary roads would be constructed (15 miles on existing disturbance), 0.6 miles of new temporary roads would be constructed in RHCAs.

Measure 1: Fish and frog populations – disturbance to individuals

Direct effects would be similar to Alternative 2 but reduced. Potential direct effects to frogs are possible where felled trees may strike individual frogs during thinning operations. However, risk would be extremely low due to the limited scope of operations, e.g., the limited amount of thinning adjacent primary habitat limited (actual water and/or wet meadow), within 113 acres (< 2% of RHCAs) and within 24 acres of class I and II streams, primary frog habitat. Risk to populations would be especially low when considering the relative low acreage of the proposed action in relation to the size of the watershed.

Indirect effects would be very similar to Alternative 2, but somewhat reduced to the slight reduction of commercial activity and possible reduction of stream crossings. There may be fewer temporary stream crossings in Alternative 3 because of the slightly reduced level of commercial harvest proposed in the project area (less 199 acres total) including 107 acres in RHCAs. Similarly, effects from fuels treatments would be similar to Alternative 2, but may occur at a reduced level due to the reduction of proposed burning and fuels treatments, less 1,352 acres of RHCA fuels treatments.

Similar to Alternative 2, this alternative would have the potential to elevate sediment to undesirable amounts and impact channel substrates. Potential sediment delivery in Alternative 3 would be incrementally lower because the scope of the project is reduced which decreases the amount of sediment delivered. However, due to the temporary nature of effects and through application of the PDC and BMP (Appendix C and Hydrologist report (Appendix)), it is anticipated that effects to substrate embeddedness and negative effects to fish would be minimal and short-term (1-10 years) in

duration. Closing and rehabilitating roads would reduce sediment related impacts long-term; sediment levels would return to background levels upon project completion (>10 years).

Potential effects from change in timing or peak flow magnitudes are similar to similar to Alternative 2. The projected increase in EHA in Alternative 3 is incrementally lower than in Alternative 2; 43% vs. 45% respectively because of the reduced scope of activities. Similar to Alternative 2, through the application of the PDC and BMP, there would be no expected measureable adverse effects to flow from implementation activities: timber harvest, Rx burning and roads. Though the potential for increases in peak flow and overland flow from road and skid trail crossings are acknowledged, potential effects would also largely minimized through BMPs and design criteria. Therefore, increases in peak flows would not expected to negatively impact fish and fish habitat (substrate).

In summary, minor, short-term (<2 years/duration of project) direct impacts to frogs could occur from project implementation activities at stream crossings; primarily at unimproved crossings on intermittent channels during summer foraging. Long-term effects would be incrementally decreased upon completion of project activities (closed roads). Project implementation would not be expected to directly affect fish.

Short-term (<2 years/duration of project), indirect effects to fish and aquatic habitat (substrate) could occur from elevated sediment delivery during project implementation activities but slightly less than alt. 2. Nonetheless, project activities may produce localized effects to redband trout immediately below project sites. However, PDC and BMPs including timing and magnitude of these localized effects are not expected to result in measurable effects to fish and aquatic habitat (substrate). Upon project completion, affects to fish and aquatic habitat (substrate) would improve as sediment levels are reduced below the existing condition (pre-project) from closure and rehabilitation of roads in RHCAs (Reference Hydrologist Report). In addition, long-term (3-100+ years), sediment production would decrease increase due to large trees falling into the channel, capturing sediment and developing pool habitat including pool tailouts (spawning substrate). The proposed action would move the measure towards the desired future condition.

Alternative 2 would be consistent with the applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report). Alternative 2 would not be consistent with all PDC in the Programmatic BA, specifically sediment: (C.2, C.4 and C.6)-see Appendix C. However, BMPs and project design criteria developed for the project area would provide protection of water quality and avoid adverse effects of sediment to frogs and frog habitat and also fish.

Cumulative Effects

See discussion on cumulative effects under Alternative 2. Cumulative effects in Alternative 3 would be nearly identical to Alternative 2.

Project monitoring actions are included in Chapter 2 of FEIS.

Measure 2: Water Temperature (stream shade)

Effects would be similar to Alternative 2 but reduced. Risk to affecting stream shade and subsequently temperature would be reduced primarily through the reduction of the amount of Rx burning and hardwood treatments proposed. Similarly, beneficial effects to promoting hardwoods, increasing shade long term, thus incrementally reducing temperature, would be reduced.

Table 86. Proposed non-commercial hardwood treatments for Alt. 3 including streams adjacent 303(d) list for water temperature; 303d streams highlighted in bold.

		RHCA category				
Streams	303 D listed	**1**	**2**	**3**	**4**	**Grand Total**
Big Spring Creek					1.1	1.1
357b					1.1	1.1
Buck Hollow				5.2		5.2
299a				3.5		3.5
302a				1.7		1.7
Crazy Creek	**X**		**2.0**	**39.0**	**2.7**	**43.7**
202d	**X**				**1.3**	**1.3**
675	**X**		**1.0**			**1.0**
678	**X**		**1.0**			**1.0**
681	**X**				**0.5**	**0.5**
224e	**X**				**0.6**	**0.6**
218	**X**			**39.0**	**0.2**	**39.2**
Derr Creek	**X**		**1.0**		**0.5**	**1.5**
712	**X**		**1.0**			**1.0**
713	**X**				**0.5**	**0.5**
Dicer Meadow					0.5	0.5
637					0.5	0.5
Double Corral Creek	**X**				**5.0**	**5.0**
707	**X**				**5.0**	**5.0**
Happy Camp Creek	**X**		**3.2**		**10.9**	**14.1**
237a	**X**		**1.3**		**1.0**	**2.3**
237c	**X**		**1.9**			**1.9**
604a	**X**				**2.7**	**2.7**
635	**X**				**0.7**	**0.7**
636a	**X**				**1.9**	**1.9**
687	**X**				**0.8**	**0.8**
688	**X**				**1.2**	**1.2**
689	**X**				**1.2**	**1.2**
691	**X**				**0.5**	**0.5**
692	**X**				**0.5**	**0.5**
Haypress Creek				1.2		1.2
701				1.0		1.0
Jackson Creek	**X**	**4.9**	**1.2**		**0.2**	**6.3**
634	**X**		**1.2**			**1.2**
679	**X**	**1.0**				**1.0**
684	**X**	**1.0**				**1.0**

		RHCA category				
Streams	303 D listed	**1**	**2**	**3**	**4**	**Grand Total**
685	**X**	**1.0**				**1.0**
686	**X**	**1.9**				**1.9**
Little Summit Creek	**X**	**0.2**	**5.0**	**7.6**	**8.9**	**21.7**
393b	**X**				**0.9**	**0.9**
605b	**X**			**3.0**	**1.1**	**4.1**
639	**X**			**0.9**		**0.9**
641	**X**		**1.0**	**3.3**		**4.3**
642	**X**		**1.9**			**1.9**
644	**X**		**0.8**		**0.1**	**0.9**
645	**X**		**1.0**			**1.0**
649	**X**				**0.5**	**0.5**
650	**X**				**0.5**	**0.5**
662	**X**				**3.5**	**3.5**
663	**X**				**0.5**	**0.5**
667	**X**				**0.5**	**0.5**
670	**X**				**0.5**	**0.5**
Thornton Creek	X		3.6		5.6	9.2
537a					4.1	4.1
651			1.0			1.0
660					0.5	0.5
655					0.5	0.5
658			0.9			0.9
659			1.7			1.7
Toggle Creek	**X**	**3.0**				**3.0**
718	**X**	**3.0**				**3.0**
Grand Total		**8.1**	**16.0**	**52.9**	**35.3**	**113**

In this alternative, non-commercial thinning would occur to within five to ten feet of stream channels. Only trees that do not provide shade or provide bank stability would be removed so that the existing amount of stream shade is maintained, unless hand thinning benefits hardwoods. Non-commercial thinning would reduce the competition between riparian-associated species and conifers resulting in more woody, shrubby species. However, only thinning 24 acres of class I & II streams (towards outer edge of RHCA) in this alternative, thus limiting the effects (potential short term negative and long term positive). Limited non-commercial thinning would result in increased growth rates for both conifers and riparian shrubs. Conversely, the canopy cover provided by the overstocked conifers that are left (trees over six inches) after non-commercial thinning occurred would continue to shade out hardwoods and hinder their growth and expansion.

Of the 113 acres proposed for non-commercial thinning in RHCAs, 95 acres (49 units[15]) would specifically target suppressed riparian hardwood stands to thin out encroaching conifers (Table 86). Of those 95 acres, 78 acres (37 units) would occur adjacent 303d listed streams. Non-commercial thinning adjacent 303d listed streams would occur on 8.1 acres along class I streams and 12.4 acres are along class II streams. Similar to Alternative 2, no measurable effects to temperature should result from implementation of the project from changes in channel morphology-see Measure 5.

There would not be any measurable loss of shade or increase in water temperatures in any fish bearing or non-fish bearing perennial streams in the planning area. There is a potential to increase water temperature in intermittent non-fish bearing streams (class IV) when they are flowing, but this should not result in a violation of state water quality standards because these streams go dry before peak water temperatures occur in the watershed. However, the risk is extremely low and would not be measurable when considering the scope of proposed activities described above.

Alternative 2 would be consistent with the Programmatic BA, and applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report).

Cumulative Effects

See discussion on cumulative effects under Alternative 2. Cumulative effects in Alternative 3 would be nearly identical to Alternative 2.

Alt. 3 would add cumulatively to decreasing shade in the short-term (1-15 years) by thinning out competing conifers in hardwood stands but on a very limited scale; 20 acres along Class I & II streams distributed across the watershed. Additionally, shade may be impacted by application of limited prescribed burning activities within RHCAs (228 acres) but effects would likely be short-term (<1 year). In the long-term (5-100 years), it is anticipated that shade would be improved due to increased growth of riparian hardwoods or increased growth rates of residual trees. Regardless, there should not be any measurable increase in water temperatures in any fish bearing or non-fish bearing perennial streams in the planning area. There is a very low potential to increase water temperature and reduce shade (up to 14 acres) in intermittent non-fish bearing streams (Class IV) when they are flowing, but this should not result in a violation of state water quality standards because these streams typically go dry before peak water temperatures occur in the watershed.

Monitoring

Project monitoring actions are included in Chapter 2 of FEIS.

Measure 3: Large Wood (number of large wood pieces/100')

Potential effects are similar to Alternative 2. However, the decrease in acres (107) of commercial harvest in Alternative 3 reduces the potential to improve the vigor and production of large trees that could become large woody debris in streams in the future. In stream reaches that are deficient in LWD, fewer trees would be felled into the stream channel to move streams toward meeting the Large Woody Debris (particularly any trees > 9" dbh (but less than 21" dbh).

Non-commercial thinning and underburning would still occur within RHCAs, but at a much reduced level, (1,581 acres vs. 228 acres) and would produce a similar reduction in potential effects as discussed in Alternative 2. However, the overstocked densities of trees too large for noncommercial thinning would remain, thus reducing the potential of achieving RMOs (in a shorter time-frame than if commercial harvest and increased PCT occurred) that are discussed in Alternative 2. Since no large wood that contributes to in-stream habitat would be removed, and no wood would be removed from

[15] Units with >0.5 acre(s) of proposed activity

active flood channels (with the exception of underburning), there would be no effect directly or indirectly on in-stream wood or habitat for fish.

Alternative 2 would be consistent with the Programmatic BA, and applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report).

Cumulative Effects

Cumulative effects in Alternative 3 would be similar to Alternative 2.

Project monitoring actions are included in Chapter 2 of FEIS.

Measure 4: Pool Frequency (pools/100') / Pool Quality/ Sediment

Potential effects are similar to Alternative 2, though commercial and non-commercial thinning and underburning would still occur within RHCAs, but at a much reduced level (see LWD discussion above). Regardless, pool frequency or pool quality would not be directly affected by the RHCA thinning, underburning or upland treatments under this alternative because wood, flow regime and stream stability would not be measurably changed due to thinning set-backs (PDC) and the low intensity of underburns in these humid environments.

As described in Alternative 2, analysis conducted in the Hydrologist report indicates that this alternative could potentially elevate sediment delivery during project implementation, but would be incrementally less than Alternative 2 (reference Measure 1 above). Still, minor, short-term (<2 years/duration of project) impacts to pool quality could occur but long-term (>10 years/project completion) improvement would be anticipated from closure and rehabilitation of roads in RHCAs.

However, fish and frog habitat would remain at its current condition because of the lack of large trees present to fall into the stream that could create pools and catch sediment. These conditions would remain until existing trees grow to adequate size (LWD ≥ 12' dbh, INFISH) and then fall into the stream (15-30 years), leading to an increase in pool frequency and quality.

Alt. 3 would be consistent with applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report). Alternative 2 would not be consistent with all PDC in the Programmatic BA, specifically sediment: (C.2, C.4 and C.6); reference Aquatic Species Report. However, BMPs and project design criteria developed for the project area would provide protection of water quality and avoid adverse effects of sediment to frogs and frog habitat and also fish.

Cumulative Effects

Cumulative effects in Alternative 3 would be similar to Alternative 2.

Measure 5: Streambank Condition (% stream bank stability, channel width to depth ratio)

Effects would be similar to Alternative 2. However, the risk of potential effects would be reduced because of the reduced amount of activity proposed in RHCAs. Non-commercial thinning would not disturb streambanks, especially with application of PDC. As in Alternative 2, indirect effects of this alternative would be an increase in bank stability due to an increase in stands of hardwoods and other riparian plants along the stream channel once the conifer canopy (< six inch dbh) and grazing pressure is reduced. However, this beneficial effect would be limited due to the reduced scope of proposed thinning adjacent the inner riparian area.

Effects of roads would be very similar to Alternative 2, as the amount of new temporary road construction would be the same. As in Alternative 2, all stream crossings would be limited to roads over culverts on the class I and II streams and on existing roads that cross dry channels of class III

and IV streams over a temporary culvert or an armored ford, as few crossings as reasonable would be used in these streams and crossings would be rocked or a temporary culvert would be placed to reduce sediment transport. There may be fewer temporary stream crossings in Alternative 3 because of the slightly reduced level of commercial harvest proposed in the project area (less 199 acres total) including 107 acres in RHCAs, Therefore, reducing the amount of temporary stream crossings that would negatively impact streambank stability.

Similar to Alternative 2, and as described above in Measures 1 (disturbance) and 4 (pool quantity and quality), minor short-term (<2 years/duration of project) effects from elevated sediment delivery and increase in peak flows to streambank condition may occur but would be minimized with application of PDC and BMPs. Minor, short term (<2 years/duration of project), impacts would occur to streambank conditions at stream crossings. Long-term (>10 years/project completion) improvements to bank stability and width-to-depth ratios would occur overtime as crossings are rehabilitated (as described in Alt. 2 above), LWD is recruited and channels narrow.

Alternative 2 would be consistent with the Programmatic BA, and applicable INFISH and ONFLRMP standards and guidelines (reference Forest Plan consistency table in Aquatic Species Report).

Cumulative Effects

Cumulative effects in Alternative 3 would be similar to Alternative 2.

Effects Determination

Determination for Alternatives 2 and 3 is MIIH, may impact individuals or habitat of redband trout, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species. Treatments would occur outside spawning (April to June). These dates are also within the in-water work period (ODFW 2008).

Determination for Alternatives 2 and 3 is MIIH, may impact individuals or habitat of Columbia spotted frog, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species. Treatments activities would occur outside breeding season (March 1 to May 1) within channel migration zone to reduce vulnerability of frogs to any possible effects. These dates are also within the in-water work period (ODFW 2008).

Wildlife

The following section is summarized from the Wildlife Specialist's Report, which is located in the Jackson project file at the Paulina Ranger District, Prineville, OR (See Map 12 in Appendix D for Key Wildlife Areas).

This section describes the existing condition for Threatened, Endangered, Region 6 Regional Forester Sensitive wildlife species, Ochoco National Forest Plan Management Indicator species, Neotropical Migratory Birds (Focal Species), and habitat components for the Jackson Final Environmental Impact Statement (FEIS). Impacts to Threatened, Endangered, and Sensitive fauna, and the effects determinations and Biological Evaluation are also included in this report.

The project area is commonly referred to as scabland stringer country. Although, the southwest portion of the project area is truly scabland stringer with the drainages containing the forested areas and non-forest vegetation occupying a large portion of the country between the drainages. The remainder of the project area contains more contiguous forest with non-forest vegetation continuing to dissect the landscape. The forested areas make up 71% of the project area and the non-forest portion makes up 28% of the project area. The non-forest portion is dominated by low and stiff sagebrush/bunchgrass communities with scattered juniper, although meadows, rock and aspen stands

are also grouped within the non-forest vegetation. The project area contains a diversity of vegetation due to a wide variety of soils and land types. The dry grand fir Plant Association Group (PAG) is the most common forest type in the project area and occurs throughout most of the project area. Tree species found on these sites include ponderosa pine, Douglas-fir, western larch, lodgepole pine and grand fir. Within the dry grand fir PAG, are stands dominated by lodgepole pine. These lodgepole dominated stands are fairly unique and occur along several streams within the watershed. One exception is the southwest portion of the project area which is dominated by the Douglas Fir PAG along the Deep Creek corridor and the Mesic Ponderosa Pine PAG's. The moist grand fir PAG is the least common plant association group and is primarily associated with drainages in the northwestern portion of the project area. The xeric ponderosa pine PAG sites are scattered and primarily occur on ridge tops with shallow soils and are often bordered by sagebrush scablands or juniper woodlands. Small remnant aspen clones are scattered throughout the watershed. They are primarily associated with springs, seeps and streams. Riparian shrub communities such as willow, alder, and red-osier dogwood occur at a wide variation in densities along streams throughout the project area.

The combination of vegetation types that occur within the project area provides habitat for a variety of terrestrial wildlife species. Several species that are considered to be relatively uncommon or rare on the Forest or have been observed and recorded within this watershed, include: golden eagle, bald eagle, sage-grouse, black-backed woodpecker, wolverine, American marten, snowshoe hare, sandhill crane, and Lewis' woodpecker. Some of the rare sightings, for example marten, are not confirmed sightings and are not believed to occur on the Ochoco National Forest or in the project area. The following species are considered common in the watershed: badger, beaver, black bear, bobcat, coyote, cougar, great horned owl, long eared owl, long-tailed weasel, ruffed grouse, northern goshawk, pileated woodpecker, pronghorn, pygmy nuthatch, red-tailed hawk, downy woodpecker, coopers hawk, northern harrier, osprey, Rocky Mountain elk, western bluebird, long-toed salamander, Pacific tree frog, northern pygmy owl and white-headed woodpecker. Introduced species of terrestrial fauna that have sightings in the watershed include the wild turkey. Many other species of terrestrial wildlife are likely to occur within the watershed but have not been included in the sighting records to date.

Threatened, Endangered and Sensitive Species (TES)

Management activities considered in this Environmental Analysis require a Biological Evaluation (BE) to be completed (FSM 2670.1,2671.44). The biological evaluation process (FSM 2672.43) is intended to conduct and document activities necessary to ensure proposed management actions would not likely jeopardize the continued existence or cause adverse modification of habitat for:

A. Species listed as Endangered (E) or Threatened (T), or Candidate (C) to be listed by the USDI Fish and Wildlife Service. Greater sage-grouse and California wolverine, both candidate species are the only terrestrial wildlife species federally listed or under review for listing under the Endangered Species Act that are likely to occupy any portion of this project area. Both of these species were found to be warranted for federal listing in 2010, but are precluded from listing action due to higher listing priorities.

B. Species listed as Sensitive (S) by the USDA Forest Service Region 6 that are suspected or documented on the Ochoco National Forest (USDA Forest Service, 2008). Sensitive terrestrial species potentially occurring on the Ochoco National Forest include: bald eagle, wolverine, peregrine falcon, upland sandpiper, bufflehead, tricolored blackbird, Lewis's woodpecker, white-headed woodpecker, Townsend's big-eared bat, silver bordered fritillary, Johnson's hairstreak, Crater Lake tightcoil snail, Greater sage-grouse, and pygmy rabbit.

SPECIES ADDRESSED FOR THE PROJECT AREA

Threatened, Endangered, and Sensitive (TES) species that are documented or suspected to occur on Ochoco National Forest are listed in Table 87.

Table 87. List of Threatened, Endangered, and Sensitive species, their status, and presence in the Jackson project area.

Species	Listing	Presence
Northern Bald Eagle (*Haliaeetus leucocephalus*)	Sensitive	Confirmed (documented within project area)
California Wolverine (*Gulo gulo*)	Sensitive	Suspected (documented on the Ochoco National Forest, unconfirmed sightings in the project area)
Pygmy Rabbit (*Sylvilagus idahoensis*)	Sensitive	Not Present (suitable habitat does not occur in the project area)
Peregrine Falcon (*Falco peregrinus anatum*)	Sensitive	Present (suitable nesting habitat does not occur within the project area, sightings on the Ochoco National Forest)
Greater Sage-Grouse (*Centrocercus utophasianus*)	Sensitive	Suspected (sightings within project area)
Bufflehead (*Bucephala albeola*)	Sensitive	Not Present (suitable habitat not present in the project area)
Upland Sandpiper (*Bartramia longicauda*)	Sensitive	Suspected (no sightings in the project area))
Lewis's Woodpecker (*Empidonax wrightii*)	Sensitive	Confirmed (documented in the project area)
Townsend's big-eared bat (Corynorhinus townsendii)	Sensitive	Not Present (suitable habitat not present within the project area)
White-Headed Woodpecker (Picoides albolarvatus)	Sensitive	Confirmed (documented in the project area)
Tricolored blackbird (*Agelaius tricolor)*	Sensitive	Not Present (suitable habitat not present within the project area)
Silver-Bordered fritillary Butter (*Bolaria selene*)	Sensitive	Suspected (no sightings within the project area)
Johnson's hairstreak (*Callophrys johnsons'*)	Sensitive	Suspected (no sightings within the project area)
Crater Lake Tightcoil (*Pristiloma arcticum crateris)*	Sensitive	Suspected (no sightings within the project area)

There are no federally listed Threatened or Endangered terrestrial wildlife species known to occur on the Ochoco National Forest. The Northern bald eagle was delisted in 2007 and is now addressed as a sensitive species on the Ochoco National Forest. The Ochoco National Forest is also within the listing range for the Canada lynx *(Lynx canadensis)*, but Canada lynx habitat was remapped in 2001. Due to insufficient quantities of primary habitat, Key Linkage Areas (KLA) and Lynx Analysis Units (LAU) are not currently mapped on the Ochoco National Forest. In addition, The Deschutes and Ochoco National Forests requested informal consultation (March 30, 2001) on continued implementation of their respective Land and Resource Management Plans (LRMPs) with LAUs mapped in accordance with the 2000 LCAS. The U. S. Fish and Wildlife Service (USFWS) gave concurrence that the mapping was consistent with the current mapping direction. Based upon the lack of habitat to support lynx residency and reproduction and the view that lynx are not a resident, reproductively active animal in Oregon, it has been concluded that implementing forest plans using the current mapping would result in "may affect, but not likely to adversely affect" (NLAA) conflict determinations (May 24, 2001 and June 22, 2001). The Regional Foresters Special Status Species list dated December 9, 2011 does not have the Canada Lynx as either suspected or documented on the Ochoco National

Forest. Sensitive species that are not listed as documented or suspected on the Regional Foresters Sensitive Species list for the Ochoco National Forest are not analyzed for potential effects.

Of the 14 species listed in Table 97, the project area contains potential habitat for eight species including the bald eagle, greater sage-grouse, white-headed woodpecker, upland sandpiper, Lewis's woodpecker, silver-bordered fritillary butterfly, Johnson's hairstreak, and California wolverine. These species are discussed in the following text.

Summary of Determinations

Table 88 summarizes the determinations for effect/impact on the species assessed in this BE.

Table 88. Summary of Effects Determinations for Threatened, Endangered and Sensitive Species for the three Alternatives for the Jackson Project.

Species	Listing	Presence/Absence	Alt. One	Alt. Two	Alt. Three
Bald Eagle	Sensitive	Confirmed	NI	MIIH	MIIH
California Wolverine	Sensitive	Suspected	NI	MIIH	MIIH
Pygmy Rabbit	Sensitive	Not Present	NI	NI	NI
Peregrine Falcon	Sensitive	Suspected	NI	NI	NI
Greater Sage-Grouse	Sensitive	Confirmed	NI	NI	NI
Bufflehead	Sensitive	Suspected	NI	NI	NI
Upland Sandpiper	Sensitive	Suspected	NI	NI	NI
Lewis's Woodpecker	Sensitive	Confirmed	NI	MIIH	MIIH
White-Headed Woodpecker	Sensitive	Confirmed	NI	MIIH	MIIH
Tri-Colored Blackbird	Sensitive	Not Present	NI	NI	NI
Silver-Bordered fritillary	Sensitive	Suspected	NI	NI	NI
Johnson's hairstreak	Sensitive	Suspected	NI	MIIH	MIIH
Townsend's big-eared bat	Sensitive	Not Present	NI	NI	NI
Crater Lake tightcoil	Sensitive	Not Present	NI	NI	NI

NE – No 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 the Species.

Northern Bald Eagle

Existing Condition:

The northern bald eagle *(Halaieetus leucocephalus)* was officially de-listed as a federal threatened species on August 8, 2007. While the bald eagle has been de-listed, they are still protected under the Bald and Golden Eagle Protection Act of 1940. The U.S. Fish and Wildlife Service (2007) prepared Bald Eagle Management Guidelines to help landowners, land managers, and others to meet the intent of this Act. In addition, monitoring of selected bald eagle nest sites will continue to occur including sites on national forest system lands. The Land and Resource Management Plan (LRMP) also provides protection for nest and roost sites by restricting activities during the nesting and roosting periods. The LRMP also provided direction for the management of roosting habitat through the designation of Eagle Roosting Areas (MA-F12).

There are no known bald eagle nests or winter roost sites within the Jackson project area. Little Summit Prairie provides potentially suitable unoccupied foraging habitat for a nesting pair; however, there are no nearby open water bodies that would provide foraging opportunities early in the nesting season. Suitable nest trees do occur south of the prairie on the north facing slope. Deep Creek is the largest stream in the project area and could potentially provide suitable unoccupied foraging and nesting habitat. However, it is not clear if Deep Creek has the capacity to provide an adequate and consistent food supply for a nesting pair of bald eagles.

Alternative 1

There would be no activities associated with the Jackson project that would affect bald eagles or their habitat within the project area. There could be increased risk of loss of habitat due to future wildfire intensity or extent due to retention of existing fuel loads and continuation of fuel development and accumulation over time. However, predicting the impact of future events on bald eagle nesting, roosting or foraging areas in a quantitative manner is difficult because of uncertainties regarding the location and conditions under which such future events might occur. Trees with potential as future nest sites may be weakened by stress from competition, and succumb to insect infestation. Once the live overstory trees die, they become less attractive as nest sites for bald eagles. The determination for the **No Action Alternative is no impact (NI),** because there would be no alteration of habitat (or change from current trends) and no change in potential disturbance levels.

Alternatives 2 and 3

Both action alternatives would have similar effects to bald eagles. There are no known nests or winter roosts located in the project area. Use within the project area is believed to be incidental foraging activity. Both alternatives could improve habitat for this species in the short term by creating slightly more open forest conditions which could make prey and carrion more accessible, but the project may also have some potential to result in disturbance to infrequent foraging eagles. Both alternatives could lead to increased longevity of large live ponderosa pine in the future which could maintain potential future nesting habitat. However, the lack of high quality foraging habitat in this watershed limits the potential of this project area to contribute to essential habitat for this species. Therefore, the determination of effect of both action alternatives on the bald eagle is “May impact individuals or habitat, but not likely to result in a trend toward federal listing or loss of viability of the species or populations (**MIIH**).

Cumulative Effects

Past activities, ongoing projects and reasonably foreseeable activities are not expected to combine with effects from this project to result in cumulative effects that would be greater than the effects described above for each alternative.

California Wolverine

Existing Condition:

California wolverine habitat is best described in the terms of its ability to provide seclusion and freedom from disturbance while also providing foraging habitat and a prey base (Ruggiero et al., 1994). Wilderness areas, large tracts of roadless areas, high elevation alpine areas and other similar habitats provide the highest quality habitat and are where wolverines are most often found. Reproductive habitat would primarily be located on north slopes in large structure moist grand fir, subalpine fir plant associations or boulder fields. The project area has a very low potential of providing reproductive habitat for wolverines because the area lacks high elevation moist grand fir or sub alpine habitat types and there are no boulder fields in the project area. Foraging sources vary and include everything from small rodents to large ungulates, both in the form of active kills and the scavenging of carcasses (Ruggiero et al., 1994). Prey base within the watershed has probably

increased as big game herds have increased. Wolverines often exhibit large territories, meaning- they will actively travel in search of food/prey and mating opportunities. These territories and home ranges may vary seasonally by following the vagaries of foraging sources.

The project area is within the historic range for wolverines and wolverine sightings are recorded within the watershed. There were two unconfirmed sightings of wolverine in the Jackson Creek subwatershed in 1985 and 1994. Additional sightings are recorded south of the project area. Sightings have also been documented on the Deschutes and Malheur National Forests and elsewhere on the Ochoco National Forest. Winter Track surveys have been conducted in the project area with no wolverine tracks being observed. High road densities (>2 mi/sq.mi.) have dissected the landscape resulting in reduced habitat effectiveness and poor distribution of use by wolverines. Wolverine occurrence in the analysis area would be infrequent at best due to high road densities and human disturbance. Wolverine may be impacted by management practices that influence subalpine and alpine communities, particularly those that reduce the presence and opportunity for carrion availability (Copeland et al. 2007). Roads and other forms of human disturbance may impact wolverine (Ruggiero et al. 2007). Projects that benefit big game, a potential food source, would potentially improve the prey base for this species within the watershed.

Alternative 1

The no action alternative does not directly alter cover or forage for species that would be likely food resources for wolverine. However, there may be a higher risk of future large scale disturbance associated with this alternative. Road densities have been decreased within the project area in the past 10 years with a total of approximately 41 miles being closed. Road densities within the project area would remain at levels that would result in the habitat being undesirable for species like wolverines that avoid human activities. Under this alternative, forage for many herbivorous species would continue to decline because of the continued development of closed forest canopies resulting in less available food resources for carnivores such as wolverine. At some point in the future, forage areas would likely develop due to insect or disease outbreaks or high intensity wildfire. Thus, availability of prey would vary over time depending on the extent and intensity of future disturbance events. The determination for the no action alternative is **No impact (NI)** as there would be no impact to habitat and no change in potential disturbance levels.

Alternatives 2 and 3

None of the action alternatives propose the construction of new system/permanent roads. Temporary road construction and the opening of closed roads, proposed under both action alternatives, would increase the potential for human disturbance. However, the effects would be short-term and would not have a long-term effect on available wolverine habitat. Large wood accumulations may be affected by fuels treatment activities in the upper elevation of the northwest portion of the project area. Nevertheless, the overall effect on potential denning habitat would be considered minor because the project area has a limited amount of the moist grand fir plant association. Activities associated with both action alternatives would improve forage conditions for potential prey species and sources for carrion. This could result in increased food sources for wolverines and other large carnivores. As is in Alternative 1, the analysis area does not have sufficient reproductive habitat and only the upper portions of the analysis area provide habitat for foraging and dispersal. The project would not alter rock, talus habitat, but the project could alter large wood accumulations and vegetation, which could modify potential denning habitat.

Cumulative Effects- Alternatives 2 and 3

Management activities and uses that have occurred in the past have influenced the availability and quality of habitat for wolverine. Removal of large down wood through timber harvest or prescribed burning has altered the availability of potential denning sites for wolverine. Road construction and

development of recreation sites have altered the extensiveness and level of human activity throughout the project area, increasing the potential for disturbance to wildlife. There has also been increased forage production for big game in thinned or burned areas. Ongoing uses in the project area would continue to occur. Recreational use would continue to limit remote character in the project area. The net combined effects of implementing the alternatives in this project with the past, present and reasonably foreseeable actions in the area are the same as described under the direct and indirect effects section above.

Determination

A determination of "May impact individuals or habitat, but not likely to result in a trend toward federal listing or loss of viability of the species or populations (MIIH) was reached for alternatives 2 and 3 because: the project does not alter rock, talus habitat, but could alter large wood accumulations and vegetation, which could alter potential denning habitat. However, the project has a low probability of disturbing any wolverine due to the relatively low potential for occupancy of habitat in the project area. The project would improve the forage base for potential prey species and sources of carrion. Therefore, potential food resources for carnivores such as wolverine would be improved under the action alternatives. Wolverines may use the area and habitat modification would occur under the action alternatives, however the project is not expected to have adverse effects to this species.

Greater Sage-Grouse

Existing Condition:

The western sage-grouse inhabits areas dominated by big sagebrush. Seasonal habitats can be described as breeding (March-May), late brood rearing (June-October), and wintering (November-February). Breeding habitats are composed of leks, nesting habitat, and early brood rearing habitat. Leks, or breeding display sites occur in open areas surrounded by sagebrush (Gill et al. 1965). Preferred nesting habitat ranges from 15-30% sagebrush canopy cover, with an understory of 15% grass, and a 10% forb component. Nesting cover provides concealment of the hen and the nest. Brood rearing habitat can have less of a sagebrush component with the preferred habitat composed of 15-25% sagebrush canopy cover, with an understory of 15% grasses, and 10% of forb canopy cover. Early brood rearing habitat is usually in close proximity to nest sites, although the distance from nest sites can vary according to moisture and the availability of forbs and insects. In June and July as sagebrush habitats dry up, sage-grouse move to sites with more succulent vegetation (Connely 1983). Seasonal movements may exceed 75 kilometers (Connely et. al. 1998). Sage-grouse are dependent on large expanses of sagebrush for winter survival. A key component of sage-grouse habitat is a wide open sage-steppe setting largely free of trees or other vertical structures that could serve as perches for birds of prey. Though sage-grouse are known to use portions of Ochoco National Forest, this watershed is not identified as priority habitat for this species (ODFW, 2010).

There has been one sage-grouse sighting within the watershed noted in the wildlife sightings database. This sighting was of 4 birds, identified as adults, and was located along the middle/upper Little Summit Creek. The sighting occurred in September. There are no known leks that occur within the watershed. The nearest leks are located approximately six to eight miles south of the watershed on private and Bureau of Land Management property. Suitable sage-grouse habitat has likely always been limited within the watershed because the area lacks large contiguous blocks of sagebrush associated habitats. Little Summit Prairie, which occurs in the southeast portion of the watershed is the largest block of potential habitat within the watershed. There are no historical sightings of sage-grouse associated with Little Summit Prairie. The majority of the Prairie is privately owned and would be considered primarily mesic and dry meadow habitat.

Table 89 displays the acres of sagebrush shrub steppe communities that occur in the project area. Juniper/low sagebrush or juniper/rigid sagebrush communities that occur in the project area are not displayed. Densities of juniper in these community types would likely make the majority of these acres unsuitable for use by sage-grouse. The small patch size and lower quality of rigid sage communities on a large portion of acres reduces the suitability for use by sage-grouse. A large portion of low sagebrush associations are relatively small in size and fragmented by conifer stands or juniper associated communities.

Potential nesting habitat is limited within the project area. Mountain big sagebrush communities are represented by 413 acres in relatively small patches with relatively low sagebrush cover. Larger more contiguous blocks of suitable nesting habitat occur in closer proximity to existing leks located south of the project area. Mesic meadow and riparian habitats that could potentially provide habitat for sage-grouse comprise 2% of the project area, with 1,121 acres identified. The mesic habitats tend to be small in size, scattered, and isolated from sagebrush habitats and surrounded by conifers or juniper that would provide perch sites for raptors. The existing mesic habitats would not provide a significant habitat component for sage grouse. The project area provides limited wintering habitat for sage-grouse, primarily because of annual snow depths and the dominance of rigid sagebrush within a large portion of the watershed.

Table 89. Summary of Sagebrush Steppe Habitat Types within Deep Watershed

Watershed Acres		**54,522**
*Shrub-Steppe Habitat Type	Low sagebrush(acres/% area)	1,104 (2%)
	Mountain big sagebrush (acres/% area)	413 (< 1%)
	Rigid sagebrush (acres/% area)	9,972 (18%)

Table does not include juniper/low sagebrush and juniper/rigid sagebrush communities

Alternatives 1

There is a possibility that sage-grouse could use habitat within the planning area for foraging, but this is unlikely because the distance to the nearest known leks is too great the planning area lacks high quality. Any use that may occur would likely be associated with the northern edge of Little Summit Prairie and the stiff sage scabs that are located to the northwest of the Prairie. Alternative 1 would not affect sage-grouse habitat within the planning area. Natural succession and the expansion of juniper and pine on the edges of the open scabs and on the north portion of the Prairie could reduce potential habitat over time. In addition, the existing habitat is highly fragmented and does not contain large areas of open sagebrush habitat. The determination for the alternative 1 is **(NI) No Impact** there would be no impact to habitat and no change in potential disturbance levels.

Alternatives 2 and 3

Juniper removal is proposed in both action alternatives. Alternative 2 proposes 893 acres of treatment and Alternative 3 proposes 863 acres. These treatments would reduce juniper densities on the edges of currently identified non-forest plant association groups. These treatments could benefit the sage-grouse because these treatments may improve the vigor of sagebrush, grass, and forbs. Under all alternatives, natural succession would continue and potential sage-grouse habitat would slightly decline over time. Ongoing uses in the project area would continue to occur. Grazing would continue which can result in decreases in herbaceous forage, primarily in the form of forbs, but also some grasses and sagebrush.

Cumulative Effects

Based upon the Sage-Grouse Conservation Assessment and Strategy, and upon the recent petition finding of the U.S. Fish and Wildlife Service, the major historic actions that have affected sage-grouse populations were habitat conversion, habitat fragmentation, human disturbance, man-made facilities such as powerlines and fences, grazing, increases in invasive species and noxious weeds and

the discontinuance of intensive predator control (ODFW 2005 and USFWS 2005)). The alternatives do not propose to add to any of these identified adverse cumulative effects on sage-grouse.

Past activities, ongoing projects and reasonably foreseeable activities are not expected to combine with effects from this project to result in cumulative effects that would be greater than the effects described above for each alternative.

Determination

For the Greater Sage-grouse and its habitat a **(NI) No Impact** determination for all alternatives was reached by: Use of habitat within the planning area by sage-grouse is expected to be remote, even though a population occurs on a portion of the district and south onto BLM lands: The alternatives would have the potential for small positive effects to potential habitat as a result of juniper removal. No negative effects to potential habitat are expected.

White-Headed Woodpecker

Existing Condition:

The White-headed woodpecker prefer ponderosa pine habitat that has more open stand conditions with large pines for foraging and large snags for nesting. White-headed woodpeckers favor live ponderosa pine as foraging substrate, but have also been observed in lodgepole pine, sugar pine, Engelmann spruce and other species. They generally select large diameter ponderosa pine snags as nest sites, but these nest sites are not always in tall snags (Dixon, 1995; Marshall, 1997).

Though the population of white-headed woodpeckers has been reported as increasing across the western states (Wisdom et. al, 2000), there have been local population declines in the Blue Mountains (Csuti et. al, 1997) and on Deschutes and Winema National Forests (Marshall et. al, 1997). Within the project area, white-headed woodpeckers have been infrequently observed. One sighting occurred in the Big Springs area which contains one of the largest contiguous blocks of large diameter ponderosa pine habitats in the project area. Another sighting occurred south of Little Summit Prairie, in non-typical white headed woodpecker habitat. Open ponderosa pine stands dominated by large trees are scattered in the project area and rarely occur in large continuous blocks of habitat. A large portion of the suitable habitat is located on ridge tops adjacent to non-forested scabs. Most of the stands dominated by large diameter ponderosa pine are multi-storied stands and have understories of young small diameter pine.

Satellite imagery from 2004 was used to characterize vegetation, which was subsequently used to estimate white-headed woodpecker reproductive habitat within the watershed. The satellite imagery only provides a broad scale look at the live-tree component and does not provide information on stand specific snag or down log levels. A watershed scale snag analysis has been done for the watershed and is summarized in the Management Indicator Species section under Primary Cavity Excavators. Predictive model (Viable) indicates that the historical range of variability (HRV) for white-headed woodpecker nesting habitat would have been between 18,825 and 30,434 acres in the watershed. Currently, white-headed woodpecker primary reproductive habitat includes approximately 18,636 acres which is slightly below HRV. Current conditions in the analysis area are limiting for white-headed woodpecker, with single-strata late and old structure forests being below the HRV in ponderosa pine PAGs. White headed woodpecker habitat would have been more common on dry sites under a natural fire regime. It is expected that the majority of this habitat would have been on relatively dry slopes and ridges, particularly in ponderosa pine sites where single-strata old growth forest structure would have been more common Dense understories, consisting primarily of young trees, is likely limiting suitable white-headed woodpecker habitat within the project area. The majority of the ponderosa pine PAG acres are dominated by mid-sized trees as the large tree component has been removed during past timber harvest on much of the ponderosa pine PAG. In

addition, understory vegetation has become established since European settlement and subsequent implementation of fire suppression. Some understory treatments have occurred within the analysis area. Shrub cover does not appear to be limiting factor in the quality of habitat. It is expected that a portion of the predicted reproductive habitat has fairly high stocking of understory species and would benefit from noncommercial thinning.

Alternative 1

This alternative would not treat forest stands and thus the current trends in snag and large wood abundance would continue to occur. The amount of existing snags present within the project area would not be altered by implementation of this alternative, though continued competitive stress would likely result in mortality of trees and thus recruitment of snags and down wood. Concurrently, the build up of fuels and canopy conditions that favor crown fires and high fire intensity may ultimately facilitate a stand replacing disturbance event. Such events yield an abundance of snags in the short term, but may result in large areas devoid of snags in 50 to 100 years afterwards (after the majority of the initial pulse of snags has fallen down). Large snag recruitment would begin again after the new stand matures enough to provide such structure. This may take 150 years or more.

This alternative would maintain the existing acres of fir-dominated understories and the trend toward fir dominated habitats. The no action alternative would favor the species that utilize fir-dominated habitats, by maintaining this habitat above the historic range of variability. There would be a continued decline in white-headed woodpecker habitat which prefers open, pine dominated stands. This alternative would not move towards the historical range of variability for the white-headed woodpecker and its associates. The trend of decreasing open forest and single-strata LOS would continue in the short term as understory trees fill in from below. Of the approximately 4,190 acres of mapped LOS that have been identified in the analysis area, 362 acres (8%) is in ponderosa pine plant associations. The majority of these are in a multi-strata condition with high stocking levels of young ponderosa pine and Douglas fir in the understory. Mortality due to stand densities being above sustainable levels would likely result in a loss of foraging habitat for white-headed woodpeckers (live pine) as the overstory pine trees succumb to stress from competition in overstocked stands.

Conclusion: This alternative would not restore habitat for white-headed woodpeckers. This habitat type would remain below HRV. Over time, stand conditions area expected to decline on sites that cannot sustain high densities of conifers. As trees on such sites succumb to insect invasion they would stop producing seeds, sap and invertebrates associated with foliage. These are listed as important food resources for this species (Marshall et. al. 2003). If the mortality becomes extensive, and live canopy closure is lost in large areas of severe insect infestations or fire intensity, then affected areas would become less suitable for this species. If the mortality remains moderate and patchy, then the affected areas may become more suitable for this species which prefers relatively open forest conditions. Projections indicate that white-headed woodpecker habitat (18,636 acres) would remain below the Historic Range of Variability (HRV) in 30 years in the absence of large scale disturbance as shown in Table 92. Observations within the project area indicate that the 18,636 acres of predicted habitat is likely an overestimate. Many of these acres are in a multi-storied condition with medium to high densities of seedling to sapling size trees in the understory, a condition that would make them less desirable for species like the white headed woodpecker.

Determination

Under Alternative 1, habitat for the white headed woodpecker would not be treated and current trends in habitat condition would continue. Habitat for the white-headed woodpecker would remain below HRV and habitat would continue to decline. Trends in risk of habitat loss to insect, disease and wildfire would not be altered. Refer the Silviculture Report and the Fire and Fuels Report for detailed discussion of risk of loss to these disturbance agents. This alternative would have no direct effects on

the white-headed woodpecker, but could ultimately lead to an elevated level of risk of habitat loss in some areas. The determination for the white-headed woodpecker Alternative 1 is **(NI) No Impact.**

Effects Common to Alternatives 2 and 3

In both action alternatives, all existing snags would be left on site that are not deemed to be a safety hazards. Since this alternative does not propose harvest of snags, the amount of existing snags present within the project area should not be substantially altered by implementation of any of the alternatives. However, the alternatives do set treated stands on different courses for rate of large snag development and overall snag recruitment. Trees retained in thinned stands should have increased diameter growth rate, and thus are more likely to provide large snag recruitment in the future. On the other hand, trees retained in thinned stands should generally stay healthy longer and thus would not provide snags as quickly as unhealthy stands. Refer to the Silviculture Report for more details on predicted response of released trees to thinning. Trees that are removed from thinned stands would not contribute to future snag habitat. Compared to untreated stands, thinned stands are not likely to provide a large number of dead trees quickly. Snags and down wood may be consumed by prescribed fire. This should be partially offset by the creation of down wood due to fire-killed trees. The effect of fire on snag retention would likely result in a higher number of hard snags, with a concurrent reduction in soft and hollow snag habitat. Because of anticipated low fire intensity, it is also likely that while large existing snags may be consumed by fire, the snags created by fire would tend to be in smaller size classes due to the vulnerability to fire mortality of smaller, thin barked trees.

Alternative 2

This alternative would reduce the understory fir component on acres dominated by ponderosa pine and western larch and increase the abundance of more open stand structure with ponderosa pine contributing a relatively larger percentage of the species composition. This would help restore white-headed woodpecker habitat on most of the commercial harvest area. Of the 2,627 acres of commercial thinning harvest, 645 acres of treatment would occur in ponderosa pine PAGs which would be priority sites for white-headed woodpecker habitat. Commercial thinning would also occur on 1,982 acres within Douglas fir and dry grand fir plant associations that are dominated by early seral species, primarily ponderosa pine and western larch. Because of the variation in species composition and size within the 1,982 acres, the quality of habitat for white headed woodpeckers would be variable within these acres. A portion of these acres are expected to retain higher concentrations of fir species in the understory, which may reduce the suitability. This alternative treats 1,318 acres by noncommercial outside commercial harvest units and 686 acres of hardwood restoration thinning in ponderosa pine PAGs. Prescribed underburning would occur on 668 acres outside of thinning units in ponderosa pine PAGs. This alternative is expected to restore white-headed woodpecker habitat on 2,627 acres, as shown in Table 90. Where noncommercial thinning occurs in two-storied stands with a component of large live ponderosa pine and suitable snags for nesting, this treatment would also serve to help restore white-headed woodpecker habitat. Noncommercial thinning in young stands promotes the development of large pine in the future, and thus habitat for white-headed woodpecker. This alternative would move white-headed woodpecker habitat within the range of habitat expected to occur historically. This alternative would continue the process on the District and Forest, of implementing the Viable Ecosystems Management Guide, reducing the understory fir component on acres dominated by ponderosa pine and western larch. This alternative would have the greatest potential for creating habitat for the white-headed woodpecker and its habitat associates.

Conclusion: This alternative is expected to restore white-headed woodpecker habitat on 2,627 acres moving this habitat type to within HRV post-treatment. This alternative would result in about 2,324 acres (17 %) more primary nesting habitat for white-headed woodpeckers in 30 years compared to no action as shown in Table 91. Projections indicate that white-headed woodpecker habitat would be below HRV in 30 years unless follow-up maintenance burning occurs on pine sites. White-headed

woodpeckers would be expected to nest within commercially treated areas for up to 15 years on mesic sites (grand fir and Douglas-fir PAGS), or up to 30 years on more xeric sites (ponderosa pine PAGs) depending on the level of maintenance burning that occurs.

Determination

This alternative could improve habitat for this species by enhancing the development of large trees and snags in stands where they are currently limited and by creating more open forest conditions. Prescribed fire has the potential to modify the abundance of large snags and their condition class in treated areas. This could lead to a reduction in nesting habitat for this species. Protective measures incorporated in the project design should reduce the loss of large snags, but some would still be consumed during prescribed burning. The alternative results in a net increase in habitat for this species at the landscape scale, based on structural/seral stages. Refer to the PCE section for further details on predictions of habitat for this species. The determination of effect of this alternative on white-headed woodpecker is **"May impact individuals or habitat, but not likely to result in a trend toward federal listing or loss of viability of the species or populations (MIIH).**

Alternative 3

Alternative 3 would have effects similar to those described above for Alternative 2, but with less acres of commercial and more acres of non-commercial treatment. Of the 2,446 acres of commercial thinning harvest, 560 acres of treatment would occur in ponderosa pine PAGs which would be priority sites for white-headed woodpecker habitat. Commercial thinning would also occur on 1,886 acres within Douglas fir and dry grand fir plant associations that are dominated by early seral species, primarily ponderosa pine and western larch. This alternative treats 1,569 acres by noncommercial and 665 acres of hardwood restoration thinning in ponderosa pine PAGs. Prescribed underburning would occur on 648 acres of ponderosa pine PAGs outside of thinning units. This alternative is expected to restore white-headed woodpecker habitat on 2,446 acres as shown in Table 90.

Conclusion: This alternative is expected to alter forest structure enough to restore habitat for white-headed woodpeckers on 2,446 acres moving this habitat type to within HRV post-treatment. This alternative would result in about 2,166 acres (16 %) more primary nesting habitat for white-headed woodpeckers in 30 years compared to no action as shown on Table 92. Projections indicate that white-headed woodpecker habitat would be below the HRV in 30 years unless follow-up maintenance burning occurs on pine sites.

Determination

This alternative could improve habitat for this species by enhancing the development of large trees and snags in stands where they are currently limited and by creating more open forest conditions. Prescribed fire has the potential to modify the abundance of large snags and their condition class in treated areas. This could lead to a reduction in nesting habitat for this species. Protective measures incorporated in the project design should reduce the loss of large snags, but some would still be consumed during prescribed burning. The alternative result in a net increase in habitat for this species at the landscape scale, based on structural/seral stages. Refer to the PCE section for further details on predictions of habitat for this species. the determination of effect of this alternative on white-headed woodpecker is **"May impact individuals or habitat, but not likely to result in a trend toward federal listing or loss of viability of the species or populations (MIIH).**

Table 90. White-Headed Woodpecker Primary Nesting Habitat (in acres)

Alternative	HRV low	HRV high	Acres Post Treatment	HRV range yr 1
Alternative 1	18,825	30,434	18,636	below
Alternative 2	18,825	30,434	21,263	within
Alternative 3	18,825	30,434	21,082	within

Table 91. Treatments in Potential White-headed Woodpecker Habitat (P. Pine PAGs)

Treatment Type	Harvest + follow-up (HTH)	Non-comm. Thin/follow-up (PCT + HWD)	Natural Fuels burning (UB, no thinning)
Alternative 1	0	0	0
Alternative 2	648	2,004	991
Alternative 3	560	2,234	648

Table 92. Jackson 30-Year Projection of Pileated and White-headed Woodpecker Primary Nesting Habitat (Post-treatment at the Watershed Level)

Treatment Option	Pileated wp Habitat Acres Post-Treatment	White-headed wp Habitat Acres Post-Treatment	Pileated wp Habitat Acres Projected At 30 Years	White-headed wp Habitat Acres Projected At 30 Years
Alternative 1	4,376	18,636	6,515	13,523
Alternative 2	3,813	21,263	5,230	15,847
Alternative 3	3,538	21,082	5,271	15,689

Cumulative Effects

Refer to the list of past harvest activities included in the cumulative effects section for pileated woodpeckers. Of the regeneration harvest areas (3,371 acres), those that were treated with clear cut harvest prescriptions (HCC), would have lost most or all of the overstory trees and white-headed woodpecker habitat. On the other hand, regeneration harvest (HCR) that retained a combination of large live pine and large diameter snags or tall stumps, would have been potentially suitable for nesting by white-headed woodpeckers. Overstory removal treatments can vary depending on understory stocking and harvest prescription, but often they targeted the large overstory pine for removal. Thus, upon completion, the overstory removal treatments would have eliminated or degraded white-headed woodpecker habitat. This intensity of treatment occurred on 7,095 acres. However, units that retain approximately four to six live overstory pine trees and large diameter snags would provide for nesting white-headed woodpeckers. Shelterwoods and Partial cuts generally often retain enough overstory trees to provide white-headed woodpecker nesting habitat. As thinning tends to target grand fir and Douglas-fir for removal, and reduces stand density and understory vegetation, most thinned stands would have improved ability to serve as either nesting or foraging habitat for white-headed woodpeckers if they occur in ponderosa pine stands. Shelterwood harvest occurred on 1,312 acres and partial cut treatments occurred on 4,681 acres, but some of this was not in ponderosa pine stands, or did not retain ponderosa pine overstory. The historic individual and group selection harvest that occurred prior to 1978 usually did not retain large pine while opening stands up enough to favor white-headed woodpeckers. Removal of snags for firewood, for hazard abatement or under salvage sales would have reduced habitat for woodpeckers. Fire suppression activities allowed development of dense understory regeneration in stands of large ponderosa pine, which reduced habitat suitability for white-headed woodpeckers. The effects of past management activities and natural events influence the amount of primary nesting habitat available today and is reflected in the existing condition displayed in Table 90.

The alternatives further affect habitat availability at the landscape scale. White-headed woodpecker primary nesting habitat HRVs are displayed in Table 90 along with the amount of suitable primary nesting habitat predicted to be present at the landscape scale after implementation. Over time, as other younger pine stands develop larger trees, potential habitat would increase. However, over time as canopy closure recovers in treated areas and understory vegetation becomes dense, primary nesting habitat would decrease. These trends are reflected in projections displayed in Table 92. Alternative 2 would have the greatest potential for improving habitat for the white-headed woodpecker. As shown in Tables 92, white-headed woodpecker habitat would increase to within HRV under the action alternatives. Noncommercial treatments would have some effect on the trends of pine and fir habitats, but much less than stands treated with commercial harvest. Without future intervention or disturbance, such as maintenance underburning and/or understory thinning or naturally occurring low intensity fire, white-headed woodpecker habitat would decrease over time.

Implementation of Viable Ecosystems and efforts to reduce hazardous fuel accumulations at the watershed and Forest level would continue to restore more open forest conditions in many forested stands, resulting in increased dominance of pine and larch and single stratum stand structure on more acres than is currently present. At the watershed scale, the abundance and distribution of white-headed woodpecker habitat would become within what is believed to have been the historic level in the short-term under all action alternatives, but would be below HRV under the no action alternative. However, keeping white-headed woodpecker habitat within HRV in the long term would require future maintenance, which is outside of the scope of this project. In 30 years white-headed woodpecker habitat is projected to be below HRV under all alternatives without follow-up maintenance actions.

Specifically, present and reasonably foreseeable projects that have the potential to negatively affect white-headed woodpecker habitat include the District/Forest Firewood program and ongoing hazard tree removal. These projects could slightly add cumulatively to the proposed post/pole and fire wood removal units. In alternatives 2 and 3, there are 224 acres and 212 acres respectively that are proposed for post/pole and fire wood removal. However, units are small in size, averaging less than 16 acres and are dispersed across the project area. Considering that the Ochoco Standards for snag densities would be met following treatment, and the area affected is small, the overall cumulative effect to snag densities within the planning area would be minimal. Within the remainder of the project area, all existing snags would be left that are not deemed to be safety hazards. The amount of existing snags present within the project area should not be substantially altered by implementation of any alternative.

As described for pileated woodpeckers (pileated woodpecker cumulative effects section), this project may contribute to increased accessibility and thus additional area vulnerable to illegal snag removal, which would reduce potential nesting habitat for this species and other primary cavity excavators.

Lewis's woodpecker

Existing Condition:

Lewis' woodpecker (*Melanerpes lewis*) is most common in open habitats (e.g. burns) and uses cottonwood galleries in the Blue Mountains (Marshall et al. 2003). Wisdom (2000) reported that burned ponderosa pine forest created by stand-replacing fires provide highly productive habitats as compared to unburned pine. They feed on insects in the spring and summer, but rely on seeds, nuts and fruits in the fall and winter, which they cache under bark or in cracks and crevices on tree boles. They breed in low numbers in open habitats along Eastern Oregon rivers and stream valleys. They are not considered strong cavity excavators but require large snags in an advanced stage of decay that are easier to excavate. Lewis' woodpeckers would also use old cavities created by other woodpeckers. Forty-two percent of the nest trees on the eastern edge of the Mt. Hood National Forest were in ponderosa pine (typically snags) and 43 percent were in living and declining Oregon white oak. The

mean diameter of nest trees was 26 inches and mean nest tree height was 41 feet (Marshall et al. 2003). Haggard and Gaines (2001) determined that the Lewis' woodpecker was most abundant in low snag density stands within a stand replacement fire study conducted on the Wenatchee National Forest in Washington.

This species was formerly "abundant" in Oregon, but the population has been declining throughout its range. Marshall et al. (2003) reports the species is declining throughout its range possibly due to loss of suitable habitat, competition for nest holes, and the effects of pesticides. The declines are more severe at low elevations, especially the Willamette Valley, and losses are attributed reduction of nest and food storage trees, pesticides, to loss of oak woodland habitat and competition with European starlings (Marshall et al. 2003).

Lewis's woodpecker habitat at a landscape scale is reflected in the abundance of open pine dominated forests. Refer to the discussion above on white-headed woodpeckers. Habitat is also discussed in the Landbird section of this document as this species is identified as a focal species representing dry forest and riparian woodland habitat types.

Satellite imagery from 2004 was used to characterize vegetation which was subsequently used to estimate Lewis's woodpecker reproductive habitat within the watershed. The satellite imagery only provides a broad scale look at the live-tree component and does not provide information on stand specific snag or down log levels. A watershed scale snag analysis has been done for the watershed and is summarized in the Management Indicator Species section under Primary Cavity Excavators. Reproductive habitat for Lewis's woodpecker is currently 14,303 acres for the watershed, which is within HRV. The reproductive habitat estimate is a broad scale look at the live-tree component and does not provide information on stand specific snag or down log levels. Habitat for Lewis's woodpecker has likely always been limited in this watershed by the abundance and distribution of areas with high tree mortality (such as wildfires) and areas with abundant large old cottonwood. A shrubby understory and declining abundance of cottonwood is also likely to be a limiting factor for the suitability of habitat within the watershed. The effective browsing by both wild and domestic ungulates and the effective suppression of wild fires may be the primary factors limiting shrub production in open stands. The lack of patches of burned forest habitat may also be limiting factor. The Lewis' woodpecker has been recorded within the project area, though there are very few sighting records on file.

Alternative 1

Habitat for Lewis's woodpecker would not be treated and current trends in habitat condition would continue. Although currently within HRV, habitat for the Lewis' woodpecker is expected to decline with the ingrowth of understory trees and the reduction in the amount of open habitats. Trends in risk of habitat loss to insect, disease and wildfire would not be altered. Refer the Silviculture Report and the Fire and Fuels Report for detailed discussion of risk of loss to these disturbance agents. This alternative would have no direct effects on the Lewis's woodpecker, but could ultimately lead to an elevated level of risk of habitat loss in some areas. The determination of effect of this alternative on the Lewis's woodpecker is **"No Impact (NI).**

Alternative 2

This alternative could improve habitat for this species by promoting riparian hardwood vegetation, enhancing the development of large trees and snags in stands where they are currently limited, and by creating more area with open forest canopy. Prescribed fire has the potential to modify the size, abundance and condition class of snags in treated areas, which could yield both positive and negative results to habitat for this species. The extent of project activities and expected outcomes should provide for a net increase of 3,562 acres in habitat for this species and be at the high end of the HRV in the project area The determination of effect of this alternative on the Lewis's woodpecker is **"May**

impact individuals or habitat, but not likely to result in a trend toward federal listing or loss of viability of the species or populations (MIIH).

Alternative 3

This alternative could improve habitat for this species by enhancing the development of large trees and snags in stands where they are currently limited, and by creating more area with open forest canopy. Riparian treatments are not proposed under Alternative 3 and as a result hardwood vegetation would follow the current trends. Prescribed fire has the potential to modify the size, abundance and condition class of snags in treated areas, which could yield both positive and negative results to habitat for this species. The extent of project activities and expected outcomes should provide for a net increase of 3,346 acres in habitat for this species and be within HRV in the project area.. The determination of effect of this alternative on the Lewis's woodpecker is **"May impact individuals or habitat, but not likely to result in a trend toward federal listing or loss of viability of the species or populations (MIIH).**

Cumulative Effects

Effects from past activities, ongoing projects and reasonably foreseeable activities are not expected to combine with effects from this project to result in cumulative effects that would be greater than the effects described above for each alternative.

Peregrine Falcon

Existing Condition:

Reproductive habitat for peregrine falcons is limited in this watershed by the scarcity of vertical cliff or pinnacle faces greater than 75 feet in height with horizontal ledges or cave-like openings. In Oregon peregrine falcons occur as resident and migratory populations. There are no known peregrine falcon eyries on Ochoco National Forest. Nesting occurs in xeric areas of eastern Oregon, marine habitats of western Oregon, montane habitats to 6,000 feet elevation, small riparian corridors statewide, and more recently urban habitats of the lower Willamette and Columbia Rivers. Riparian corridors are used for travel and as hunting areas (90-95 percent of all prey items are birds that may come from these systems, Pagel 1992). Due to the lack of suitable cliff habitats within the watershed, it is unlikely that peregrine falcons would be reproducing within the watershed. There have been no sightings of peregrine falcons within the watershed, although there have been peregrine sightings southeast of the project area on private land. Other sightings have occurred on the Ochoco National Forest. All sightings are likely associated with migration. Peregrine falcons may forage in this watershed, especially during migration. Suitable foraging habitat exists, although peregrines typically do not select denser forested habitats or rolling topography that characterizes the project area.

Effects Common to all Alternatives

Suitable nesting habitat does not occur in the project area. Dispersing falcons that may pass through the project area are expected to be able to avoid any human disturbance associated with alternatives 1, 2 and 3. Alternatives 2 and 3 could improve foraging habitat for this species by creating more open forest conditions which could make prey more accessible.

Cumulative Effects

Past activities, ongoing projects and reasonably foreseeable activities are not expected to combine with effects from this project to result in cumulative effects that would be greater than the effects described above for each alternative.

Determination

A **No Impact (NI)** determination has been reached for the peregrine falcon relative to the activities proposed with the three alternatives. Suitable nesting habitat is not present. Migratory individuals that could pass through the project area would be able to avoid any potential disturbing activity. Suitable foraging areas would remain inside and outside the project area.

Tricolored Blackbird

Existing Condition:

The Tricolored blackbird (*Agelaius tricolor)* is a highly gregarious colonial breeder largely endemic to California. Breeding colonies are scattered and intermittent in Oregon. The Oregon population was estimated to have declined by 22 percent in the 1980s, but the Oregon population represents only one percent of the total tricolored blackbird population (Beedy et al. 1999). The species currently holds rankings in Oregon as SP Sensitive (peripheral or naturally rare) and by the Natural Heritage program as G3 Vulnerable – either rare throughout its range or found locally in a restricted range. Tricolored blackbirds nest in large lowland marshes with an abundance of tall emergent or shrubby vegetation. Nesting occurs in fresh-water marshes of cattails, tules, bulrushes and sedge, or in thickets of willows or other shrubs. While the tricolored blackbird has been documented to occur between Prineville and Madras (Marshall et al. 2003) and they occasionally are posted as sightings near Powell Butte by local birders on the COBOL internet site, there are no known breeding locations of either species on the Forest. Habitat for tricolored blackbird has likely always been limited in this watershed by the absence of extensive marsh habitat with an abundance of cattails or bulrush. The project area does not contain any marshes with expansive thickets of cattail, bulrush, willow, nettles or blackberries that could potentially provide adequate nesting habitat for this colonial nesting species. Historically, floodplain vegetation on private land at Big Summit Prairie may have been more diverse with more extensive side channels and wetlands that could have provided suitable habitat for the tricolored blackbird in some areas. On the other hand flood irrigation may have improved potential for use by tricolored blackbirds in other portions of the prairie where riparian vegetation has become established in response to irrigation.

Direct, Indirect and Cumulative Effects All Alternatives

Suitable habitat does not exist in the project area. There are no documented occurrences of this species in the project area or on the district. Because of lack of habitat and presence, there would not be any direct, indirect or cumulative effects to this species.

Determination:

A **No Impact (NI)** determination is reached for the alternatives proposed in the Jackson Vegetation Management project. Suitable habitat for this species is not present in the project area.

Bufflehead

Existing Condition:

The bufflehead (*Bucephala albeola*) nests near deep mountain lakes surrounded by open forested areas containing snags (Csuti et al., 1997). Natural nesting sites are cavities in trees close to water. Aspen is the preferred nest tree, but it would also nest in ponderosa pine and Douglas fir (Marshall et al. 2003). In Oregon, breeding occurs primarily in the central Cascade Lakes region (Marshall et al. 2003). It winters throughout Oregon but is an uncommon breeder in the central and southern Cascades (Marshall 2003). Marshall (1996) stated that human disturbance from high recreation use at Cascade Lakes and a shortage of suitable nesting cavities due to forestry practices may be having an impact on their population status. Oregon breeding population is considered sensitive by the ODFW because of small size and limited nesting habitat (Marshall et al 2003). The Oregon breeding

population is considered sensitive by the ODFW because of small size and limited nesting habitat (Marshall et al 2003).

On the Paulina Ranger District buffleheads are not commonly seen. However, an occasional bufflehead is spotted during migration on small ponds and reservoirs on the Paulina Ranger District. There have been no sightings of bufflehead within the project area. There are no Lakes, only small, less than ½ stock ponds or reservoirs that would not be of sufficient size to provide suitable nesting, brooding or foraging habitat for a pair of buffleheads and their young.

Direct, Indirect and Cumulative Effects All Alternatives

Suitable habitat does not exist in the project area. It is expected that bufflehead use of the project area is incidental and primarily during migration. Because of lack of habitat and potential incidental use, there would be no direct, indirect or cumulative effects to this species.

Determination

A **No Impact (NI)** determination is reached for the alternatives. Suitable breeding habitat for this species is not present in the project area. Any use that may occur would be incidental. The alternatives would have no environmental effects on habitat, individuals, or the population.

Upland Sandpiper

Existing Condition:

The upland sandpiper breeds in partly flooded meadows, grasslands and prairies, usually with a fringe of trees, and often in the middle of higher elevation sagebrush communities (Csuti et al., 1997). Meadows favored by this sandpiper are little grazed and are comprised of grasses, sedges, and herbaceous plants (Marshall et al., 1992). There are no known sightings of sandpipers on the Paulina Ranger District or within the planning area. However, historically sandpipers bred in Big Summit Prairie just west of the Deep Creek Watershed. The Deep Creek Watershed contains potentially suitable breeding habitat for upland sandpipers within Little Summit Prairie. The majority of this prairie is privately owned and is grazed each year by livestock which would likely reduce the quality for nesting. The edges of the prairie are under Forest Service ownership and may be suitable for nesting sandpipers. It would be extremely rare to find sandpipers breeding or incidentally using habitat within the planning area.

According to Marshall et al. 2003, Oregon’s upland sandpiper population, probably the largest west of the Rocky Mountains, is close to extirpation, and that remnant breeding populations are limited to Bear and Logan Valleys in Grant County. However, some field guides show isolated or rare occurrences in South Central Oregon and northern California (Kaufman 2000, Sibley 2000). Breeding by this species at Big Summit Prairie was reported in 1919 and a single bird was observed in that area in 1987. Big Summit Prairie is located just west of the project area. Continental range has been decreasing over the last two centuries due to hunting in the late 1800’s, and conversion of prairie habitat to farming and grazing (White 1983). Though populations east of the Rocky Mountains are stable or increasing, populations west of the Rockies are declining and its continued existence in the Northwest is precarious (Marshall et al. 2003). Marshall et al offered as possible reasons for the western population declines the following: encroachment of pine into meadows, use of herbicides to control or eliminate forbs in nesting meadows, overgrazing in meadows especially during incubation and brood rearing, downcutting of streams which impact water table and meadow systems.

There are no known sightings of upland sandpipers on the Paulina Ranger District or within the project area. The project area contains potentially suitable breeding habitat for upland sandpipers within Little Summit Prairie, although there are no records or sightings for this area. The majority of this prairie is privately owned and is grazed each year by livestock which would likely reduce the quality for nesting. There are small areas of Forest Service ownership on the edges of the Prairie that

may be suitable for breeding sandpipers. It would be extremely rare to find upland sandpipers breeding or incidentally using habitat within the project area.

Direct, Indirect and Cumulative Effects All Alternatives

These alternatives would not alter habitat for this species. No extensive wetlands would be altered. No activities are being proposed in all alternatives that would affect the limited sagebrush habitat that exists adjacent to Little Summit Prairie. This alternative would have no impact on this species or its habitat.

The alternatives proposed in this project would not result in direct, indirect or cumulative effects to this species due to lack of presence and habitat.

Determination

A **No Impact (NI)** determination is reached for all alternatives proposed. The alternatives proposed activities would not occur in the limited unoccupied habitat that occurs within the project area. Use by upland sandpipers within the project area is expected to be rare. The alternatives would have no environmental effects on habitat, individuals, the population or the species.

Pygmy Rabbit

Existing Condition:

The pygmy rabbit is a sagebrush obligate species present within the Great Basin sage-grouse habitats (WDFW, 1995). Pygmy rabbits require sagebrush habitats with deep soils and abundant basin big sagebrush and herbaceous cover to facilitate den creation and protection from predators (WDFW, 1995). Suitable habitat for the pygmy rabbit does not occur within the project area. Existing sagebrush habitats are low, stiff and mountain big sagebrush communities, located in shallow soil and rock dominated habitats. Basin big sagebrush and deep soiled sagebrush habitats are not present in the project area.

Direct, Indirect and Cumulative Effects All Alternatives

Suitable habitat does not exist within the project area. Lack of habitat likely prevents this species' presence within the project area. Because of the lack of habitat and the unlikely occurrence of the species, no direct, indirect of cumulative effects from any of the alternatives to pygmy rabbits is expected.

Determination

A **No Impact (NI)** determination is reached for the alternatives proposed in this project to the pygmy rabbit. Lack of suitable habitat and species presence is the reason for this determination.

Townsend's big-eared bat

Existing Condition:

Habitat for the Townsend's big-eared bat (*Corynorhinus townsendii*) is limited in this watershed by the scarcity of caves and abandoned wooden buildings and cavern-like bridge abutments. Townsend big-eared bat maternity and hibernation colonies are typically in caves and mine tunnels. They roost almost exclusively in cavity roosts, both in human-made structures (that is, buildings, bridges, and mines) and caves (Christy and West 1993). They are extremely sensitive to disturbance while roosting, because they hang directly from the ceiling of the roost and do not go into torpor (temporary hibernation) during the day in summer colonies (Barbour and Davis 1969 and Dalquist 1948 cited in Christy and West 1993). Perkins and Levesque (1987) estimated the Oregon population at 2,300-2,600 bats and Gaines (1997 cited in NatureServe 2008) estimated 3,000-5,000 individuals in Oregon. The species range extends from southwestern British Columbia, western Washington, western and

central Oregon, and northwestern and west-central California. NatureServe (2009) gives them a status of S2, Imperiled in the state of Oregon. The greatest threat to the species is vandalism and disturbance by humans. Disturbance of a nursery colony or of a hibernating group is likely to cause the bats to abandon the site and move to an alternate roost. An additional threat is blockage of cave/mine entrances through collapse or human activities (NatureServe 2009). There are no caves or mines that would provide suitable sites for maternity or hibernation colonies. There are no recorded locations for Townsend's big-eared bat within the project area.

Direct, Indirect and Cumulative Effects All Alternatives

Suitable habitat does not likely exist in the project area. There are no documented occurrences of this species in the project area or on the district. Because of lack of habitat and presence, there are not likely to be any direct, indirect or cumulative effects to this species.

Determination

A **No Impact (NI)** determination is reached for the alternatives proposed in the Jackson Vegetation Management project. Suitable habitat for this species is not present in the project area.

Silver-bordered fritillary butterfly

Existing Condition:

The silver-bordered fritillary is known from three locations in Oregon: Big Summit Prairie, Crook Co., the Strawberry Mountains, Grant Co., and in the south Wallowa Range north of Halfway, Baker Co. (Pyle 2002, Warren 2005). The habitat is open moist flowering meadows, bogs and marshes with a willow component (Lewis 2001). Eggs are laid on or near violets, bog violet (*Viola nephrophylla*), marsh violet (*Viola palustris*), and *Viola glabella*. Adults fly from early June to mid-August. Adults collect nectar from a variety of other flowering plants (pyle 1974). NatureServe (2008) lists this species as G5, demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery. In Oregon its ranking is listed as S2, Imperiled.

Historically, moist meadow and riparian habitats were more abundant than what currently exist today. The majority of stream channels within the watershed have down cut, resulting in a lowering of the water table and a loss of riparian vegetation including: cottonwood, aspen, dogwood, birch, and willow species. The down cutting also caused a reduction in moist meadow habitats within the watershed. A variety of activities have influenced the conditions that currently exist including: livestock grazing, timber harvesting, and road construction. The loss of beaver has also influenced the conditions that currently exist.

The silver-bordered fritillary, has been surveyed for, since at least 1995 on the Ochoco National Forest. Survey notes indicate the majority of potential habitat within a mile or two of Big Summit prairie has been surveyed. Survey notes indicate that productivity decreases as distance from the prairie increases. Big Summit prairie is located approximately 4 miles east of the Deep Watershed. There have been sixteen sites recorded where silver-bordered fritillary has been observed or their host violet species have been observed. None of these locations occur in the watershed. Ellen Lewis, an amateur lepidopterist, who was involved in the surveys describes habitat as, "The transition zone where forest streams meet the prairie. A zone covered with sage, rabbit brush and many flowering plants." Potential threats to habitat and species include: Natural succession or drying of open, boggy meadow type habitat, to conifer or willow dominated habitat. Activities that alter the water-table or reduce floristic diversity, such as land development, wetland drainage, intensive fertilizing and grazing, and pesticide application, also threaten this butterfly's existence (WDFW, 1995).

Potential habitat may exist in association with the approximately 800 acres of Meadow systems that occur within the watershed. There is no current inventory of marsh and fen type habitats that may be associated with the meadow systems. A large portion of the meadow systems have been affected my

channel degradation as well as conifer encroachment. As a result, potential habitat for the silver-bordered fritillary is likely limited within the watershed. To date all recorded locations of the silver-bordered fritillary occur outside the watershed.

Direct, Indirect and Cumulative Effects All Alternatives

Alternatives 1, 2, and 3 would not alter habitat for this species. No wetland habitat would be altered. No direct, indirect, or cumulative effects to this species are expected.

Determination

The determination for this alternative is **"No impact" (NI)** to Silver-bordered fritillary. There are expected to be no cumulative effects associated with activities under alternatives 1, 2, and 3.

Johnson's hairstreak

Existing Condition:

These butterflies are found in mature to old-growth, moist, cool conifer forests of the Pacific Northwest and west of the Cascade Mountains. There is however, one known population in northeast Oregon in Baker county on the Wallowa-Whitman National Forest. Females lay pale eggs directly on dwarf mistletoes on a variety of conifers, especially on ponderosa pine and lodgepole pine (Pyle 2002). The larvae of the Johnson's hairstreak feed on the aerial shoots of dwarf mistletoe (Arceuthobium) found in western hemlock, true firs, lodgepole pine, western larch, and ponderosa pine (Schmitt & Spiegel, 2008). It is not known which species of mistletoe serve as a host for the larva of this butterfly in the forests of Central Oregon. A variety of mistletoe species are present in the watershed. Adults sip flower nectar (including Oregon grape, Pacific dogwood, ceanothus, and pussy paws (Pyle 2002). The Johnson's Hairstreak "spends most of its time in canopy so likely to be overlooked even where it occurs in some numbers" (NatureServe 2009). To date, there are no known sightings of these butterflies on the Ochoco National Forest. Threats to this species include loss of habitat from logging, and spraying to kill tussock moths and budworms (Pyle 2002). In Oregon its ranking is listed as S2, Imperiled while globally its status is G3, very rare or local throughout its range or found locally in a restricted range (NatureServe 2008).

The species is suspected to occur on the Ochoco National Forest, but currently there is no confirmed documentation for this species anywhere on Ochoco National Forest. It is not known which (if any) species of mistletoe serve as a host for the larva of this butterfly in the forests of Central Oregon. A variety of mistletoe species are present in the watershed. Schmidt and Spiegel (2008) state that in the absence of recent large scale disturbance, dwarf mistletoe infestation levels can occur in early, mid, and late successional stands. The project area has not experienced a large scale fire event in recent years. Therefore, mistletoe infection is assumed to be present in all stand age classes which could serve as a host for the caterpillar, if it occurs in association with the mistletoe present on this Forest. Refer to detailed discussions in the forest health section of this report. At present this species has not been determined to be present in Central Oregon or specifically associated with the species of mistletoe that occur in the analysis area.

Alternative 1

Habitat for the Johnson's hairstreak would follow the current trends. Dense forested conditions that currently exist would not be treated. Trends in risk of habitat loss to insect, disease and wildfire would not be altered. Refer to the Silviculture Report and the Fire and Fuels Report for detailed discussion of risk of loss to these disturbance agents. This alternative would have no direct effect on Johnson's hairstreak, but could ultimately lead to an elevated level of risk of habitat loss in some areas. The determination for Johnson's hairstreak Alternative one is **(NI) No Impact.**

Alternatives 2 and 3

This alternative would alter habitat for this species. Some densely forested areas would be made more open, which could improve the abundance of nectar producing plants in the understory upon which adult hairstreak butterflies feed. However, the alternative would also substantially reduce the level of mistletoe infection in treated stands. This could result in modification of food source for larval hairstreak caterpillars. It is unknown whether this species actually occurs on this forest as described in the "existing condition" section above. However, there is some potential that it could occur in the project area. Mistletoe would not be eradicated at the landscape scale by this project and likely not completely controlled within treated units. Mistletoe is abundant throughout the watershed and would be retained in abundance in specially designated fish and wildlife habitat areas such as PFAs, nest cores, pfh and a variety of riparian buffers as well as in other untreated areas. Therefore mistletoe should remain in abundance and well distributed throughout the watershed. This proposal does not include any spraying, trapping or other controls for Lepidoptera. For these reasons impact of this alternative on Johnson's hairstreak is determined to be **"May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause loss of viability to the population or species" (MIIH).**

Cumulative Effects

Effects from past activities, ongoing projects and reasonably foreseeable activities are not expected to combine with effects from this project to result in cumulative effects that would be greater than the effects described above for each alternative.

Crater Lake Tightcoil

Existing Condition

The Crater Lake tightcoil may be found in perennially wet situations in mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 m. of open water in wetlands, springs, seeps and riparian areas, generally in areas which remain under snow for long periods during the winter. Riparian habitats in the Eastern Oregon Cascades may be limited to the extent of permanent surface moisture, which is often less than 10 m. from open water" (Duncan et al. 2003).

Riparian habitat occurs within the project area and is associated within the perennially wet streams and springs that occur throughout the project area. Stream flows fluctuate throughout the year and decrease throughout the summer months. As a result permanent soil moisture also fluctuates tremendously. Suitable habitat is likely limited within the project area. The project area is currently not within the identified range for this species (ONHIC. 2004).

Direct, Indirect and Cumulative Effects Alternatives 1, 2 and 3

There would be no direct and indirect effects associated with the implementation of Alternatives 1, 2 or 3. The project area is outside of the current range for this species. There have been no documented sightings for this species within or near the project area. The nearest documented sightings are on tributaries west of the Deschutes River. There are no cumulative effects for this species when considering the alternatives in combination with past, present and reasonably foreseeable actions.

Determination

For the reason stated above, the determination is **No Impact (NI)** for all alternatives.

Management Indicator Species

Management indicator species (MIS) are species selected because their welfare is presumed to be an indicator of the welfare of other species using the same habitat or whose condition can be used to assess the impacts of management actions on a particular area, or other species of selected major biological communities. Management indicator species are selected from several categories including State or Federal Threatened or Endangered species lists; species commonly hunted, fished, or trapped; non-game species of special interest; and species with special habitat needs that may be influenced significantly by planned management programs.

The Ochoco National Forest Land and Resource Management Plan (LRMP) identified the pileated woodpecker; common flicker (northern flicker); primary cavity excavators (including, but not limited to woodpeckers and sapsuckers); golden eagle and prairie falcon; bald eagle; Rocky Mountain elk and mule deer as terrestrial management indicator species.

Table 93. Ochoco National Forest Terrestrial Management Indicator Species

Species	Reason for Selection	Habitat Present in Analysis Area	Species Present in Analysis Area
Primary Cavity Excavators	**Snag habitat.** Primary cavity excavators were selected to represent the species that require snag habitat that is often reduced by forest management activities. The primary cavity nesters serve as ecological indicators for a large number of species and for secondary cavity users, like swallow, blue birds and bats (FEIS pp. 3-21).	**YES**	**YES**
Pileated Woodpecker	**Old growth habitat.** The pileated woodpecker was selected to serve as an indicator for other species that require large snags, large amounts of down-dead wood, and large trees with defect. The pileated woodpecker represents the presence of favorable habitat for species that require mature and old growth habitat. It may also indicate the presence of favorable habitat for secondary cavity nesters, such as the northern flying squirrel, pygmy owl, saw whet owl, and flammulated owl (FEIS pp 3-21).	**YES**	**YES**
Common flicker (Northern flicker)	**Old growth juniper habitat.** The common flicker (Northern Flicker) was selected to represent species that utilize old growth juniper habitat. The flicker is probably the only primary cavity excavator that is capable of creating cavities in juniper (Thomas 1979, FEIS pp 3-21).	**YES**	**YES**
Bald Eagle	**State or Federal Threatened or Endangered species.** Currently considered a Regional Forester's Sensitive species. (LRMP 4-243).	**YES**	**YES**
Golden Eagle & Prairie Falcon	**Cliff, talus, or cave habitats.**	**NO**	**NO**
Rocky Mountain Elk & Mule Deer	**Species that is commonly hunted.**	**YES**	**YES**

Primary Cavity Excavators (PCE)

The primary cavity excavator group was selected as a MIS to represent the species that require snag habitat that is often reduced by forest management activities. The primary cavity excavator MIS

group includes birds that feed primarily on dead wood insects and that excavate their own nest cavities. The PCEs serve as ecological indicators for a large number of species and for secondary cavity users, like swallow, blue birds and bats (FEIS pp. 3-21).

The primary cavity excavator group includes several species including the pileated woodpecker and northern flicker (LRMP MIS), white-headed woodpecker and Lewis' woodpecker (TES and Focal species), and red-naped sapsucker (focal species)that are on other special status lists and that would be further discussed in this report. The list of MIS species associated with the analysis area are: pileated woodpecker, white-headed woodpecker, northern flicker, Lewis' woodpecker, Williamson's Sapsucker, red-breasted nuthatch, black-backed woodpecker, white-breasted nuthatch, pygmy nuthatch, red-napped sapsucker, hairy woodpecker, three-toed woodpecker, downy woodpecker. See Wildlife Specialist report for more detail on general habitat associations of PCEs.

Snag Habitat

Management Direction

The Ochoco Land and Resource Management Plan standards and guidelines for snags specify that across the Forest, snags must meet an average of 47% of biological potential. The Regional Forester's Forest Plan Amendment # 2 (USDA Forest Service, ONF, 1997) amended the Ochoco LRMP. The Regional Forester's Forest Plan Amendment # 2 (Eastside Screens) requires managing snags at 100% maximum potential for primary cavity excavators, which is a minimum of 2.25 snags/acre (Thomas 1979), as determined using the best available science. Rose et al. (2001) reported that the results of monitoring indicate that the biological potential models are a flawed technique. The Forest Service has direction to use the "best available science." Currently the Ochoco National Forest is managing snags according to the Viable Ecosystem Management Guide (VEMG) levels. VEMG levels are based on the historical range of variability. VEMG snag levels were agreed upon with the Regional Office to meet the amendment standards and guidelines, except that snags would not be managed below the Eastside Screens minimum of 2.25 snags/acre (USDA Forest Service 1997). Table 94 is a summary of the weighted average snags/acre by plant association. Table 95 lists the log retention standards in the Regional Foresters Amendment #2.

Table 94. Viable Ecosystem Management Guide Snag Levels

Plant Association Group	<20"dbh		>20"dbh	
	Low	High	Low	High
Moist Grand Fir	4.4/ac.	10.0/ac.	1.5/ac.	4.9/ac.
Dry Grand Fir	3.2/ac.	7.1/ac.	1.0/ac.	3.3/ac.
Douglas Fir*	1.3/ac.	3.1/ac.	.2/ac.	1.6/ac.
Moist Ponderosa Pine*	1.2/ac.	2.7/ac.	.2/ac.	1.6/a.
Dry Ponderosa Pine*	.0/ac.	.3/ac.	.1/ac	.5/ac.

***Although VEMG snag levels are less then 2.25 in these PAGs snag levels would not be managed below 2.25 per acre.**

Table 95. Viable Ecosystem Management Guide down Log Levels

Plant Community	PCS. Per Acre	DIA. Small End	Piece Length & Total Length
Ponderosa Pine	3-6	12"	>6 ft. 20-40 ft.
Mixed conifer	15-20	12"	>6ft. 100-140 ft.

Recently, the Decayed Wood Advisor (DecAID (Mellen-Mclean et al. 2009) has become available for use. This work is an advisory tool to help land managers evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags, down wood, and other wood decay elements. Until new information becomes accessible, the DecAID vegetation data provides the most current, empirical data available for dead wood evaluations. There is a variable range of

conditions across the Forest from insects, disease and management practices. As a consequence, there are varying densities of snags across the landscape. It must be noted that DecAID must be utilized at an appropriate scale. The general rule is that the analysis area be at least 20 square miles (12,800 acres) and roughly the size of a fifth field hydrologic unit code watershed. The Jackson analysis area is comprised of 54,609 acres. The DecAID assessment process is based on the concept of the historic range of variability (HRV). Thus, if we manage current habitats within the range of HRV, we will likely do an adequate job of ensuring population viability for those species that remain (Landres et al. 1999).

A snag analysis utilizing the best available science was completed for the Jackson project in order to analyze the existing amount of snag habitat. The snag analysis utilized information from the Forest-wide Viable Ecosystems Management Guide (VEMG), the Landscape Ecology, Modeling, Mapping and Analysis team's Gradient Nearest Neighbor (GNN) Models, and DecAID. Viable stratifies the environment along a gradient of size, structure, species composition, and relative tree density. The 2004 satellite imagery layer was used to develop the Viable map. Data is mapped on a 25 meter pixel grid, meaning the map is divided up on a 25 meter grid and that every 25 meter square (pixel) is assigned a value that relates to a stratum of size, structure, tree species composition, and relative tree density. VEMG was utilized to estimate the HRVs for the habitat types within the planning area. The Gradient Nearest Neighbor (GNN) is an imputation modeling technique that produces maps where each pixel is associated with the inventory plot that has the most similar spectral and environmental characteristics (Ohmann and Gregory 2002). The GNN utilized field data from the Continuous Vegetation Survey (CVS) and Forest Inventory Analysis (FIA) to impute snag data into each viable pixel to estimate existing snag levels at the landscape level. DecAID presents information on wildlife use of snag diameter, snag density, down wood diameter, and down wood percent cover, and on the range of natural (unharvested) and current (all) conditions of snag density and down wood percent cover by diameter classes (Mellen-McLean et. al., 2009).

For this analysis, the satellite imagery was from 2004 and the GNN data was from 2006. The satellite imagery and GNN data does not include fires or other activities that have occurred since the satellite snapshot was produced. This should not affect the snag analysis numbers because there have been no timber harvests and/or large wild fires since 2004. Noncommercial thinning and fuels projects have occurred, but these activities did not remove any existing snags. The 2006 GNN data was not updated with snag fall down rates and there have been no epidemic levels of insects or diseases within the analysis area since the GNN snapshot. Based on knowledge of the area's existing transportation system, and ongoing fuel wood removal, snag levels in portions of this watershed may be slightly overestimated in the snag analysis due to hazard tree removal along roads in the planning area.

To begin the analysis, the 5 structural stages of VEMG (See Silviculture report) were combined to match the three structural stages in DecAID. A crosswalk was created from all VEMG to DecAID habitat and structure codes. This was done using the VEMG guide and DecAID information as well as input from the Forest Ecologist.

DecAID structural stages include: Open, Small and Large. In DecAID, the Open structural stage is everything from grass/forbs to sapling and pole sized trees where tree stocking is less than 10% or where tree stocking is equal to or greater than 10% and quadratic mean diameter (QMD) is 1-9 inches. The small structural stage includes a range of conditions that consists of small trees with an open canopy to medium trees with a closed multi-storied canopy where tree stocking is equal to or greater than 10% and QMD is 10-19 inches. The Large structural stage includes the conditions that have stocking greater than or equal to 10% and trees with QMD greater than or equal to 20 inches and includes open and closed multistoried canopies.

Table 96. VEMG and DecAID Habitat Structure Crosswalk

VEMG STRUCTURE	DECAID STRUCTURE
• Grass/forb/shrub – trees may be present but not dominant • Seedling and sapling – trees ≤4.9" dbh • Pole – trees 5-8.9" dbh	Open
• Small – trees 9-20.9" dbh	Small
• Medium and Large – trees ≥21"dbh	Large

Next, the Historic Range of Variability (HRV) for snag densities for each habitat type and structure class was identified. DecAID data from unharvested stands provides a reference condition in the various habitat types for distribution of snag and down wood size and densities across a large landscape. DecAID analyzes snag habitats not only by habitat type and structure, but by snag size (>= 10" dbh and >= 20" dbh). In the VEMG, the historic range of variability is given by both structure and plant association group. The Viable structure and plant association groups were converted to habitat types in DecAID and a weighted average of HRVs across the habitat was computed. Juniper stands are not included within the DecAID framework for the snag analysis.

Table 97. VEMG Plant Association Group and DecAID Habitat Type Crosswalk

VEMG PLANT ASSOCIATION GROUPS AND SERAL STAGES	DECAID HABITAT TYPE
• Douglas Fir – Late seral structural stages • Dry Grand Fir – Mid and late seral structural stages • Moist Grand Fir – Early, mid, and late seral structural stages	Eastside Mixed Conifer
• Douglas Fir – Early and mid seral structural stages • Dry Grand Fir – Early seral structural stages • Dry Ponderosa Pine – Mid and late seral structural categories • Moist Ponderosa Pine – all seral structural categories	Ponderosa Pine/Douglas Fir

Primary Cavity Excavator Habitat Selection

The following tables identify the PCEs that occur in each habitat type in the Jackson project area and the habitat characteristics preferred by each species. Preference by snag size and density class are indicated by tolerance level. DecAID calculated three tolerance levels (30%, 50% and 80%) for dbh of snags and the density of snags used by PCEs. Levels are one-sided intervals with the lower limit of the interval being zero. Thus, an 80% tolerance level indicates 80% of the individuals in the population have a value for the parameter of interest between 0 and the value for the 80% tolerance level. Or conversely, 20% of the individuals in the population have a value for the parameter of interest greater than the 80% level. An alpha level of 0.10 was used when calculating the tolerance levels. For example, an 80% tolerance level of wildlife use of snag diameter (dbh) means that 80% of all individuals observed of some species (combined across one or more wildlife studies) uses snags less than or equal to some specific dbh, and 20% use snags greater than that dbh. With normally distributed data the 50% tolerance level is the mean (Mellen-McLean et al. 2009).

Eastside Mixed Conifer Habitat Type (EMC)

The eastside mixed conifer habitat type contains a wide array of tree species and stand dominance patterns. Douglas-fir is the most common tree species in this habitat. It is almost always present and dominates or co-dominates most overstories. Lower elevations or drier sites may have ponderosa pine as a co-dominant with Douglas-fir in the overstory and often have other shade-tolerant tree species growing in the undergrowth. On moist sites, grand fir are dominant or co-dominant with Douglas-fir. Other conifers include western larch on mesic sites, Engelmann spruce, lodgepole pine, and subalpine fir on colder sites. Stand canopy structure is generally diverse.

Table 98. Snag Size, Decay Class, and Tree Species Preferred by MIS PCE's in the East-side Mixed Conifer Forest

Species/Group	Snag size (in) for 30%, 50%, 80% tolerance levels	Snag decay	Primary Snag Species
Black-backed woodpecker	Nesting: 8.8, 12.0, 16.7 Roosting: 6.7, 10.9, 16.8 Foraging: 10.9, 14.0, 18.9	Moderate to Hard	Douglas-fir, western larch, ponderosa pine, lodgepole pine
Hairy woodpecker	Nesting: 10.5, 16.3, 25.2 Foraging: 8.3, 11.7, 17.0	Moderate	Aspen, ponderosa pine, western larch
Northern flicker	Nesting: 17.7, 22.2, 30.6 Foraging: 18.2, 21.8, 27.2	Moderate	Western larch, ponderosa pine, Douglas-fir
Northern three-toed woodpecker	Nesting: 8.8, 10.8, 14.0 Roosting: 9.8, 11.7, 14.3 Foraging: 11.4, 14.7, 19.7	Soft to Moderate	Aspen, Douglas-fir, Lodgepole pine, western larch for nesting Lodgepole pine for foraging
Primary cavity nesters/ excavators/ woodpeckers	Foraging: 50% tl = 11.3 select > (12") 30 cm dbh[1]	Soft to Moderate	Aspen, western larch, ponderosa pine for nesting Ponderosa pine[1] and western larch for foraging
Pileated Woodpecker	Nesting: 25.2, 29.5, 36.0. Roosting: 25.8, 28.0, 31.2 Foraging: 12.9, 19.9, 30.4	Hard to Soft	Ponderosa Pine, western larch, grand fir
Pygmy nuthatch	Nesting: 14.7, 21.3, 30.8		Ponderosa pine
Red-breasted nuthatch	Nesting: 13.0, 20.0, 29.0	Moderate	Douglas-fir
Red-naped sapsucker	Nesting: 20.9, 26.3, 34.5		Western larch, lodgepole pine, Douglas-fir
White-breasted nuthatch	Nesting: 9.8, 21.2, 36.7		
White-headed woodpecker	Nesting: 20.8, 26.7, 35.9	Moderate	Ponderosa pine
Williamson's sapsucker	Nesting: 20.2, 26.2, 34.6	Moderate	Douglas-fir, ponderosa pine, western larch

[1]Lyons et al. 2008

Table 99. Snag Densities Surrounding Nest and or Roost Sites of PCE's in East-side Mixed Conifer

Species	Snag density/acre for 30%, 50%, 80% tolerance levels			
	Green Forests		Recent Post-fire	
	>10" dbh	>20" dbh	>10" dbh	>20" dbh
Black-backed woodpecker	2.5, 13.6, 29.2	0.0, 1.4, 5.7	57.2, 82.4, 119.2	
Hairy woodpecker	No Data for green forests		42.9, 67.2, 104.1	
Lewis's woodpecker	No Data for green forests		24.2, 39.5, 62.8	0.0, 6.2, 16.1
Northern flicker	No Data for green forests		26.8, 49.6, 84.1	2.2, 17.4, 39.6
Pileated Woodpecker	14.9, 30.1, 49.3	3.5, 7.8, 18.4		
Pygmy nuthatch	1.1, 5.6, 12.1	0.0, 1.6, 4.0		
White-headed woodpecker	0.3, 1.9, 4.3	0.0, 1.5, 3.8	18.6, 52.0, 98.7	
Williamson's sapsucker	14.0, 28.4, 49.7	3.3, 8.6, 16.6		

Ponderosa Pine/Douglas-fir Habitat Type (PPDF)

The Ponderosa pine/Douglas-fir (PPDF) Wildlife Habitat Type is composed of ponderosa pine and ponderosa pine-Douglas-fir forest and woodland Alliances. Ponderosa pine and Douglas-fir are the

most common trees in this habitat but western larch may be a co-dominant. On more productive sites grand fir may occur in the understory, producing a multi-layer structure.

Table 100. Snag Size, Decay Class, and Tree Species Preferred by MIS PCE's in the Ponderosa Pine/Douglas-fir Forest

Species/Group	Snag size (in) for 30%, 50%, 80% tolerance levels	Snag decay	Primary Snag Species
Black-backed woodpecker	Nesting: 8.1, 13.2, 20.5 Foraging: 8.0, 12.1, 18.2	Hard	Ponderosa pine, western larch, lodgepole pine, Douglas-fir,
Hairy woodpecker	Nesting: 10.3, 16.4, 25.3 Foraging: 8.3, 11.7, 17.0	Moderate to hard	Ponderosa pine, Douglas-fir, Lodgepole pine
Lewis's woodpecker[1]	Nesting: 15.1, 19.8, 26.8		Ponderosa pine
Northern flicker	Nesting: 17.2, 21.8, 28.8 Foraging: 18.2, 21.8, 27.2	Soft to Moderate	Ponderosa pine, , Douglas-fir
Northern three-toed woodpecker	Nesting: 8.8, 10.8, 14.0 Foraging: 7.5, 9.4, 12.1		Lodgepole pine for foraging
Primary cavity nesters/ excavators/ woodpeckers	Foraging: select > (12") 30 cm dbh[2]	Moderate	Aspen, western larch, ponderosa pine, Lodgepole pine for nesting Ponderosa pine[2] and western larch for foraging
Pileated Woodpecker	Nesting: 25.5, 30.1, 36.8 Foraging: 12.9, 19.9, 30.4	Hard to Soft	Ponderosa pine, western larch, grand fir
Pygmy nuthatch	Nesting: 16.9, 22.8, 31.5		Ponderosa pine
Red-naped sapsucker	Nesting: 11.8, 2.03, 31.9		Western larch, lodgepole pine, Douglas-fir
White-headed woodpecker	Nesting: 20.6, 26.4, 35.5 Roosting: 19.9, 23.8, 29.6	Moderate	Ponderosa pine, aspen, grand fir
Williamson's sapsucker	Nesting: 20.0, 25.8, 34.5		Douglas-fir, ponderosa pine, western larch

[1]Post-fire habitat only
[2]Lyons et al. 2008

Table 101. Snag Densities Surrounding Nest and Roost Sites of PCE's in Ponderosa Pine/Douglas-fir

Species	Snag density/acre for 30%, 50%, 80% tolerance levels			
	Green Forests		Recent Post-fire	
	>10" dbh	>20" dbh	>10" dbh	>20" dbh
Black-backed woodpecker	2.5, 13.6, 29.2	0.0, 1.4, 5.7	44.4, 64.4, 94.3	
Hairy woodpecker	No Data for green forests		42.9, 67.2, 104.1	
Lewis's woodpecker	No Data for green forests		24.1, 39.2, 62.4	0.0, 6.2, 16.1
Northern flicker	No Data for green forests		26.8, 45.6, 84.1	2.2, 17.4, 39.6
Pileated Woodpecker	14.9, 30.1, 49.3	3.5, 7.8, 18.4		
Pygmy nuthatch	1.1, 5.6, 12.1	0.0, 1.6, 4.0		
White-headed woodpecker	0.5, 1.9, 4.0	0.5, 1.8, 3.8	18.6, 42.7, 98.7	
Williamson's sapsucker	14.0, 28.4, 49.7	3.0, 8.4, 16.3		

The tables exhibited below show the HRVs and existing condition for snags in the Jackson planning area. The information is presented as the percent of the analysis area that should have expected quantities and sizes of snags.

Table 102. HRVs by Snag Density Class, Existing Snag Abundance by Density Class, and PCE Habitat Use of Snags >=10"and >=20" dbh by Density Class in the Eastside Mixed Conifer Habitat Type.

	Snags >=10" DBH						**Snags >=20" DBH**						
Density Class (Snags per acre)	**0**	**0 - 6**	**6 - 12**	**12 - 24**	**24 - 36**	**36+**	**0**	**0-2**	**2-4**	**4-6**	**6-10**	**10-18**	**18+**
EMC HRV %	17 - 25	27 - 31	16 - 17	16 - 25	6 - 10	5 - 8	31 - 43	14 - 20	13 - 18	9 - 13	9 - 14	5 - 7	1 - 2
EMC % Existing	15	49	17	11	6	2	29	25	16	15	13	2	0
Relationship to HRV	Below HRV	Above HRV	Within HRV	Below HRV	Within HRV	Below HRV	Below HRV	Above HRV	Within HRV	Above HRV	Within HRV	Below HRV	Below HRV
Snags per acre for PCE Habitat Use at 30%, 50%, and 80% Tolerance Levels in the ≥10 dbh EMC Habitat Type and comparison to HRV							Snags per acre for PCE Habitat Use at 30%, 50%, and 80% Tolerance Levels in the **≥20"** EMC Habitat Type and comparison to HRV						
Black-backed WP		2.5 @ 30% t.l.		13.6 @ 50% t.l.	29.2 @ 80% t.l.		0.0 @ 30% t.l.	1.4 @ 50% t.l.		5.7 @ 80% t.l.			
Hairy	NO DATA FOR GREEN FORESTS												
Lewis's	NO DATA FOR GREEN FORESTS												
Northern Flicker	NO DATA FOR GREEN FORESTS												
Northern 3-toed	NO DATA FOR GREEN FORESTS												
Pileated WP				14.9 @ 30% t.l.	30.1 @ 50% t.l.	49.3 @ 80% t.l.			3.5 @ 30% t.l.		7.8 @ 50% t.l.		18.4 @ 80% t.l
Pygmy Nuthatch		1.1 @ 30% — 5.6 @50% t.l.		12.1 @ 80% t.l.			0.0 @ 30% t.l.	1.6 @ 50% t.l.	4.0 @ 80% t.l.				
Red-breasted Nut.	NO DATA FOR GREEN FORESTS												
Red-naped Sap.	NO DATA FOR GREEN FORESTS												
White-breasted Nut.	NO DATA FOR GREEN FORESTS												
White-headed		0.3 @ 30%, 1.9 @ 50%, 4.3 @80% t.l.					0.0 @ 30% t.l.	1.5 @ 50% t.l.	3.8 @ 80% t.l.				
Williamson's Sap.				14.0 @ 30% t.l.	28.4 @ 50% t.l.	49.7 @ 80% t.l.			3.3 @ 30% t.l.		8.6 @ 50% t.l.	16.6 @80% t.l.	

Information from DecAID tables (unharvested plots for snags ≥20" (50cm) dbh) PP/DF_O.Inv-15, PP/DF_S.Inv-15, PP/DF_L.Inv-15, EMC_ECB_O.Inv-15., EMC_ECB_S.Inv-15, EMC_ECB_L.Inv-15, and modified with HRV information from Viable.

Table 103. HRVs by Snag Density Class, Existing Snag Abundance by Density Class, and PCE Habitat Use of Snags >=10"and >=20" dbh by Density Class in the in the Ponderosa Pine/Douglas-fir Habitat Type.

PPDF	**Snags >=10" DBH**						**Snags >=20" DBH**						
Density Class (Snags per acre)	**0**	**0 - 4**	**4-12**	**12 - 24**	**24 - 36**	**36+**	**0**	**0-2**	**2-4**	**4-6**	**6-10**	**10-18**	**18+**
PPDF *HRV %*	54 - 61	19 - 27	12 - 15	3 - 5	0 - 1	0 - 1	67 - 76	15 - 19	6 - 10	1 - 2	1 - 2	0 - 1	0 - 1
PPDF % *Existing*	38	42	17	2	1	0	61	28	9	1	1	0	0
Relationship to HRV	Below HRV	Above HRV	Above HRV	Below HRV	Within HRV	Within HRV	Below HRV	Above HRV	Within HRV	Within HRV	Within HRV	Within HRV	Within HRV
Snags per acre for PCE Habitat Use at 30%, 50%, and 80% Tolerance Levels in the ≥10 dbh PPDF Habitat Type and comparison to HRV							Snags per acre for PCE Habitat Use at 30%, 50%, and 80% Tolerance Levels in the ≥20" PPDF Habitat Type and comparison to HRV						
Black-backed		30% t.l. = 2.5		50% t.l. = 13.6	80% t.l. = 29.2		30% t.l. = 0.0	50% t.l. = 1.4		80% t.l. = 5.7			
Hairy	NO DATA FOR GREEN FORESTS												
Lewis's	NO DATA FOR GREEN FORESTS												
Northern Flicker	NO DATA FOR GREEN FORESTS												
Northern 3-toed	NO DATA FOR GREEN FORESTS												
Pileated		14.9 @ 30% t.l.			30.1 @ 50% t.l.	49.3 @ 80% t.l.			3.5 @ 30% t.l.		7.8 @ 50% t.l.		18.4 @ 80% t.l.
Pygmy Nut.		30% t.l. = 1.1, 50% t.l. = 5.6		80% t.l. = 12.1			30% t.l. = 0.0	50% t.l. = 1.6	80% t.l. = 4.0				
Red-breasted Nut.	NO DATA FOR GREEN FORESTS												
Red-naped Sap.	NO DATA FOR GREEN FORESTS												
White-breasted Nut.	NO DATA FOR GREEN FORESTS												
White-headed		30% t.l. = 0.5, 50%, t.l. = 1.9, 80% t.l. = 4.0						30% t.l. = 0.5, 50% t.l. = 1.8	80 % t.l. = 3.8				
Williamson's Sap.				30% t.l. = 14.0	50% t.l. = 28.4	80% t.l. = 49.7			30% t.l. = 3.0		50% t.l. = 8.4	80% t.l. = 16.3	
Information from DecAID tables (unharvested plots for snags ≥20" (50cm) dbh) PP/DF_O.Inv-15, PP/DF_S.Inv-15, PP/DF_L.Inv-15, EMC_ECB_O.Inv-15., EMC_ECB_S.Inv-15, EMC_ECB_L.Inv-15, and modified with HRV information from Viable.													

Existing Condition

Open stands dominated by large diameter pine trees were more abundant historically than what exists today. Open stands dominated by large trees within mixed conifer PAGS would also have been more abundant historically than they are today. Multi-strata stands dominated by large trees and with relatively dense canopy conditions are currently within the range of what would have been expected historically within the moist and dry grand fir PAGS. Multi-strata stands dominated by large trees would have been more abundant in the Douglas-fir PAG than they are today. The abundance of snags is an important attribute of primary cavity excavator habitat and one of the variables used in the snag and down wood assessment. Historically, fire regimes would have played a more prominent role in creating a mosaic of stand conditions, snag abundance and snag distribution across the landscape. For example, in both the PPDF and in the EMC there would have been more area devoid of snags than

there is today. This is because stands that have skipped one or more fire return cycles may have more snags currently than they would have had occurred historically due to ingrowth of trees and mortality resulting from competition, and insect and disease mortality. On the other end of the scale, snag analysis at the watershed level indicates that stands with very high snag density in the mixed conifer habitat type (DecAID EMC) would have been more common than what is present on the current landscape. This is, at least to some extent, the result of fire suppression which has limited high intensity fire and thus the production of high density snag patches. Historically, snags would also have been present at higher densities in some areas that have had timber harvest in the past four to five decades which reduced snag levels in harvested areas.

Eastside Mixed Conifer Habitat (EMC)

There are 17,415 acres of EMC habitat type in the Jackson project area. The number of snags in the EMC habitat type in the Jackson project area is generally greater than historic conditions. Historically, there was a substantial portion of the landscape in the EMC habitat type that did not have any snags and therefore did not provide nesting habitat for PCEs. It is estimated that 17-25% of the EMC habitat was devoid of snags greater than or equal to 10 inch dbh and 31-43% was devoid of snags greater than or equal to 20” dbh. Currently, the amount of the EMC without snags is below HRV with 15% of the Jackson area devoid of snags greater than 10”dbh and 29% of the EMC devoid of snags greater than 20” dbh. Presently, 72% of the EMC in Jackson is within or exceeds HRVs for snag density in snags greater than 10” dbh and 69% of the EMC exceeds or is within HRV for snag density in snags greater than 20”. The greatest abundance of snags is represented in the less than 6 snags per acre range. Forty-nine percent of the EMC habitat has between 0-6 snags per acre that are >=10”dbh and 56% of the EMC has between 0-6 snags per acre that are >=20” dbh. Increased stocking levels resulting from fire suppression and ingrowth of trees has resulted in more of the EMC habitat with snags.

Stands with very high snag densities would have been more common historically than what is present today. The amount of very high density snag patches (36+ snags per acre in the greater than 10” dbh size class and 18+ snags per acre in the >20” size class) is less than historic conditions. Very high snag densities would have likely occurred following large fires or epidemic insect or disease outbreaks which have not occurred in the watershed. This condition was relatively rare historically, however. High density snag patches have been reduced in some areas due to past timber harvest practices in the last four to five decades. Ongoing firewood cutting and hazard tree removal along forest roads have also negatively affected snags numbers, especially the large diameter snags and high density snag patches. Low road density areas within the planning area are likely to contain higher snag levels than mixed conifer stands in more accessible areas. Presently, 2% of the EMC has very high snag density (>36+ snags per acre) in the greater than 10”dbh size class. There are no high density patches in the large diameter (>20”) snags. Primary cavity excavator species that select for high density snag patches in the EMC habitat type include the black-backed woodpecker, hairy woodpecker, pileated woodpecker, and Williamson’s sapsucker. Reviewing the literature in DecAID, the EMC habitat in the Jackson area provides enough snag habitat to meet the 80% tolerance level for the black-backed woodpecker, pygmy nuthatch, and white-headed woodpecker and easily provides adequate snag densities and size for the 50% tolerance level for the pileated woodpecker and Williamson’s sapsucker. Higher snag densities in the smaller diameter snag classes benefits all the primary cavity excavators by providing foraging habitat but is especially suited for the black-backed woodpecker, hairy woodpecker and northern three-toed woodpecker. These species are generally associated with the small and medium sized snags between 10” and 20” dbh.

Ponderosa Pine/Douglas-fir Habitat (PPDF)

There are 22,310 acres of PPDF habitat type in the Jackson project area. Similar to the EMC habitat type, the number of snags in the PPDF habitat type is also greater than historic conditions.

Historically, more than half (54-62%) of the landscape in the PPDF did not have any snags greater than or equal to 10 inch dbh and nearly three quarters (67-76%) of the landscape did not have snags greater than 20" dbh. The higher density categories (24-36 and 36+ snags per acre >=10 and 10-18 and 18+ snags per acre >=20"dbh) are within HRV, but at the low end. These higher snag density classes historically occupied less than 1% of the landscape in the PPDF habitat type, however. Currently, there is less area devoid of snags (38% vs 54-62% historically) and more area with snags. Densities are within or are above the HRV in all density categories except for the 12- 24 snags per acre category which is below slightly below HRV. The 12-24 snags per acre density class historically would have occurred on 3-5% of the PPDF habitat type while it currently occurs on 2%. Increasingly dense stands due to over 80 years of fire suppression and tree mortality from insects has resulted an excess of snags (above HRV) in the 0-4 and 4-12 snags per acre (>=10 dbh and 0-2 snags per acre (>=20" dbh in the PPDF habitat type. The abundance of snag habitat is within or above HRVs for all primary cavity excavators. Adequate habitat is available to meet the 80% tolerance level for all the primary cavity excavators associated with the PPDF habitat type. Although the 12-24 snags per acre density class is slightly below HRV, the 0-4 and 4-12 snags per acre categories exceed HRVs.

Direct and Indirect Effects of Alternative 1

Under the No Action alternative, no management activities are proposed. In the short term, snag levels would change slowly over time. The assumption is that snag creation due to endemic levels of insects, disease and stress mortality generally equals the loss of snags through natural processes. However, due to the increased number of dense stands in the planning area, wildfire risk is increased which could lead to increased snags in larger areas. Alternative 1 has the greatest potential for the development of high density snag patches.

Alternative 1 from the Jackson Vegetation Management Project would not negatively affect viability of the Forest MIS primary cavity excavators in either the short or long term. Other than a large wildfire, snag levels would be expected to remain fairly constant. This is assuming that snag creation due to endemic levels of insects, disease and stress mortality generally equals the loss of snags through natural processes.

Direct and Indirect Effects of Alternatives 2 and 3

Because the effects of Alternatives 2 and 3 are so similar, the discussion will be combined. Under both action alternatives, harvest units would not have snags marked for removal, except as required to meet OSHA requirements for safety. Harvest treatments should not substantially alter the available snag habitat level directly. Snag abundance and distribution requirements would be met to the extent that snags are present in the existing condition or are present after fuels treatment. However, thinning overstocked trees is expected to reduce tree mortality, and thus the rate of snag recruitment. Thinning also reduces the amount of trees left standing within treatment units and thus there are fewer trees available to eventually die and become future snags. Fuels treatments may alter snag availability. Since all trees greater than or equal to 21 inches would be left, and trees less than 21 inches would only be thinned, opportunities to provide snags in deficient areas, and sources for recruitment of future snags would be retained.

Because a small percentage of each habitat type is treated, there is very little difference in effects of snags across the landscape. Table 104 displays the total land base affected by each activity (acres are not double counted except for "Total Fire"). The Total Fire column displays all acres that would have fire on the ground. It includes acres proposed for harvest and noncommercial thinning (PCT) if they also include fire. Due to the nature of fire, these types of activities have more influence on snag densities than any other proposed activity. With the exception of the 12-24 snags per acre density class, Alternatives 2 and 3 would maintain snags in both size and abundance within or above HRV in the PPDF habitat type. Adequate habitat would continue to be available to meet the 80% tolerance

level for all primary cavity excavators associated with the PPDF habitat. In the EMC habitat type, the action alternatives would also meet the 80% tolerance level for all primary cavity excavators.

Harvest and Noncommercial Thinning

This discussion includes the aspen stand treatments. The Project Design Features (PDF) for Jackson meets or exceeds Forest Plan standards and moves toward managing snag habitat across the landscape at higher levels by retaining all existing snags within harvest units. This management strategy recognizes the need for high densities of snags for primary cavity excavators (Forest MIS). Although PDFs say that all snags would be retained, there may be a slight loss of individual snags through necessary danger tree removal during harvest activities. The number of snags which would possibly be removed would be so small that it would not affect the overall densities. In the noncommercial units, unlike the harvest units, all snags are generally retained as danger trees can easily be avoided by sawyers on foot.

In alternatives 2 and 3, there are 224 acres and 212 acres respectively that are proposed for post/pole and fire wood removal. Units are small in size, averaging less than 16 acres and are dispersed across the project area. Lodgepole pine would be thinned up to 20.9”d.b.h. Lodgepole pine snags, in excess of forest standards would be removed. Snag densities would be affected on less than 1.2% of the EMC habitat type. Considering that the Ochoco Standards for snag densities would be met following treatment, and the area affected is small, the overall snag densities within the planning area would not be affected. Within the remainder of the project area, all existing snags would be left that are not deemed to be safety hazards. The amount of existing snags present within the project area should not be substantially altered by implementation of any alternative.

The alternatives do set treated stands on different courses for rate of large snag development and overall snag recruitment. Indirect effects of the proposed harvest treatments (including public firewood units) would be increased growth rates on residual live trees, which would accelerate increased growth of future large snags on those sites. Treatments would decrease the number of potential small snags in the short term. Treatments are designed so stands would be more open with increased distances between trees, therefore reducing stress and risk of mortality from insects and disease. Thinned stands should generally stay healthy longer, and thus would not provide snags as quickly as unhealthy stands. Also, as a result of the thinning, there would be less trees left following treatment than there would be prior to treatment and thus there would be fewer trees available to become snags in the future. Trees that are removed from thinned stands would not contribute to future snag habitat. Compared to untreated stands, thinned stands are not likely to provide a large number of dead trees quickly. These treatments would also lessen the chances of large wildfires in the area. This could mean less snag pockets and possibly lower snag densities per acre in the short and long term, especially in the mixed conifer habitat types. The net result is that treated units would provide fewer, but larger snags in the future compared to untreated stands with similar initial stand density and tree size. Refer to the Silviculture Report for more details on predicted response of released trees to thinning.

Table 104. Total Land Base Ac. Affected by Each Proposed Activity by DecAID Habitat and Structure Types

ALT 2									
Habitat		**Harvest**	**% Harvest**	**PCT**	**% PCT**	**Fire ***	**% Fire**	**Total Fire**	**% Total Fire**
EMC	17,415	3,082	17	2,260	13	1,347	8	5,693	33
PPDF	22,310	2,436	10	4,396	18	5,235	23	11,643	52
ALT 3									
Habitat		**Harvest**	**% Harvest**	**PCT**	**% PCT**	**Fire ***	**% Fire**	**Total Fire**	**% Total Fire**
EMC	17,415	3,005	17	2,034	12	1,186	7	5,258	30
PPDF	22,310	2,324	10	3,968	18	4,670	21	10,612	48

*Fire includes activity fuels as well as natural fuels.

Fuels Activities

Due to the nature of fire, these types of activities have more influence on snag densities than any other proposed management activity. Fuels treatments that affect snag densities are activity fuels and natural fuels burning. Activity fuels underburning would reduce the forest debris (slash) from harvest and noncommercial thinning. Activity fuels projects provide the greatest chance of retaining the existing snags – especially in the larger categories. Flame lengths are generally low. However, large trees can be lost if the duff layer is too dense around the large trees or if the slash is too close to the retained trees. Natural fuels burns consist of utilizing prescribed fire in densely forested, dry mixed conifer stands with heavy fuels on steep slopes and limited road access. Prescribed fire in these stands would be a multiple entry process over a period of several years, starting with one or two burns to reduce large fuel concentrations under moist conditions so as to protect large old trees. It would also be utilized under pine stands to maintain forest health, reduce seedlings and saplings, maintain open stands, and promote fire tolerant species such as ponderosa pine, western larch, and Douglas fir while reducing fire intolerant species such as western juniper and grand fir. Natural fuels burns have a greater opportunity to increase snag densities than activity fuels burns, especially in the smaller size classes. These types of burns are utilized to reduce the competing smaller trees from the stands. As the trees to burn are still standing, there is also an increased chance of small area crown fires, again increasing the snag numbers.

During both activity fuels and natural fuels burns, snags and down wood may be consumed by prescribed fire. This should be partially offset by the creation of snags and down wood due to fire-killed trees. The effect of fire on snag retention would likely result in a higher number of hard snags, with a concurrent reduction in soft and hollow snag habitat. Because of anticipated low fire intensity, it is also likely that while large existing snags may be consumed by fire, the snags created by fire would tend to be in smaller size classes and/or fire intolerant species (such as grand fir) due to the higher vulnerability to fire mortality of smaller and thin barked trees.

Alternatives 2 and 3 would not negatively affect the viability of the Forest MIS primary cavity excavators. Of the proposed burning, only 1,935 acres in Alternative 2 are natural fuels burns and 1760 acres in Alternative 3. Again, because a small percentage of each habitat type is treated, there is no difference in effects of snags across the planning area. Short term, these alternatives could increase snag levels within the planning area sooner than without management.

Conclusion

When the existing condition is considered in combination with the action alternatives, there is not expected to be a significant change in snag densities across the watershed. The high density snag category within the EMC habitat type is currently below HRV. The high density snag categories are typically created from wild fires and are not expected to occur from prescribed fire activities that are part of the proposed actions. Returning fire to the watershed has the potential to create small snag patches within the watershed, but it is not expected to move overall snag densities in the high density category towards HRV. In the future, there would be open areas with fewer larger snags (in treated areas) and areas with numerous smaller average diameter snags and down wood (in untreated areas). As a whole, this complex distribution of dead wood habitat should provide for the range of species listed above at the landscape scale and proposed treatments should not move snag habitat away from HRV. Since all trees greater than or equal to 21 inches would be left, and trees less than 21 inches would be thinned, opportunities to provide snags in deficient areas, and sources for recruitment of future snags would be retained. For these reasons, this project is determined to be consistent with the LRMP as amended by the Regional Forester's Plan Amendment 2, and would not foreclose options to meet snag levels described in the VEMG in the long term.

Cumulative Effects

Projects that have affected snags since the data was collected in 2004 are the Deep Vegetation Management Project which implemented 8,980 acres of prescribed burning and 5,080 acres of non-commercial thinning. Post-implementation observations (District Silviculturist) of the burning units showed that about half the units increased both large and small snags. The rest of the burned units killed mainly seedlings, not affecting the overall snag densities. The thinning projects did not remove any snags. The thinned stands while not as susceptible to insects and disease now should in the long term grow larger trees and eventually provide for larger snags in these areas.

Current actions that continue to negatively affect snag numbers are hazard tree removal along major forest roads and the Forest/District public firewood collection. Although new firewood regulations have restricted firewood cutting to within 600 feet of main roads, there is still some illegal firewood cutting off the main roads and cutting snags other than lodgepole (which in some cases takes care of the hazard trees).

PILEATED WOODPECKER

The pileated woodpecker was selected to serve as an indicator for other species that require large snags, large amounts of down-dead wood, and large trees with defect. The pileated woodpecker represents the presence of favorable habitat for species that require mature and old growth habitat. It may also indicate the presence of favorable habitat for secondary cavity nesters, such as the northern flying squirrel, pygmy owl, saw whet owl, and flammulated owl (FEIS pp 3-21).

The pileated woodpecker occurs primarily in dense mixed conifer forests in late seral stages or in deciduous stands in valley bottoms (Marshall et al. 2003). Pileated woodpeckers nest in large diameter (> 21"d.b.h.) and tall snags, and depend heavily on carpenter ants for food. They commonly feed on dead grand fir trees and downed logs. They also roost in large hollow trees and tend to select relatively dense stands with grand fir common. They typically select for multi-strata mixed conifer LOS. The pileated woodpecker's habitat associates prefer dense forest conditions, and they include Townsend's warbler, hermit thrush and red-breasted nuthatch among others. Some of these are discussed further in the Landbirds section of this report. As dense mixed coniferous stands often contain a high density of dead or dying trees, habitat for this species also represents habitat for the black-backed and three-toed woodpeckers, which are attracted to stands with abundant snags and activity by bark beetles and wood boring beetles.

Pileated woodpecker habitat is managed through guidelines in the Ochoco Forest Plan and recommendations of best available science. Recommendations for management of the Pileated woodpecker ("Habitat Use and Management of Pileated Woodpeckers in Northeastern Oregon," Bull et al. 1992), includes management of 900 acres of habitat for each territory. It is also recommended that the 900 acres contain 75% grand fir types; 25% would be old growth and the remainder in mature stands. At least 50% would have 60% canopy closure or greater. There are 23,977 acres of grand fir and 5,321 acres of Douglas-fir plant association groups (PAGs) well distributed across the analysis area. Dense stands in these relatively moist PAGs, dominated by large tree structure would have provided the best primary nesting habitat for pileated woodpeckers

Existing Condition

The pileated woodpecker is considered to be an uncommon species in Oregon, limited attitudinally by habitat availability, and they are an uncommon permanent resident in the Blue Mountains (Marshall et al. 2003). Pileated woodpecker habitat for the Ochoco National Forest is defined as ponderosa pine stands with Douglas-fir and grand fir understories, or mixed conifer stands with greater than 15-20 inch in diameter trees and a dense canopy condition.

The Ochoco National Forest Land and Resource Management Plan allocated Old Growth Management areas (OGMA) across the Forest to serve as reproductive habitat for the pileated woodpeckers. An additional 300 ac. of supplemental feeding habitat has been designated adjacent to each OGMA reproductive habitat area. Currently, there are four allocated old growth areas (Deep Creek-OG-D2-02, Happy Camp-OF-D2-06, Jackson Creek-OG-D2-11 and West Thornton-OG-D2-12) within the Ochoco National Forest portion of the watershed totaling 1,267 acres. The quality of reproductive habitat within the allocated OGMA is variable. The Deep Creek OGMA provides the most contiguous block of reproductive habitat within the project area. Jackson Creek and Happy Camp OGMA also provide reproductive habitat, although the amount of Late and Old Structure (LOS) stands are less than fifty percent of the OGMA. The West Thorton (OGMA) contains approximately 25% LOS and is split into two blocks of 105 acres and 182 acres. The largest block of 182 acres provides limited reproductive habitat. In general, pileated reproductive habitat within the project area is naturally fragmented by the scab stringer nature of the landscape and further fragmented by past timber harvesting that has reduced the large tree component across the landscape. Supplemental feeding habitat has been designated adjacent to each OGMA reproductive habitat area. A total of 1,431 acres of supplemental feeding habitat was been designated adjacent to the four OGMA. Satellite imagery from 2004 was used to characterize vegetation, which was subsequently used to estimate pileated woodpecker reproductive habitat within the analysis area.

The predictive model (Viable) indicates that the HRV for pileated woodpecker reproductive habitat would have been between 3,017 and 6,717 acres in the analysis area. Currently, pileated woodpecker primary reproductive habitat includes approximately 4,376 acres which is within HRV. The satellite imagery only provides a broad scale look at the live-tree component and does not provide information on stand specific snag or down log levels. A watershed scale snag analysis has been done for the watershed and is summarized in the Primary Cavity Excavator section of this report. In general, multistoried large tree structure with a significant fir component with abundant snags is the preferred habitat for the pileated woodpecker. Pileated sightings are concentrated in the northern portion of the project area which has higher densities of grand fir. Sightings are also associated with the Deep Creek corridor and the north facing slope south of Little Summit Prairie. No specific surveys have been conducted for the presence of nesting pileated woodpeckers. Evidence of foraging activity is located throughout the majority of the watershed where a grand fir component remains in the overstory or understory.

Alternative 1

This alternative would not treat LOS stands or forest stands within primary feeding habitat (pfh) or designated OGMAs. This action would maintain the existing acres of fir-dominated understory and canopy closure, at least in the short term. Of the 4,397 acres of LOS stands that that have been identified in the analysis area, 3,641 acres (83%) is in grand fir or Douglas-fir plant associations. These relatively more mesic areas are the most likely to be able to sustain multi-strata LOS in the long term. Lack of treatment of the understory in these stands would perpetuate development of fir understory conditions with a positive effect on the pileated woodpecker habitat abundance and quality in the short term. Overtime however, high stand densities may lead to mortality due to insects, disease or high intensity fire. The effect of such disturbances on pileated woodpecker habitat in the long term is dependent on the type, severity and extent of the event(s). Extensive areas of high mortality that could potentially result from future large scale disturbance could limit the amount of suitable nesting habitat in affected areas, whereas events resulting in mosaics including moderate and low intensity disturbance may continue to provide high quality nesting habitat over time.

Conclusion: This alternative would maintain the suitability of all existing habitat for pileated woodpeckers in the short term. Over time the suitability for nesting is expected to decline on sites that cannot sustain high densities of conifers. As trees on such sites succumb to insect invasion they would provide a foraging substrate for a variety of woodpeckers, including the pileated. If the mortality becomes extensive and live canopy closure is lost in areas with severe insect infestations, then affected areas would become less suitable for this species as potential nesting sites.

Alternative 2

This alternative would reduce primary nesting habitat for this species by 820 acres. These acres represent 19% of existing primary nesting habitat in the project area. Primary nesting habitat would remain within HRV with 3,556 acres of primary nesting habitat remaining following treatments. The historic range of variability for pileated nesting habitat within the project area ranges from a high of 6,525 acres to a low of 3,055 acres. No large tree structure would be removed in both action alternatives. Although, canopy closure is expected to be reduced to less than 60% crown closure where the understory trees are contributing to the crown closure. The suitability of these stands for nesting and foraging is expected to decrease in the short term. This alternative would commercially thin smaller diameter lodgepole pine on 18 acres of mapped pileated feeding habitat, which is proposed as part of the post-pole/firewood proposal. Alternative 2 would commercially harvest on 4,322 acres in grand fir and Douglas-fir PAGs across the project area, which are sites more likely to provide habitat for species such as pileated woodpeckers. As the canopy is likely to be reduced to less than 60% crown closure, where this condition occurs, after treatment, this alternative would reduce the suitability of these stands as foraging and nesting habitat for pileated woodpeckers, at least in the short term. Canopy closure is expected to recover to some extent, as the retained trees expand their crowns in diameter and depth in response to the release from competition that results from the thinning. Thinning of mid-story trees would promote the development of large structure trees in the future, ultimately providing a source of recruitment for large snags and down logs. Thus, this treatment could facilitate the development of higher quality nesting and roosting habitat in the future. The prescription calls for preferential retention of ponderosa pine and larch, but grand fir and Douglas-fir would also be retained as individuals or clumps within these stands, especially on north and east facing slopes and in draws.

Noncommercial thinning (including hardwood treatments) would occur on 332 acre within mapped pfh and 5,104 acres in grand fir and Douglas-fir PAGs (outside of commercial harvest units). Thinning of these small trees would help to promote the development of larger trees in the stand. Thus, this treatment could facilitate the development of higher quality foraging and nesting habitat in the long term. Noncommercial thinning that occurs in grand fir and Douglas-fir PAGs is not expected

to affect foraging or nesting habitat in the short term because trees less than 9”d.b.h are not commonly used for foraging or nesting. In the long term foraging habitat may be slightly reduced because thinning would select against grand fir species which is a desirable forage species.

Prescribed burning would occur within mapped pileated feeding habitat on 545 acres, and would occur on 3,583 acres in grand fir and Douglas-fir PAGs (outside thinning units). This activity may reduce habitat suitability by reducing canopy closure and by altering the timing of mortality in grand fir and Douglas-fir. Fire is likely to result in an abundance of fire-killed fir trees soon after the treatment, providing a flush of foraging substrate, but later within stand mortality is expected to decline and thus foraging opportunities. The level of impact to suitability for pileated woodpeckers with this treatment is dependent on fuel loading and burn conditions initially, as well as the frequency of maintenance burning. It is assumed that across the majority of prescribed burn units, forested stands are expected to retain sufficient tree density within these PAGs to maintain suitability for use by pileated woodpeckers immediately after treatment where it occurs outside of harvest areas.

No harvest, noncommercial thinning or natural fuels burning is prescribed within the 1,267 acres of mapped Old Growth Management Areas.

Conclusion: This alternative is expected to reduce quantity of primary nesting habitat on 820 acres (19% of existing) within the project area in the short term. The amount of mapped pileated feeding habitat (pfh) treated by alternative is displayed in Table 106. Primary nesting habitat HRVs are displayed in Table 105. The amount of primary nesting habitat across the analysis area would remain within HRV as shown in Table 105. Over time, as canopy closure recovers in treated areas and as other stands develop larger trees, primary nesting habitat would increase. Pileated woodpeckers generally would not be expected to nest within areas that are commercially treated under this alternative for a period of 25 to 30 years on mesic sites (grand fir and Douglas fir PAGs) because of the reduction in canopy closure. Non-commercially thinned stands on such sites are expected to remain suitable for nesting after treatment. Impact of prescribed burning on nesting habitat is dependent on residual stocking and degree of crown scorch. It is assumed that prescribed burning on grand fir and Douglas-fir PAGs is likely to reduce suitability for nesting by pileated woodpeckers due to the relatively high fuel loads and higher representation by fire intolerant species in the mix. On xeric sites (ponderosa pine and juniper PAGs) primary nesting habitat would not occur whether treated or not.

Alternative 3

This alternative would reduce primary nesting habitat for this species by 793 acres. These acres represent 18% of existing primary nesting habitat in the project area. The effects to primary nesting habitat would be the same as for alternative 2. Alternative 3 includes commercial harvest on 13 acres within mapped pfh, and would commercially thin 4,217 acres in grand fir and Douglas-fir PAGs within the project area. Effects of this treatment would be as described for Alternative 2, but on 105 less acres.

This alternative would noncommercially thin conifer stands (including hardwood treatments) on 311 acres of mapped pfh and 4,310 acres in grand fir and Douglas-fir PAGs (outside of commercial harvest units). Thinning of these small trees would help to promote the development of larger trees in the stand, and thus the development of higher quality foraging habitat in the future. This affect is the same as described for Alternative 2, but on 794 less acres. The prescription calls for preferential retention of ponderosa pine and larch, but grand fir and Douglas-fir would likely be retained as individuals within these stands, especially on north and east facing slopes and in draws. No trees equal to or larger than 21”dbh would be harvested. Where noncommercial thinning occurs in grand fir and Douglas-fir PAGs, the suitability for use by pileated woodpeckers is not expected to be affected. In cases where currently suitable nesting habitat receives understory thinning and canopy closure is

reduced to less than 50%, the Viable and Wildhab analysis reflects the reduction, and it is included in the alternative acres displayed in Table 105.

Prescribed natural fuels burning would occur within mapped pfh on 196 acres and on 3,180 acres in grand fir and Douglas-fir PAGs (outside thinning units). This activity can be highly variable on potential effects to pileated habitat. This activity may reduce habitat suitability by reducing canopy closure and by altering the timing of mortality in grand fir and Douglas-fir. Fire can result in an abundance of fire-killed fir trees soon after the treatment in some areas where fuel loading is high, providing a flush of foraging substrate, but later within stand mortality is expected to decline and thus foraging opportunities. Fire can result in the reduction of downed wood, at least in the short term of 1-3 years following burning. The level of impact to suitability for pileated woodpeckers with this treatment is dependent on fuel loading and burn conditions initially, as well as frequency of maintenance burning. It is assumed that across the majority of prescribed burn units, forested stands are expected to retain sufficient tree density within these PAGs to maintain suitability for use by pileated woodpeckers immediately after treatment where it occurs outside of harvest areas.

Conclusion: The amount of primary nesting habitat would be reduced by 838 acres (19% of existing) within the project area in the short term. The amount of mapped pileated feeding habitat (pfh) treated by alternative is displayed in Table 106. Primary nesting habitat HRVs are displayed in Table 105. Over time, as canopy closure recovers in treated areas and as other stands develop larger trees, primary nesting habitat is expected to increase. The amount of primary nesting habitat across the analysis area would remain within HRV as shown in Table 105. Noncommercially treated stands on mesic sites may remain suitable for nesting after treatment, depending on residual stocking and degree of crown scorch. On xeric sites (ponderosa pine and juniper PAGs) primary nesting habitat would not occur whether treated or not.

Effects Common to Alternatives 2 and 3:

In action alternatives 2 and 3, there are 224 acres and 212 acres respectively that are proposed for post/pole and fire wood removal. Units are small in size, averaging less than 16 acres and are dispersed across the project area. Lodgepole pine would be thinned up to 20.9”d.b.h. In alternative 2, 18 of the 224 acres are within the mapped pileated woodpecker feeding habitat and in alternative 3, there are 13 of the 212 acres in mapped pileated feeding habitat. Trees to be harvested are lodgepole pine which are generally small diameter (<12”) and do not provide primary nesting or foraging habitat for the pileated woodpecker. Referring to DecAID, trees less than 14.2” dbh provide foraging at the 30% tolerance level (Mellen-Mclean 2009). Lodgepole pine snags in excess of forest standards would be removed. Snag densities would be affected on less than 1.2% of the Eastside Mixed Conifer habitat type identified within DecAID (see snag analysis). Considering that the Ochoco Standards for snag densities would be met following treatment, and the area affected is small, the overall snag densities within the planning area would not be affected. Within the remainder of the project area, all existing snags would be left that are not deemed to be safety hazards. The amount of existing snags present within the project area should not be substantially altered by implementation of any alternative. However, the alternatives do set treated stands on different courses for rate of large snag development and overall snag recruitment. Trees retained in thinned stands should have increased diameter growth rate, and thus are more likely to provide large snag recruitment in the future. On the other hand, trees retained in thinned stands should generally stay healthy longer, and thus would not provide snags as quickly as unhealthy stands. Also, as a result of the thinning there would be less trees left following treatment than there would be prior to treatment and thus there would be fewer trees available to become snags in the future. Trees that are removed from thinned stands would not contribute to future snag habitat. Compared to untreated stands, thinned stands are not likely to provide a large number of dead trees quickly. The net result is that treated units would provide fewer, but larger snags in the future compared to untreated stands with similar initial stand density and tree

size. Refer to the Silviculture Report for more details on predicted response of released trees to thinning.

Snags and down wood may be consumed by prescribed fire. This should be partially offset by the creation of snags and down wood due to fire-killed trees. The effect of fire on snag retention would likely result in a higher number of hard snags, with a concurrent reduction in soft and hollow snag habitat. Because of anticipated low fire intensity, it is also likely that while large existing snags may be consumed by fire, the snags created by fire would tend to be in smaller size classes and/or fire intolerant species (such as grand fir) due to the higher vulnerability to fire mortality of smaller and thin barked trees.

Table 105. Pileated Woodpecker Primary Nesting Habitat (in acres)

Alternative	HRV low	HRV high	Acres Post Treatment	HRV range yr 1
1	3,055	6,525	4,376	within
2	3,055	6,525	3,556	within
3	3,055	6,525	3,583	within

Table 106. Comparison of Treatment Acres in Mapped Pileated Woodpecker Feeding Habitat (pfh)

Alternative	Pileated wp Harvest in pfh	Pileated wp Non-comm. Thin in pfh	Pileated wp Natural Fuel/Activity Fuel burning in pfh	Total Treatment Acres in pfh and % of pfh acres with treatment
1	0 ac.	0 ac.	0 ac.	0 ac.
2	18 ac.	332 ac.	195 ac.	545 ac./38%
3	13 ac.	311 ac.	101 ac.	425 ac./30%
			Total Acres (pfh)	1,431 acres

Cumulative Effects

There have been numerous timber sales within the project area, which include a variety of harvest prescriptions. Records from the Paulina Ranger District indicate the following amount of past harvest treatments on Forest Service lands within the Jackson project area since 1978:

Regeneration Harvest Total – 3,371 acres
- Clearcut/Clearcut with Reserve Trees – 2,059 acres
- Shelterwood/Seedtree– 1,312 acres

Overstory Removal – 7,095 acres.
Partial Removal Cutting (thinning, selection cutting) – 4,681 acres

Additional harvest prior to 1978 focused primarily on the larger high value trees which would have also provided high value pileated nesting and roost trees.

The regeneration harvest areas received prescriptions (HCC, HCR), which would have removed most or all of the overstory trees and pileated woodpecker habitat. This intensity of treatment occurred on 3,371 acres. Overstory removal treatments can vary depending on understory stocking and harvest prescription, but often they resemble a HCC or HCR upon completion, and thus would have in many cases removed or degraded pileated habitat. This intensity of treatment occurred on 7,095 acres. Among these acres, units that retain approximately four to six live overstory trees would provide for some future large snag and log habitat as the younger stand around them develops into a mature stand, but would have largely eliminated pileated woodpecker habitat in the short term. Partial cuts generally do not retain enough overstory trees to provide pileated woodpecker nesting habitat in the short term, but may be used as foraging areas. Such stands do retain structure that could contribute to both the overstory and the snag and down wood components in the future as the stand develops around them. As thinning tends to target grand fir and Douglas-fir for removal, and reduces stand density so that less trees die, most thinned stands would have limited ability to serve as either nesting or foraging habitat for pileated woodpeckers. Shelterwood harvest occurred on 1,312 acres and partial

cut treatments occurred on 4,681 acres. The historic individual and group selection harvest that occurred prior to 1978 usually did not render habitat unsuitable for nesting by pileated woodpeckers, as the majority of the stand was retained. These high-grade and sanitation salvage operations did remove large trees and snags that could have otherwise served as roost trees or nest trees for pileated woodpeckers. However many occupied and productive nest stands do contain evidence of these historical logging operations. Mapped pfh are generally delineated outside of previously harvested areas, though some acres within mapped pfh have received some level of hazard tree removal, salvage or woodcutting in the past. Removal of snags for firewood, for hazard abatement or under salvage sales would have reduced habitat for woodpeckers. However, at the same time that pileated woodpecker habitat was being reduced within timber harvest units, fire suppression activities were being implemented across all plant associations. As a result of this fire suppression, grand fir was allowed to develop in the understory of many stands that were previously dominated by ponderosa pine and larch. In these stands, pileated woodpecker habitat has increased compared to historic conditions. These past activities and events affect the existing amount of habitat on the landscape and are reflected in the Viable and Wildhab analysis of existing condition.

Ongoing grazing, recreational use, riparian improvement and exclosure maintenance activities are not expected to result in effects to this species when combined with effects of this project. However, ongoing firewood cutting may combine with this project to further reduce habitat for pileated woodpeckers. When implemented within the rules established by the firewood synopsis, there should be no net cumulative effect. However, people continue to remove large snags illegally, accessing them cross country or on old timber harvest access routes. This project proposes to construct up to 10 miles of new temporary roads. Though all skid trails and new roads are scheduled to be closed after project activities are completed, some people are likely to utilize these road beds and skid trails for a period of time before closures are implemented (some people may breach closures after they are implemented) in order to access firewood. This project may contribute to increased accessibility, and thus additional area vulnerable to illegal snag removal which would reduce potential nesting habitat for this species and other primary cavity excavators.

Specifically, present and reasonably foreseeable projects that have the potential to negatively affect pileated woodpecker habitat include the District/Forest Firewood Program and ongoing hazard tree removal. These projects could slightly add cumulatively to the proposed post/pole and fire wood removal units. In alternatives 2 and 3, there are 224 acres and 212 acres respectively that are proposed for post/pole and fire wood removal. However, units are small in size, averaging less than 16 acres and are dispersed across the project area. Considering that the Ochoco Standards for snag densities would be met following treatment, and the area affected is small, the overall cumulative effect to snag densities within the planning area would be minimal. Within the remainder of the project area, all existing snags would be left that are not deemed to be safety hazards. The amount of existing snags present within the project area should not be substantially altered by implementation of any alternative.

At the watershed scale, the combined effect of the proposed action alternatives with these present and reasonably foreseeable actions is that the abundance and distribution of pileated woodpecker habitat would still be within the range of what is believed to have been the historic level. Habitat for pileated woodpeckers would be concentrated on sites that are more likely to sustain such stand densities and species distributions, and would be eliminated from sites that are less likely to sustain it in the long term

Forest Plan Consistency: The pileated woodpecker is distributed across the Ochoco National Forest and there are adequate amounts, quality, and distribution of habitat to provide for pileated woodpecker population viability. Given the relatively wide range of this species, increasing population and habitat trends, and the amount and distribution of habitat remaining, within the project area, at the forest level and across the eco-region, viability for this species is expected to be provided

for on the Ochoco National Forest. Given that this project impacts less than 2% of the suitable priority nesting habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat in the short term. However, this reduction in nesting habitat is insignificant at the Forest scale and is not expected to reduce the viability of this species at the Forest level. For these reasons the Jackson Project is expected to result in continued viability of pileated woodpeckers on Ochoco National Forest.

NORTHERN FLICKER

The northern flicker was chosen as a terrestrial management indicator species (MIS) for old growth juniper (LRMP FEIS 3-21 and 4-96). This species can excavate nests in old growth juniper, where other species of woodpeckers do not serve as primary cavity excavators.

Northern flickers are described as a common inhabitant of Oregon (Marshall et al. 2003). Northern flickers are habitat generalists and occur throughout the analysis area, especially in open stands. Many researchers have reported on aspects of behavior and nest use by flickers as part of general studies of cavity nesting birds. Recently such interest has intensified as flickers have been recognized as "keystone" excavators which may influence the abundance of secondary cavity nesters in forest systems (Martin et al. 2004). The northern flicker is generally most abundant in open forests and forest edges. The flicker is a habitat generalist and can be found nesting in a wide variety of habitat types, so long as snags or hollow trees or nest boxes of the appropriate dimensions are present.

Non-significant population decline ranging from 0.4-0.6 percent per year based on Breeding Bird Surveys 1966-2000 was reported by Marshall et al. (2003) for the this species. Northern flickers are ranked as S5, Secure (NatureServe 2009).

Though this species is not dependent on juniper habitat, this analysis would disclose conditions of old growth juniper because the northern flicker is listed as a MIS for this type of habitat in the current LRMP. The northern flicker is a common species and is often observed in relatively open forest conditions, particularly at lower elevations. This project area is at relatively high elevation, with elevation ranging from 4,500 to 6,300 feet, so flickers may not be present in as large of numbers as elsewhere on the Forest where low elevation habitat is more abundant. There are 783 acres of juniper woodland and juniper steppe PAGs scattered across the analysis area, with 362 acres with trees in the medium to large size class. This is an under representation of the amount of juniper that occurs within the project area. Historically, juniper would have occurred on less acreage throughout the project area than what currently exists. Most of the expansion has been into the ponderosa pine habitats and at the interface between non-forest PAGs with other forested PAGs. There is also a juniper component scattered within Non-Forested Lands that occurs within the project area. A majority of the juniper associated with the Non Forested Lands are old growth juniper due to infrequent fires that would have historically occurred within this vegetation type.

Current conditions within the juniper woodland and juniper steppe PAGs (not considering the non-forest and other forested PAGs previously discussed) closely reflect what would be expected historically within the project area. The primary difference is younger juniper occur at higher densities. Within the juniper steppe you would expect 148 to 312 acres would be in late seral condition with open stands of large (size class 4 to 5) or old structure juniper trees. Currently, there are 250 acres in the late seral condition with open stands of large trees and is within HRV. Within juniper woodland you would expect 8 to 16 acres in the late seral condition. Currently there are 15 acres in the late seral open condition which is within HRV.

Alternatives 2 and 3

The proposed action alternatives include 11 acres of commercial thinning in dry site ponderosa pine with size class 5 with >50% crown closure. The treatment would thin from below and would create more open conditions that would favor species like the northern flicker that prefers more open conditions. Prescribed burning would occur on the 11 acres of thinning under both action alternatives. No treatments within size class 5 juniper PAGs are prescribed. However, between 863 and 893 acres of noncommercial treatments in other size classes of juniper are prescribed to promote vigor of upland shrubs such as mountain mahogany and bitterbrush as well as promoting the vigor of native bunchgrass. The majority of these treatments are not proposed within juniper PAGs. These noncommercial treatments generally limit cutting to smaller diameter trees and retain all juniper with old growth characteristics. Therefore, these treatments are not likely to remove old-growth juniper or other juniper trees with sufficient size and defect to serve as potential nest sites for northern flickers. Treatments intended to open up stands that are becoming closed in may improve habitat conditions for northern flickers in the project area, as they tend to select open habitat types. Even though the flicker was selected as an indicator for old growth juniper, they do nest in a wide variety of forest types. A variety of forest types exist in abundance and well distributed across the Jackson planning area and this species is widespread and common across the Forest. For these reason, this project would not contribute to a negative trend in viability on the Ochoco National Forest.

GOLDEN EAGLE & PRAIRIE FALCON

The golden eagle and prairie falcon were chosen as a terrestrial management indicator species (MIS) for cliff, talus or cave habitat (LRMP 4-245).

Habitat Characteristics of the Prairie Falcon

Prairie Falcons are most common in rimrock country, where they nest, but may travel great distances in search of prey (Marshall 2003, Birds of Oregon). A combination of rimrock or other outcrops and adjacent open country provides ideal breeding habitat. Cliffs need not be large. Denton (1979) found 59% of nest on cliffs less than 100 ft., some as low as 15 ft. The principal requirement is that the nest site be sheltered from above. This appears to reflect a need for shade and possibly protection from predators (Marshall 2003).

Grasslands are the preferred habitat although they also occur in less-productive areas dominated by sagebrush. The principal requirement for foraging appears to be low and sparse vegetation that accommodates their foraging style. Prey most often consists of small mammals, usually ground squirrels (Denton 1976, Haak 1982b).

Habitat Characteristics of the Golden Eagle

Golden Eagle inhabits shrub-steppe, grassland, juniper, and open ponderosa pine, and mixed conifer/deciduous habitats. It forages in a variety of habitat types and successional stages, preferring areas with an open shrub component that provides food and cover for prey. Suitable nesting and foraging habitat can be found in mountains, canyons, and rolling hills. Of 506 occupied nests in 1982, 35% were in mature trees and 65% on ledges along rims and cliffs (Isaacs and Opp 1991). Nest trees are typically large live ponderosa pine with sturdy open branching and a trunk dbh >30 in. Golden Eagles have large breeding territories ranging 10-40 sq. mi. Nest territories may contain several alternate nests. Golden Eagles forage on a variety of prey species including: jackrabbit, cottontail, California and Belding’s ground squirrels, marmots, woodrats, small mammals, fresh carrion, and a variety of bird species (Marshall 2003).

Habitat Analysis

A forest-level analysis was conducted in 2011 using updated GIS data on rock features. The output from this analysis reflects the majority of rock features with potential nesting habitat. Rock features

identified in the GIS data are those that are of sufficient size to be detected from aerial photographs. The rock categories included in estimating potential nesting habitat for this species included the following: rimrock, rock, rock/limestone, rocky knob, talus, talus/rocky knob, talus/rimrock. The GIS data layer is estimated to be 80% accurate in detecting rock features with cliff faces that have any potential as nesting sites. Some small cliffs may have been overlooked in the aerial photo interpretation, and some rock features identified as potentially having cliff habitat, may not be suitable for nesting sites. However, this data is expected to be representative of the majority of suitable nesting substrate and of sufficient accuracy for a comparison of potential rock habitat within the project area and across the landscape at a forest-wide scale. From this analysis it was estimated that in the Jackson project area there are 332 acres of rock habitat and at the Forest level there are approximately 18,838 acres of potential nesting habitat. There are rock features associated with the analysis area, although there are no rimrock or cliff features that would be suitable nesting habitat for either the prairie falcon or golden eagle.

Direct, Indirect, and Cumulative Effects of Alternatives 1, 2, and 3

There are no known golden eagle or prairie falcon nests known to occur within the project area. Cliff faces and ledges suitable for prairie falcons or golden eagles do not occur within the project area. Thinning of overstocked stands could improve foraging opportunities by making the habitat more open. However, this project area is likely to have a relatively minor influence on potential nesting and foraging habitat for prairie falcons due to a lack of rock cliff features within the project boundary. For these reasons, implementation of any alternative proposed in this project would have no direct, indirect or cumulative effect and would not affect the viability of either the prairie falcon or golden eagle on the Ochoco National Forest.

OTHER RAPTORS

A variety of raptors are known to be within the area of influence of this project or have sightings within the analysis area. They include red-tailed hawk, Cooper’s hawk, bald eagle, golden eagle, goshawk, osprey, and prairie falcon. There are no known golden eagle, prairie falcon, or bald eagle nests known to occur within the project are. There are goshawk, Cooper’s hawk, red-tailed hawk, and osprey nests within the analysis area. The bald eagle (TES), golden eagle (MIS), Northern goshawk (Eastside Screens consistency), and prairie falcon (MIS) have been discussed in other sections of this report.

Alternative 1

This alternative would not treat forest stands and thus the current trends in forest development would continue to occur. This alternative would maintain the existing acres of fir-dominated understories and the trend toward fir dominated habitats. This would tend to favor the forest dwelling accipiters (Coopers hawk) and the small forest dwelling owls (pygmy owls, saw whet owls). These dense, fir-dominated understory conditions would result in a continued loss of herbaceous and shrubby vegetation in the understory. As a result, shrub and ground nesting bird populations (prey) would remain depressed, and the ability of open forest avian predators to effectively hunt ground dwelling small mammals would continue to be limited. There would be a continued decline in habitat for species which prefer open Ponderosa Pine habitats (white-headed woodpecker, flammulated owls as Ponderosa pine dominated habitats would increase in stand densities. Tree mortality due to stand densities being above sustainable levels would result in recruitment of snag and down log habitat over time. Potential for high intensity wildfires would be increased. This would likely trigger an increase in the woodpecker population in the short term, which are also prey for avian species.

Conclusion: This alternative would maintain the suitability of all existing habitat for raptors in the short term and would not result in disturbance or displacement of raptors from existing occupied territories.

Alternative 2

This alternative would treat 5,744 acres of commercial thinning; 1,358 acres of riparian noncommercial thinning; 7,779 acres of upland noncommercial thin; 295 acres aspen treatments: including commercial and noncommercial thinning, and up to 7,485 acres of underburning. Canopy closure may be reduced to less than 60% crown in treated stands where this conditions exists. Retained trees would expand their crowns in diameter and depth in response to the release from competition that results from the thinning. Riparian thinning and aspen treatments are intended to improve riparian shrubs and riparian hardwoods which would improve vegetation diversity and habitat for a variety of raptor prey species. Thinning of mid-story trees would promote the development of large structure trees, large snags and down logs. Reducing competition from below is also likely to improve the longevity of existing large trees in the overstory. Thus, treatments may reduce suitability, in the short term, for the forest dwelling accipiters and the small forest dwelling owls. However, over time, the treatments may maintain overstory canopy by improving health and vigor of retained trees in the stands. The development of herbaceous and shrubby vegetation in the understory that results from reducing conifer density should also improve habitat for many species of shrub and ground nesting birds, and the ability of open forest avian predators to effectively hunt ground dwelling small mammals would also be improved. Large raptors that nest on large trees or snags in relatively open forests, such as red-tailed hawks and golden eagles, would benefit in the long run from treatments that promote the development of large trees and snags. This type of treatment would occur on the most acres under this alternative.

Conclusion: This alternative would maintain the suitability of habitat for raptors that select for open forest environments within treated stands and for other species in untreated stands. This alternative has potential to disturb nesting raptors in occupied territories. Design elements are included in this project to minimize disturbance to nesting raptors.

Alternative 3

The effects are the same for Alternative 2 and Alternative 3, but under alternative 3, there would be 199 acres less of commercial harvest treatment. There would be no commercial thinning within riparian corridors and only 113 acres of noncommercial thinning. Stand densities would remain high on these acres with an increased potential for disease and insects. The large diameter trees greater than 21”dbh that are also present within these stands are expected to show increased mortality from the stress of high tree densities occurring in the understories. Stand densities within riparian corridors would remain high under this alternative and the potential for improvement in the vigor and distribution of riparian shrubs would be less under this alternative. Observations indicate this is already currently occurring within the project area. Increased tree mortality is expected. Aspen treatments are also proposed under alternative 3 with an increase in the number of clones being treated compared to alternative 2.

Conclusion: This alternative would maintain the suitability of habitat for raptors that select for open forest environments within treated stands and for other species in untreated stands. This alternative has potential to disturb nesting raptors in occupied territories. Design elements are included in this project to minimize disturbance to nesting raptors.

Cumulative Effects

Regeneration harvest activities have occurred on approximately 3,815 acres in the planning area since 1985. The majority of these treatment areas received regeneration harvest prescriptions, which would have removed most or all of the overstory trees and snag habitat. Many species of hawks nest in large trees and most owls nest in cavities in snags or hollow trees or in abandoned stick nests in trees. Where these structures have been removed, potential nesting habitat has been eliminated. However, these open areas do provide foraging opportunities for many species that forage over open ground,

such as harriers, red-tailed hawks and kestrels, as well as flammulated, barn, great horned and pygmy owls. Red-tailed hawks and pygmy-owls select trees along or near the edges of forest openings for nesting. Commercial thinning and selective harvest areas may provide nesting habitat for some species of hawks and some owls. Ferruginous hawks, kestrels, flammulated owls, great-horned owls and long-eared owls are known to prefer relatively open forests. However, thinned stands would likely be too open for other owls and the forest dwelling accipiters, such as goshawks. Commercial thinning treatments and selective harvest have occurred on 4,681 acres in the project area

Present livestock (Allotment Management Plans- see Range Specialist Report) and big game management plans would continue to occur on both privately owned and federally managed lands in and adjacent to the project area. This activity can result in changes to herbaceous and sometimes shrubby vegetation. Grazing of grasses and forbs can alter the height of these plants and the amount of ground cover. This can impact the quality of nesting and brood rearing habitat for ground nesting birds and small mammals, which may serve as prey to raptors. However, removal of coarse vegetation by large ungulates can also improve the palatability and nutritional value of this forage for prey species that consume vegetation, and can improve foraging opportunities for species that feed on insects and other invertebrates, by making these food resources more visible. Browsing of palatable species of shrubs can reduce their size, height and density. This can alter the quality of nesting habitat for shrub nesting birds that may serve as prey to raptor species. Raptors which forage on ground dwelling animals such as insects, amphibians, reptiles and small mammals often take advantage of open areas with reduced ground cover as foraging sites.

A reasonably foreseeable future project that could occur in the Jackson project area is the Wheeler Aspen Stewardship agreement. This timber sale would help restore three aspen stands (19 acres) in the upper part of the project area along the 30 Road. Commercial and noncommercial sized conifers that are shading the aspen clones are planned to be removed from these stands. The project is too small to cumulatively affect, positively or negatively, the habitat of raptors.

The Forest would continue to manage forested areas to move toward historic conditions. This would increase the abundance of open park-like ponderosa pine dominated stands on dry sites. The Forest would also continue to manage forests to increase the abundance of large tree structure in single story structural classes on more mesic sites. This management trend is likely to continue until the multi-strata LOS and single-strata LOS is within the historic range of variability that has been defined for the watersheds in the project area. This process would reduce the amount of habitat available for species that prefer dense forest canopy, while increasing the amount of habitat available for species that select more open stands. Thinning of stands with relatively small trees should promote the development of large tree habitat in the future. The recruitment of large trees and large snags would contribute potential habitat for species that nest high in tall trees, such as red-tailed hawks, or that require large snags to accommodate appropriately sized cavity nests, such as kestrels and many of the owls.

Forest Plan Consistency: In accordance with standards and guidelines for hawk and owl nests contained in the LRMP, a primary buffer of five chains (330’) would be flagged around each nest site and a seasonal restriction (March 1 to August 1), within 10 chains (660’) of active hawk or owl nests, would be implemented under all action alternatives. Within the primary nest buffers the management objective is to maintain the current habitat characteristics. If risk of loss of overstory trees within these nest areas is imminent, then selective removal of competing understory conifers from the base of large trees and associated slash disposal may occur. However, commercial removal would not occur within primary nest buffers. The seasonal restrictions may be waived on a case-by-case basis, if appropriately timed monitoring indicates that the nest area is not reproductive during that nesting season. This assessment cannot be made until well into the nesting season. Waivers would only be valid for the year in which they are granted. For this reason, this project is expected to be consistent with the LRMP.

Big Game Habitat (Rocky Mountain Elk and Mule Deer)

Mule deer and Rocky Mountain elk were chosen as terrestrial management indicator species (MIS) for populations of big game and their habitat (LRMP 4-245).

The desired condition is to provide foraging, thermal cover, and security habitats to maintain healthy populations of Rocky Mountain elk, mule deer, and pronghorn that are consistent with population management objectives established by the Oregon Department of Fish and Wildlife (ODFW) (LRMP 4-37). A project objective is to increase number, distribution, and age class of a variety of big game browse species such as, mountain mahogany, ceanothus, bitterbrush, and various riparian shrub species.

The Habitat Effectiveness Index (HEI) for elk was used to analyze and describe the existing habitat condition within the watershed, and the effects of the alternatives. There are Standards and guidelines in the Ochoco National Forest Land and Resource Management Plan (LRMP) for HEI for General Forest (GF), Winter Range (WR) and General Forest Winter Range (GFWR). The majority of the planning area is within the General Forest Management allocation (GF) 48,686 acres. Forest Plan HEI standards apply to only this management area found within the planning area (LRMP 4-258). These allocations have standards and guidelines in the Ochoco National Forest Land and Resource Management Plan (LRMP). HEI includes variables for cover quality (marginal vs. satisfactory), cover quantity (% cover) and open road density. Table 107 displays the minimum standards and guidelines for percent cover, road density, and HEI value for General Forest in the third decade following publication of the LRMP. The LRMP page 4-258 states that, " It is expected that individual projects would be above and below these values, but that the overall objective (HEI) for the management areas would be met. Percent cover is the percent of the General Forest allocation within the planning area in marginal and satisfactory thermal cover combined. Marginal cover is defined as having at least 40% crown closure, whereas satisfactory cover is defined as having at least 70% crown closure. In addition, there are 6,702 acres of habitat capable of contributing to HEI that are found in other land allocations not included in this analysis, such as riparian habitat conservation areas, designated old growth, etc. In this analysis area, cover is limited in amount and distribution, primarily because of the scab stringer nature of the landscape. The entire watershed is composed of 26% non-forested lands.

Existing Condition:

The watershed lies within one Oregon Department of Fish and Wildlife (ODFW) management zone, the Ochoco Game Management Unit (GMU). The Ochoco GMU contains 47% private lands and 53% public lands. The estimated 2011 population for elk and deer was 3,900 elk and 15,400 deer. The management objective (MO) is the number of elk and deer that ODFW manages for to prevent depletion of big game animals and to provide optimum recreational and aesthetic benefits for the public (quality hunting and wildlife viewing opportunities in the present and in the future).

The LRMP objective is 2,600 elk and 18,300 deer across the Ochoco National Forest (LMRP 4-37). In the third decade (current decade) of plan implementation it was expected that there would be 2,900 elk and 18,300 deer across the forest. Currently, the ODFW management objectives (MO) in the Ochoco WMU are 4,600 elk and 20,500 deer. Mule deer populations have been generally declining across the Western States. This decline is evident in the Ochoco WMU as well. The ODFW mule deer MO was met in 1988, but has not been met since. Population estimates within the WMU have decreased from 18,500 in the late 1990's to 15,400 in 2011, but was estimated at 16,000 in 2010. The elk population steadily increased from the 1970's through the early 2000's, meeting or exceeding the 4,300 elk target starting in 1999, and has been holding fairly steady in recent years (between 4,000 and 4,700 between 2006 and 2009). The population estimate for 2011 was 3,900 elk in the Ochoco WMU.

The watershed contains 48,686 acres within the general forest land allocation and no winter range allocations. Calving and fawning can occur throughout the watershed, although, they primarily occur in proximity to riparian areas that provide high quality forage and cover. Aspen stands and other riparian hardwoods such as willow are likely to be attractive areas for calving and fawning. Pronghorn kidding may occur in more open and dry habitat where predator detection is better.

Elk and mule deer use the project area throughout most of the year. Seasonal movements are primarily influenced by snow depth. During winters with below average snow fall amounts, both species can remain in the southern portion of the project area throughout the year. During winters with normal to above normal snow accumulations, the majority of animals move to lower elevations on the forest, private or BLM managed lands.

Upland shrub species that provide forage for big game including mountain mahogany, ceanothus, upland willow and bitterbrush do not occur in large numbers within the watershed. Mountain mahogany was likely represented by higher populations and wider distribution historically because there were more open ponderosa pine stands and shrub steppe habitat that occurred at lower elevations. Bitterbrush did not cover large areas historically and remains limited within the watershed.

The displayed road density listed below in table 107 were field verified in the summer of 2011 and is those roads that are currently open and drivable. The road densities are an overestimation of the current open roads. During field verification many of the three digit roads that were open were not drivable the entire length of road, although the entire length of road was used during road density calculations. The road densities do not give an accurate indication of the amount of vehicle use and the potential disturbance effects to big game habitat. During field work conducted during the summer of 2011 many of the three digit roads received very light use until the beginning of archery season, at which time road use began to increase. OHV use within the watershed has also increased in the last 10 years, which is also primarily associated with the beginning of archery season and primarily related to hunting activities. Many studies have documented that elk avoid areas near open roads (Wisdom 1998, Ager et al 2003). Elk may be spending more time on private land in response to traffic on federal lands. This may be a response to hunting pressure, forage quality and availability, an increase in disturbance from motor vehicle use or a combination of these factors.

Table 107. Existing Cover, Road Density, HEI Value and Goals (HEI values are average values for the watershed) based on values within (HEI Tables – PIN #11 September 13,1990)

Management Area (MA)	Cover % of MA	Cover Goal % of MA Pin #11	*Road Density mi./sq. mi. (existing road density)	Och Travel Management Rule (objective road density)	LRMP Goal Road Density mi./sq. mi	Existing HEI	Pin #11 HEI Objective (3rd Decade)
General Forest (GF)	29	25	2.3	1.8	3	46	18

*road densities are displayed for the entire analysis area

Alternative 1

No satisfactory cover or marginal cover would be treated under this alternative. Open road densities are expected to decrease with the implementation of the Ochoco Travel Management Rule which was signed August 4th 2011. With implementation of the Ochoco Travel Management Rule, open road densities are expected to gradually decrease to the objective level of 1.8mi./sq.mi. for the analysis area. Percent cover and HEI would remain at the current levels for a period of time. In General Forest (GF) percent cover is currently at 29% and HEI is at 46. Habitat effectiveness would continue to follow the current trend, with gradual development of additional cover as the canopy of untreated stands continue to close.

Conclusion: In the short term, this alternative would maintain the current condition of all existing habitat for big game animals, including elk (See Tables107 and108). Stands that currently provide marginal cover would continue to close in and over time, more satisfactory (thermal) cover would develop as canopy closure increases. Additional stands, generally past harvest units, would continue to develop and additional areas of marginal and or satisfactory cover would be produced. Road densities would likely be expected to decrease depending on the effectiveness of current road closures and implementation of the Ochoco Travel Management Rule. The project area is a part of the Rager Green Dot road closure program. During the deer and elk rifle seasons, non-green dot roads are closed to vehicle traffic unless otherwise authorized by the USFS (administrative use, special permitted use). This closure runs the length of October and November. Open road densities are reduced to 1.99 mi/mi^2 with implementation of this annual closure. Forage quality would likely decrease within the project area as stands develop and crown closures increase. There would be no initial change in HEI in the analysis area. Over time, HEI is expected to increase within the management area. This alternative would not result in disturbance to elk from human activity associated with project implementation. Elk calving habitat would continue the trend of increasing density of coniferous cover and decreasing condition of riparian hardwoods and other forage species.

Alternative 2

Within General Forest (GF), this alternative would reduce satisfactory cover by 543 acres and reduce marginal cover by 1,961 acres. Total cover acres within GF would be reduced by 2,504 acres, resulting in a 17% reduction in percent cover within the analysis area. With the implementation of Alternative 2, percent cover within GF would be reduced to the minimum goal of 25 percent cover for the project area and watershed. The remaining cover would be well dispersed and in adequate patch size. It is assumed that noncommercial thinning and prescribed burning would not affect thermal cover in the short term because the trees that provide canopy cover that are greater than 40 feet tall would not be cut during PCT or killed by prescribed burning. The reduction of cover would increase the potential for increased disturbance for both deer and elk. Disturbance is primarily related to activities associated with hunting seasons and to a lesser extent other recreational activities. Increased disturbance due to decreases in cover could increase the movements of elk and deer on adjacent private lands. Cover quality and quantity is expected to increase over time as forest canopy recovers. Past re-generation cuts that have occurred on approximately 3,371 acres within the project area are currently providing security habitat for elk, but limited thermal cover as a result of the size of trees. Noncommercial thinning is expected to increase growth on younger trees and increase the development of crowns and thermal cover in the long term. A ratio of 40% of land in cover to 60% of land in forage is thought to provide optimal deer and elk habitat (Thomas, 1979). The concept that dense forest cover, (thermal cover), moderates the effects of weather and confers survival and a reproductive advantage for both deer and elk has been challenged by studies by cook et al. 1998 and Freddy 1984, 1985, and 1986. However, cover remains important where security is low because of disturbance factors such as high road densities. This alternative would move the forage/cover ratio to 25% cover and 77% forage immediately post treatment. This would move the percent of the area in cover to the minimum level of 25% for the analysis area for the 3rd decade. Alternative 2 would improve forage conditions as a result of commercial thinning, pre-commercial thinning, and prescribed burning throughout the analysis area.

Alternative 2 would temporarily increase open roads during harvest activities within GF (MA-F22) by a total of 25 miles. Increased roads during harvest activities would affect the distribution of elk within the project area during harvest activities and increase public access to sections of open roads that are currently closed. Although, temporary roads and closed roads that are re-opened would be closed following harvest activities and would not affect open road densities in the long term. No new road construction would occur under alternative 2. As a result of changes in cover, HEI would be decreased from 45 to 20 in GF meeting forest plan standards for HEI. Under Alternative 2, 5,744

commercial thinning, 7,779 acres of noncommercial thinning activities, and 1,934 of underburning is expected to improve forage production and diversity of forage species throughout the project area.

Conclusion: This alternative would reduce current thermal cover by 19% within GF as described above. The reduction in cover may lead to increased disturbance due to recreation use and a variety of hunting seasons within the project area. Increased disturbance may cause increased movements of elk to adjacent private land. Decreasing road densities can moderate the effects of decreased cover. This project does not propose additional road closures, although 42 miles of roads have been closed within the project area in the last ten years. With the implementation of the Ochoco Travel Management Rule road densities are expected to decrease to 1.8mi./sq.mi. Current road densities are below goals established within the Forest Plan. The Ochoco National Forest Plan states that cover and road density values are averages and should be managed to meet the HEI objectives for any particular area. As a result, alternative 2 meets the Forest Plan objectives. Forage conditions are expected to improve across the project area with the implementation of this alternative. The analysis indicates that the watershed values meet HEI standards for General Forest.

In the Ochoco National Forest Plan, HEI was translated into a number of animals that could be supported in an area if the habitat were maintained at optimum effectiveness. This resulted in an estimation of elk and deer population numbers. The management objective estimated for deer was 18,300 and elk ranged from 3,000 in the first decade to 2,600 in the 5th decade across the Ochoco NF for the Ochoco planning horizon (LRMP 4-44). Currently, the ODFW management objective for the Ochoco GMU (a portion of the Ochoco NF) elk is a herd of 4,600 animals, and for deer it's 20,500. These management objectives are set much higher than those of the Forest Plan.

Alternative 3

The effects of alternative 3 are similar to alternative 2, although under alternative 3 there would less acres of thermal cover treated while temporary roads would be the same. Within General Forest (GF), this alternative would reduce satisfactory cover by 521 acres and reduce marginal cover by 1,875 acres. Total cover acres in GF would be reduced by 2,396 acres, resulting in an 16% reduction in percent cover. This alternative would move the forage/cover ratio to 25% cover and 75% forage immediately post treatment. With the implementation of Alternative 3, percent cover within GF would be reduced to the minimum goal of 25 percent cover for the project area and watershed. It is assumed that noncommercial thinning and prescribed burning would not affect thermal cover in the short term because the trees that provide canopy cover that are greater than 40 feet tall would not be cut during PCT or killed by prescribed burning. Noncommercial thinning is expected to increase growth on younger trees and increase the development of crowns and thermal cover in the long term.

Alternative 3 would temporarily increase open roads during harvest activities within GF (MA-F22) for a total of 25 miles. Increased roads during harvest activities would affect the distribution of elk during harvest activities, although these roads would be closed following harvest activities and would not affect open road densities in the long term. No new road construction would occur under alternative 3. Open road density would remain at 2.3mi./sq.mi. and with the implementation of the Ochoco Travel Management rule road densities would be further reduced to 1.8mi./sq.mi which is below the Forest Plan standard of 3mi./sq. mi. in general forest. As a result of changes in cover, HEI would be reduced from 46 to 20 within GF which meets the LRMP HEI standard. Under Alternative 3, 5,545 acres of commercial thinning, 6,564 acres of noncommercial thinning activities, and 863 acres of underburning is expected to improve forage production and diversity of forage species throughout the project area.

Conclusion: This alternative would reduce thermal cover within GF, as described above. Road densities, which can have a high impact on the quality of elk habitat would not change with the implementation of this alternative. Activity associated with temporary road construction and harvest activities is expected to have a short term effect on the distribution of elk within the project- all

temporary roads would be closed following harvest activities. There has been 42 miles of road closure within the analysis area in the last 10 years. Additional road closures and the implementation of the recent Travel Management rule will further reduce road densities within the project area, with the goal of less than 2.0mi./sq.mi. within the analysis area. Current road densities are within goals established within the Forest Plan. The quality and quantity of forage should improve with the implementation of this alternative. The analysis indicates that the watershed values meet HEI standards for General Forest.

Table 108. HEI General Forest (Summer Range) (Pin #11)

	LRMP	Alt .1	Alt.2	Alt. 3
Cover (acres)	12,171	14,718	12,214	12,322
Open Rd (mi/sq mi)	3.0	1.8	1.8	1.8
Percent area in Cover	25	29	25	25
HEI Value Decade 3	**LRMP Goal: 18**	46	20	20

Cumulative Effects

Past and present management activities that have affected elk habitat within the project area include: Harvest activities, road construction, fire suppression, livestock grazing. Past harvest activities totaling 6,542 acres have occurred within the project area since 1985. Additional harvest likely occurred as early as 1950. Past harvest activities reduced the quality and quantity of thermal cover within the planning area, but also improved the quality and quantity of forage, especially in clear-cuts. Past harvest activities have improved forage availability and the diversity of forage species which has had a positive effect on habitat. However, past regeneration harvest and overstory removal cuts, that includes approximately 10,466 acres, are beginning to show a decrease in forage as young tree densities increase and canopies begin to close. As a result, forage quality has slightly decreased. Activities associated with the action alternatives would help to improve forage conditions across the project area.

Specifically, present and reasonably foreseeable projects include the Deep Restoration EA, Ochoco Travel Management Rule, the Ochoco OHV trail system, and the Westside AMP EA.

The Deep Restoration EA has closed 42 miles of road which has resulted in decreased road densities within the project area. With implementation of the Ochoco Travel Management Rule, road densities would be further reduced to 1.8mi./sq.mi which is below the Forest Plan standard of 3mi./sq. mi. in general forest.

The Ochoco Summit OHV trail system is a proposed project that would have an effect on road densities within the project area. The proposed action for Ochoco Summit, if implemented as written with no additional mitigation, would result in an open road density of 2.8mi./sq. mi within the project area. When combined with the reduction in cover that would occur in both action alternatives proposed in the Jackson project, the HEI would decrease to 15, which is below forest plan standards.

Livestock grazing has affected the quality, condition and quantity of forage available to elk. Browse species including; bitterbrush, willow, chokecherry, and mountain mahogany have been reduced as a result of historic grazing practices combined with increased elk populations and effective fire suppression efforts. Riparian shrubs are deficient in the majority of riparian areas within the project area as result of the effects of excessive browsing and riparian degradation and the loss of water tables. Riparian areas are important sources of high quality forage during calving periods and are in poor condition throughout the majority of the project area. The Westside EA was completed in 2005 and encompasses grazing allotments in the Deep Creek Watershed. The EA strengthened grazing standards in riparian areas with the goal of expediting recovery in those areas. The activities enacted

in the Westside EA have encouraged livestock to move into the uplands and disperse more evenly thereby reducing grazing pressure on riparian areas.

Forest Plan Consistency:

Rocky Mountain elk and mule deer occur in populations across the State of Oregon, and across Ochoco National Forest that have a demonstrated harvestable surplus. Oregon Department of Fish and Wildlife monitors these populations annually and sets harvest levels based on the results of annual monitoring. Given the widespread distribution of these species and their habitat across the Forest, and the potential effects described above, this project would improve the forage conditions and decrease cover. Road densities, which have the largest potential for impacting habitat have been decreased over the last ten years and with the implementation of the Ochoco Travel Management Rule would be reduced to 1.8mi./sq.mi. within the project area. The Jackson project would result in a decrease in habitat capability or carrying capacity as reflected in a decrease in HEI from 46 to 20. However, the project is consistent with Forest Plan standards for management of big game. The Jackson project is not expected to negatively affect big game populations within the planning area or within the Ochoco Wildlife Management Unit, because habitat quality and quantity are not a limiting factor. Big game populations are limited due to harvest levels, not carrying capacity. As a result For these reasons the project's overall direct, indirect and cumulative effects may result in a small negative trend (at least in the short term), but this impact is insignificant at the scale of the Forest. The Jackson Project is consistent with the Ochoco National Forest Plan standards and guidelines for deer and elk, and thus continued viability of Rocky Mountain elk and mule deer is expected on Ochoco National Forest.

Northern Goshawk

The Eastside Screens amended the Forest Plan and provided specific management direction for the goshawk. While not an MIS Ochoco LRNP, the Eastside Screens have specific standards and guidelines for management of the goshawk and its habitat. In Oregon, the goshawk is an uncommon to fairly common permanent resident in suitable habitat between 1,900 and 6,100 feet elevation in forested portions of the Cascade, Blue and Klamath mountains (Reynolds and Wight 1978, Reynolds et al. 1982, Marshall 1992). Highest densities are found east of the Cascade crest. During migration or winter the goshawk can appear anywhere in the state in forested and unforested habitats. Some of these individuals likely represent out-of-state breeders (Marshall et al. 2003). Although few data exist regarding historical changes, Squires and Reynolds (1997) suggested the distribution of the goshawk in the northern and western portions of its range is relatively unchanged.

Habitats for the goshawk are old forest and unmanaged young forests in montane, lower montane, and riparian woodland communities. Important habitat attributes of goshawk prey species include snags, down logs, woody debris, large trees, openings, herbaceous and shrubby understories and an intermixture of various forest structural stages (Wisdom et al. 2000). During winter, some goshawks may travel short distances to lower elevations and more open habitats in all upland woodland types (Wisdom et al. 2000). Goshawks nest in various forest structural conditions. Nest stands are generally characterized by large trees and the densest canopy cover available within the area (Reynolds et al. 1992) but are occasionally located in small-diameter trees (Hayward and Escano 1989, Squires and Ruggiero 1996). Foraging occurs in various cover types and structural stages, and the juxtaposition of several habitats may enhance the quality of foraging habitat around nest sites (Hargis et al. 1994).

Goshawk habitat is often characterized by three types of habit: nesting, post-fledgling, and foraging habitat. Nesting habitat usually consists of 20-40 acre patches of late and old mixed conifer forest stands with relatively high canopy closure greater than 50% (Daw and DeStefano 2001). Most nest stands are on slopes with northerly exposures, in drainages, and are often near streams. Reynolds et al. (1982) described goshawk nest sites in an eastern Oregon study as having a canopy cover ranging from 10-95 percent with a mean of 60 percent. Reynolds et al. (1992) reported that preferred nest

stands have a minimum of 40% canopy closure; and the nest sites within these stands have >60% canopy closure and open understories. Vegetation plot data collected from Deschutes National Forest goshawk nest sites showed canopy cover ranging from 49-94 percent (USDA 1993). Nest areas are often associated with forest openings (Kennedy 2003). In a study conducted in the Blue Mountains on the Malheur National Forest, Daw and Destefano (2001) found that forest structure around nests always contained wet openings and nests were positively associated with dry openings. The presence of dry openings increased the odds of a nest occurring by an estimated 2.5 times (Daw and DeStefano 2001).

The post-fledging areas (PFAs) are from 300-600 acres in size and surrounds the nest area. PFAs are important for fledglings as they provide cover and prey for the developing young. Reynolds, et. al. 1991 recommends maintaining 60% of the post-fledgling area in high canopy closure greater than 50% with a variety of structural conditions being represented. The PFA is defined as the area used by the family group from the time the young fledge until they are no longer dependent on the adults for food (up to two months) (Reynolds et al. 1992, Kennedy et al. 1994). Post-fledging areas may be important to fledglings by providing hiding cover and prey upon which to develop hunting skills (Reynolds et al. 1992). During the fledgling-dependency period, the activities of young are centered near their nests, but they move farther from the nest over time (Zachel 1985, Kennedy et al. 1994, Kennedy and Ward 2003). At the PFA scale, forest structure around nests was dominated by dense-canopied forest, always contained wet openings, and nests were positively associated with dry openings. While there was more abundant dense canopy, in late forest structure around nests, at the PFA scale, the most abundant forest structure was dense canopy, mid-aged forest (37%), followed by dense canopy, late forest (29%). The least abundant was early forest (3%; i.e., regenerating clearcuts with a small [20%] component of burns (Daw and DeStefano 2001). Dense canopy, late forest structure (i.e., trees >20.8 inches [53 cm] dbh and canopy closure >50%) was clearly important at landscape scales close to the nest, but decreased in relative abundance with distance from the nest.

There is not a lot of information available on how goshawks utilize foraging habitat. Similar to post-fledgling habitat foraging habitat contains a variety of forest conditions to support a variety of prey species. Snags and downed logs are important for many goshawk prey species and should be abundant. Foraging habitat is generally in stands with moderate to high canopy closures with fairly open understories. The open understories allow for greater maneuverability in hunting.

In 1994, the Interim Direction for Timber Sale Planning (Eastside Screens) amended the LRMP. The Eastside Screens established minimum standards for protection of the northern goshawk, stating that "until further information is known and management plans approved to insure species viability, the following standards are to be met as a minimum." The minimum standards which are still in effect are to:

- Protect every known active and historically used goshawk nest site from disturbance. "Historical" refers to known nesting activity occurring at the site in the last 5 years. Seasonal restrictions on activities near nest sites would be required for activities that may disturb or harass a pair while bonding and nesting.
- 30 acres of the most suitable nesting habitat surrounding all active and historical active nest tree(s) would be deferred from harvest.
- A 400-acre "post fledging area" would be established around every known active nest site. While harvest activities can occur within this area, retain late and old structure (LOS) stands and enhance younger stands toward LOS condition, as possible.

Nest cores and Post- fledging areas (PFA) have been mapped around or adjacent to known goshawk nesting sites. Within the planning area there are seven mapped PFA and associated nest stands. Of these nesting territories, four have been occupied in the last five years. All four post-fledgling areas are deficient in large tree structure with high canopy closures that would provide additional nesting

areas and foraging opportunities. Opportunities exist to reduce tree densities in young mixed conifer stands to develop large tree structure in the future. There is also an opportunity to thin small diameter trees less than 9 inches dbh within the post fledgling areas and foraging areas to improve foraging opportunities.

Happy Camp Creek and Happy Jack camp have not been checked in the last five years and are assumed active for this analysis. See Table 109 for information on goshawk territories and occupancy.

Table 109. History of Goshawks within the Analysis Area

Post Fledgling Area	Last Year Activity Documented	Size of Post Fledging Area	Size of Nest Stands	Number of documented nest cores
Little Summit Creek	2011	419 ac.	2 stands, 30ac. and 34ac.	2
Summit Camp	2007	403 ac.	33ac.	1
Toggle Meadow	2008	400 ac.	2 stands, 30ac. and 30ac.	2
Haypress	2006	409 ac.	31ac.	1
Happy Jack Camp	2004	421ac.	35ac.	1
Happy Camp Creek	1999	405ac.	30ac.	1
Paulina Butte	2010	400ac.	30ac.	1

There are currently 2,857 acres mapped in seven PFAs and their associated nest cores within the project area. The WILDHAB excel model analysis showed there are 27,653 acres of suitable nesting habitat that occurs within the Jackson analysis area, based on structural/seral conditions (dominated by size class 4 or 5 trees pine and/or fir trees). Historically, between 23,410 and 43,835 acres of primary nesting habitat would have been present within the project area. The amount of suitable habitat is currently within the Historic Range of Variability (HRV).

The following table displays the current forest conditions within PFAs in the project area. The Ochoco National Forest's Draft Viable Ecosystems Management Guide was used to characterize forest structure. All PFAs within the project area are not meeting the desired condition. They are all lacking in large tree structure. Generally, the nest stands have the best habitat within the PFA, with large trees common, multi-storied structure, with canopy closures exceeding 50%. The majority of the PFAs are dominated by trees in the 12-15" dbh range with scattered large trees.

Table 110. Current forest conditions within PFAs in the project area.

PFA	Crown Closure > 40% Percent of PFA	Structure (9-20"d.b.h.) Percent of PFA	Structure (> 21"d.b.h.) Percent of PFA
Happy Camp Creek	71%	51%	19%
Happy Jack Camp	68%	55%	21%
Haypress	67%	55%	23%
Little Summit Prairie	46%	72%	10%
Paulina Butte	69%	65%	19%
Summit Camp	65%	60%	21%
Toggle	66%	60%	16%

Alternative 1

This alternative would not treat forest stands within currently mapped PFAs, nesting areas or suitable goshawk habitat outside of existing PFAs. In the short term, the no action alternative would maintain the existing acres of suitable habitat within mixed conifer and ponderosa pine stands. The majority of the existing habitat consists of stands dominated by trees in the 9 inch to 20 inch dbh range with scattered larger overstory trees exceeding 20 inch dbh. Lack of treatment of the mid story trees, where a larger overstory exists, would lead to the development of multiple canopy layers with increased canopy closure. Within the majority of habitat, the development of stands dominated by large tree structure with high canopy closures would be slow because of current high stocking levels. Over time, stand densities would continue to increase and the risk of mortality to the remaining overstory trees would also be expected to increase. Observations within the project area indicate that mortality is occurring within the larger diameter trees that are scattered across the project area. It is presumed that high stocking levels are at least partially responsible for the observed mortality. There is also an increased threat of high severity wildfires occurring as stand densities increase, ladder fuels increase and ground fuels accumulate. Under Alternative 1, open understory conditions that are preferred by foraging goshawks would be expected to decrease over time as trees continue to develop in the understory.

Conclusion: This alternative would maintain the suitability of all existing habitat for goshawks within the PFAs. This alternative would result in short-term retention of existing amount and distribution of goshawk habitat, within the watershed, at the landscape scale (27,653 acres of primary nesting habitat). The suitability of the existing habitat would change over time, both positively and negatively. Some stands may attain increased tree diameters over time, but diameter growth of retained trees would not be as rapid as retained trees in treated stands. This alternative would not result in displacement of goshawk from existing occupied territories.

Alternative 2 and 3

No treatments are proposed within the identified nest stands under action alternatives 2 and 3. A number of harvest units overlap mapped PFAs. Refer to tables 111, 112, 113 for the treatments types and acres affected. The effects are similar for both alternatives 2 and 3. Alternative 2 would commercially harvest timber on 220 acres, which is 7.7% of the 2,857 acres of mapped PFA's. Alternative 3 would commercially harvest timber on 211 acres, which is 7.4 % of the 2,857 acres of mapped PFAs. Prescriptions would selectively thin the existing stands from below with ponderosa pine and western larch being the favored tree species. No trees 21"d.b.h. would be removed and no snags other than hazard trees would be cut. It is expected that commercially treated areas would express a reduction in habitat suitability at least in the short term due to a reduction in canopy closure. There are 569 acres of mapped LOS scattered within the seven PFAs. Under alternative 2, commercial harvest would occur on 37 acres within LOS stands and 34 acres under alternative 3. The LOS treatments are included in the acres for commercial harvest previously discussed. The LOS treatments would not reduce the amount of LOS, but would convert multi-strata LOS to single strata LOS where less than 21"d.bh. trees occur as part of the second canopy layer. Alternative 2 would noncommercially thin trees on 635 acres in PFAs compared to 496 acres under alternative 3. Non-commercial thinning would be followed by prescribed burning and/or hand piling. Underburning (only), would be implemented on 296 acres under alternative 2 and 125 acres under alternative 3. Non-commercial thinning and prescribed burning is expected to retain or improve habitat suitability. The thinning of small understory trees in stands with an existing overstory would reduce competition and improve the health of the overstory. Dense understories may obstruct flight corridors used by goshawks to hunt prey (Wisdom et al. 2000). In many cases habitat may be improved through opening up of overly dense understory conditions and creating a patchy distribution of dense clumps and small openings in a matrix of intermediate burn conditions (a fire mosaic). Dense understories, which exist in many of the PFA's, may lead to increased susceptibility of stand replacing fire and

insect and disease outbreaks, which can result in the deterioration or loss of nesting habitat (Graham et al. 1999, cited in NatureServe 2010, wisdom et al. 2000). The noncommercial thinning and prescribed burning proposed under both alternative 2 and 3 are intended to decrease the risk of habitat loss through insect and disease outbreaks, and also stand replacing fires.

Conclusion: Based on analysis of projected structural and seral stages, alternative 2 would result in a 928 acre increase in the amount of goshawk habitat and alternative 3 would result in 60 acres less of goshawk habitat improvement, resulting in 28,581 acres of primary nesting habitat within the analysis area for alternative 2 and 28,521 acres of goshawk habitat under alternative 3. This change is the result of stands being converted from small tree size class to large tree size class, thus meeting the criteria to be picked up by the model as primary nesting habitat. However, some treated stands would be structurally less complex following treatment and thus, though still suitable, they may have reduced habitat quality immediately following treatment. Thus, though the amount of habitat available at the landscape scale would increase under these alternatives, not all of the recruited habitat would be of optimal quality in the short term. Over time, stand complexity is expected to improve and may result in habitat that is higher in quality than what may develop in some untreated stands. Both alternatives are expected to affect habitat availability at the landscape scale in 30 years due to increase in size class and improved growth and vigor in treated stands. Both alternatives would alter existing structural conditions within all PFAs in the planning area on a total of 1,152 acres or 40% of the total PFA acres, including all treatments, under alternative 2 and 832 acres or 29% of the PFA acres, under alternative 3. No more than 16% of any PFA would be commercially treated and the majority below 10%, no treatments would occur within known nest cores, treatments are limited to thinning from below and prescribed burning. Total treatment, including commercial harvest, noncommercial thinning, and burning exceeding 50% of the PFA may result in changes in forest structure and levels of downed wood that could affect goshawk prey species. This occurs in two PFAs (Little Summit Creek and Paulina Butte) under alternative 2 and Paulina Butte under alternative 3. To minimize the effects to goshawk prey species, a PDC was developed that limits treatments to less than 50% of PFAs. (See Project Design Criteria in Chapter 2). All currently occupied territories are expected to remain suitable for occupancy by nesting goshawks.

Table 111. Commercial Treatments within Goshawk PFA (pre-commercial thinning and prescribed burning would occur following treatments)

PFA Identity	Alternative 1	Alternative 2	Alternative 3
Happy Camp Creek	0	24ac.	22ac.
Happy Jack Camp	0	57ac.	52ac.
Haypress	0	45ac.	45ac.
Little Summit Creek	0	27ac.	26ac.
Paulina Butte	0	0	0
Summit Camp	0	63ac.	61ac.
Toggle	0	4ac.	5ac.
Total HTH	0	220ac.	211ac.

Table 112. Non-commercial Thinning within Goshawk PFA (prescribed burning or hand pile would occur following treatment)

PFA Identity	Alternative 1	Alternative 2	Alternative 3
Happy Camp Creek	0	32ac.	43ac.
Happy Jack Camp	0	73ac.	67ac.
Haypress	0	57ac.	50ac.
Little Summit Prarie	0	12ac.	3ac.
Paulina Butte	0	244ac.	223ac.
Summit Camp	0	116ac.	15ac.
Toggle	0	101ac.	95ac.
Total PCT	0	635ac.	496ac.

Table 113. Prescribed Burning (only) within Goshawk PFA

PFA Identity	Alternative 1	Alternative 2	Alternative 3
Happy Camp Creek	0	0	0
Happy Jack Camp	0	3ac.	3ac.
Haypress	0	16ac.	16ac.
Little Summit Prarie	0	235ac.	40ac.
Paulina Butte	0	7ac.	7ac.
Summit Camp	0	1ac.	1ac.
Toggle	0	34ac.	34ac.
Total unburning	0	296ac.	125ac.

Cumulative Effects:

Past timber sales have affected the quality and distribution of goshawk habitat within the project area. District records indicate the following harvest activities have occurred since 1978. Regeneration harvest activities have occurred on 3,371 acres within the project area. Treatments included: Clearcut, Clearcut with reserve trees or shelterwood. Overstory removal has occurred on 7,095 acres. Most of the 7,095 acres of treatments would have removed most or all of the overstory trees and potential to provide suitable goshawk nesting habitat. Partial cutting has occurred on 4,681 acres within the project area. Portions of these acres could retain enough large or medium tree structure with high densities that would continue to provide suitable nesting habitat. The majority of acres that received commercial thinning or selective harvest prescriptions would have reduced large and medium tree structure and stand density and the quality of nesting habitat would have been reduced. These stands would have the potential of providing suitable nesting habitat in the future as the stands develop larger structure and densities over time. Additional harvest occurred in the project area beginning as early as 1950 and likely included the majority of the project area. The older harvest likely focused on individual tree selection, removing the high value trees at risk to insect mortality. Past management activities have altered the amount, quality and distribution of suitable goshawk habitat on the landscape. All PFAs and suitable goshawk habitat outside of PFAs are deficient in large tree structure either single or multi-storied stands with canopy closures exceeding 50%. The majority of the existing habitat is composed of small tree size (9”-20”dbh) with scattered large tree size (>21”d.b.h.).

Past fuels reduction, in the project area, including thinning and burning projects between 1995 and 2005 have had positive effects to goshawk habitat by reducing seedling and saplings within treatment areas which maintains open understory conditions favorable for goshawk foraging activities. Past fuels treatments has also reduced the potential for high intensity wild fires occurring within suitable habitat. The effects to snag and downed wood habitat which can affect goshawk prey species have been variable. In most areas variability remains with the amount and distribution of downed wood following prescribed burning activities. Canopy gaps created by prescribed burning activities have benefited certain prey species. Snags have been increased and reduced across treatment areas with extremes in both directions.

It is reasonably foreseeable that the Forest would continue to manage forested areas to move toward historic conditions. This would increase the abundance of open park-like ponderosa pine dominated stands on dry sites. The Forest would also continue to manage forests to increase the abundance of large tree structure in single story structural classes on more mesic sites. This management trend is likely to continue until forest conditions are within the historic range of variability that has been defined for the watersheds in the project area. This process would reduce suitability of many stands as goshawk nest sites, which tend to include dense forest canopy. At the same time, such treatments would increase the amount of habitat available for goshawk foraging which can be enhanced by more open understory conditions. Thinning of stands with relatively small trees should promote the development of large tree habitat in the future which would benefit goshawks in the long term. The recruitment of large trees and large snags would also contribute potential habitat for prey species that

select habitats that contain tall trees or that require large snags to accommodate appropriately sized cavity nests. Harvest, thinning and burning prescriptions with the action alternatives would restore healthy foraging habitat to the landscape by removing vegetation that inhibits goshawks from effectively foraging in the understory. The proposed action alternatives combined with the effects of implementing viable ecosystems within other project areas should have positive effects on goshawk foraging habitat.

A reasonably specific foreseeable future project that could occur in the Jackson project area is the Wheeler Aspen Stewardship agreement. This timber sale would help restore three aspen stands (19 acres) in the upper part of the project area along the 30 Road. Commercial and noncommercial sized conifers that are shading the aspen clones are planned to be removed from these stands. The project is too small to negatively or positively affect landscape scale goshawk habitat.

Forest Plan Consistency: Standards and Guidelines for this species were amended with the Interim Management Direction (Eastside Screens) specified in the Regional Forester's Plan Amendment 2. Post-fledging areas have been mapped for all known occupied goshawk territories in the project area. The 30 acre goshawk nest core areas would have no treatments under any action alternative. Harvest activities within PFAs would not remove late and old structure trees or snags. Treatments within nest core areas and PFAs would be implemented with seasonal restrictions. Seasonal restrictions would be employed for disturbance activities within ½ mile of known nest sites, from March 1 to September 30 of each year. These restrictions may be waived on a case-by-case basis, if appropriately timed monitoring indicates that the nest area is not reproductive during that nesting season. This assessment cannot be made until well into the nesting season. And waivers would only be valid for the year in which they are granted. Post-treatment monitoring would be conducted to determine if objectives were met, and to verify continued occupancy and reproduction in mapped goshawk territories. For these reasons, this project is expected to be consistent with the LRMP as amended by the Regional Forester's Plan Amendment 2.

Neotropical Migratory Birds and Focal Species

Neotropical migratory birds are described in the Partners In Flight - Northern Rocky Mountains Bird Conservation Plan. Partners In Flight (PIF) is a cooperative effort involving partnerships among federal, state and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community and private individuals. PIF lead the effort to complete a series of Bird Conservation Plans for the entire continental United States. PIF Landbird Conservation Planning provides the framework to develop and implement Landbird conservation strategies by recommending conservation actions on the ground that may prevent the need for future listings. These plans included priority setting, establishment of objectives, necessary conservation actions and evaluation criteria necessary for bird conservation in the western hemisphere.

The PIF Bird Conservation Plan is being used to address the requirements contained in Executive Order 13186, January 10, 2001, Responsibilities of Federal Agencies to Protect Migratory Birds. Under Section 3(E)(6), though NEPA, the EO requires that agencies evaluate the effects of proposed actions on migratory birds, especially on species of concern. The PIF plans allow the analysis of proposed projects upon Neotropical migratory birds through the use of guidelines for priority habitats and bird species by subprovince. The conservation strategy does not directly address all landbird species, but instead uses numerous "focal species" as indicators to describe the conservation objectives and measures project effects in different priority habitats for the avian community found there. This conservation plan identifies priority habitats and focal species by subprovince. The Ochoco National Forest is within the Blue Mountains subprovince. The following table lists the habitats and species listed for the Blue Mountains Subprovince.

Table 114. Habitat and species in the Blue Mountains Subprovince

Priority Habitats	Focal Species	Habitat Attribute
Dry Forest	Lewis' woodpecker	Patches of burned forest
Dry Forest	White-headed woodpecker	Large patches old forest, large trees and snags
Dry Forest	Flammulated owl	Old Forest, low canopy closure, grassy openings, dense thickets.
Dry Forest	Chipping sparrow	Open forest with small patches seedling/saplings or shrubs.
Mesic Mixed Conifer	Varied thrush	Structurally diverse; multilayered
Mesic Mixed Conifer	Olive-sided flycatcher	Edges and openings created by wildfire.
Mesic Mixed Conifer	MacGuillivary's warbler	Dense shrub layer, openings or understory. Regenerating forests
Mesic Mixed Conifer	Vaux's swift	Large snags. Late-successional forest
Riparian Woodland	veery	Dense shrub understory
Riparian Woodland	Red-eyed vireo	Deciduous forest high canopy closure
Riparian Woodland	Lewis' woodpecker	Large snags in Riparian woodland
Riparian Shrub	Willow flycatcher	Dense shrub patches.
Unique Habitats - Subalpine Forest	Hermit thrush	Dense coniferous forests
Unique Habitats - Montane Meadows	Upland sandpiper	Grasslands, Prairie, meadows
Unique Habitats - Steppe Shrublands	Vesper sparrow	Bunchgrass/sagebrush few trees
Unique Habitats - Aspen	Red-naped sapsucker	Aspen
Unique Habitats - Alpine	Gray-crowned rosy finch	Alpine habitats

The conservation strategy identifies four priority habitat types:

1. Dry Forest (primarily ponderosa pine).

2. Mesic Mixed Conifer (primarily late-successional).

3. Riparian Woodland and Shrub.

4. Unique habitats including (subalpine forest, montane meadows (wet and dry), steppe shrubland, aspen, and alpine habitats.

The project area contains both dry forest and mesic mixed conifer priority habitat types. Riparian Woodland and Shrub habitats are present, although represented by a small number of acres. There are no alpine or subalpine habitats that occur within the project area. Unique habitats including Aspen and Steppe Shrublands are present within the project area. Focal species within the Mesic Mixed Conifer, Dry forest, and Steppe Shrubland habitat type were modeled using the data derived from the Viable Ecosystems process. White-headed woodpecker was analyzed and is described in the biological evaluation for threatened, endangered, and sensitive species. The existing amount of priority habitat has been compared to the desired range of habitat identified as the Historic Range of Variability (HRV). This allows a comparison between what exists today as opposed to the balance of conditions that may have existed historically. Species that require specialized habitats such as riparian vegetation, meadows, shrublands, aspen or alpine cannot be modeled this way.

Mesic Mixed Conifer – Varied Thrush, Olive-sided Flycatcher, MacGuillivary's Warbler, and Vaux's Swift:

The Olive-sided flycatcher prefers edges and openings created by fire. Mixed conifer forests containing highly fragmented late-seral forest with a lot of edge habitat are preferred habitat. He flycatcher nests in grand fir and Douglas fir. Snags are important for foraging perches and singing perches (Marshall 2003). Habitat for the Olive-sided flycatcher is well represented throughout the analysis area in part because the dry grand fir plant association represents approximately 23,858 acres within the project area. Habitat is likely well suited for the Olive-sided flycatcher because of the natural fragmentation of habitats that occurs within the project area due to the scab stringer topography as well as fragmentation that has occurred because of past harvest activities. Approximately 12,411 acres of habitat exists within the project area based upon a Wildhab query of the Project Area.

The habitat focus for MacGuillivary's warbler is a dense understory shrub layer (includes shrubs, seedlings, and saplings). East of the Cascades, MacGuillivary's warbler is associated with dense willow thickets around springs and stream bottoms. Forages close to the ground and nests in thickets of small trees or shrubs. The loss of riparian habitat is a conservation issue identified in the conservation strategy. Dense willow thickets are lacking within the project area. Willows are present but scattered, occurring primarily as individuals or small clumps.

The Varied Thrush is most common in dense older coniferous forests (Csuti). This species is locally common in wet sites throughout the Blue Mountains above 4,265ft (Marshall 2003). Habitat for this species is limited due to the lack of moist grand fir plant associations occurring within the project area. Habitat would primarily exist within late and old multi-strata dry grand fir and Douglas fir plant associations with high canopy closure. Approximately 3,794 acres of habitat exists within the project area based upon a Wildhab query of the project area. Reduction in understory vegetation can affect the development of the organic layer.

Dry Forest – Lewis's Woodpecker, White-headed Woodpecker, Flammulated Owl, and Chipping Sparrow:

The Lewis's and white-headed woodpeckers were addressed in the Biological Evaluation section for threatened, endangered, and sensitive species. The Chipping sparrow prefers open coniferous forests or stands of trees interspersed with grassy openings and patches of shrubs and or seedling/sapling trees, especially pines (Marshall 2003). The chipping sparrow forages on the ground and in trees. Nesting occurs between April 15-July 15 on ground or in shrub species, currant not sagebrush. The Chipping sparrow is also associated with juniper woodlands and mountain-mahogany stands. Approximately 19,027 of habitat exists within the project are based upon a Wildhab query. This is slightly below the range of habitat levels that historically existed, however habitat is still well represented within the project area. The minimum potential habitat acreage of 19,251 acres existed historically. Mountain-mahogany are scattered throughout the project area, although they are generally decadent and do not represent significant stands.

Steppe Shrublands – Vesper Sparrow:

The Vesper Sparrow occurs in a wide variety of open habitat types including grassland, sagebrush, montane meadows, and juniper steppe. The Vesper sparrow is most abundant in habitats characterized by bunchgrasses and short, stiff sage. The Vesper sparrow constructs nest and forages on the ground. Habitat for the vesper sparrow is scattered throughout the project area and generally is in good condition. The Vesper sparrow utilize big sagebrush habitats that are marginally suited for the Brewer's sparrow as well as low sagebrush and stiff sagebrush communities that are present throughout the project area. The majority of the open shrubland communities within the project area are dominated by stiff sage/bunchgrass and low sage/bunchgrass. Fire suppression activities and the

resulting expansion of juniper and other conifer species have resulted in a decline of open shrublands in the project area. The expansion has primarily occurred on the edges of non-forest scabs. Vesper sparrow habitat was not modeled, although there are 11,489 acres of sagebrush dominated shrub-steppe habitat type within the analysis area that is in good condition.

Riparian Woodland and Shrub including Aspen – Veery, Red-eyed Vireo, Willow Flycatcher, Red-naped Sapsucker, Lewis's Woodpecker:

Riparian Woodland Habitat represented by deciduous forests with high canopy closure is not well represented within the project area. Habitat that would be considered suitable for the red-eyed vireo and veery is very scattered and does not occupy large areas. Riparian woodland habitat including aspen is represented by scattered aspen clones that are declining in health and distribution. Cottonwoods are present at three locations within the project area and small in size, Crazy creek, Jackson Creek, and an unnamed tributary to Happy Camp Creek. Conifer encroachment is evident as is the case for the majority of small aspen clones scattered within the project area. Dense shrub patches that would provide habitat for species represented by the Willow flycatcher are scattered and isolated. Willows and aspen are heavily browsed throughout the analysis area and as a result, they are scattered and rarely occur in significant patches. Deciduous riparian forest with a dense shrub understory characteristic of habitat for species like the veery is also very scattered. A common element of hardwood communities within the watershed is that all are exhibiting a downward trend in size, continuity and health (Watershed Analysis 2010). Historically, Riparian Woodland and Riparian shrub communities likely covered larger areas than what exist today.

Table 115. Comparison of Existing Habitat Acres to Historic Range of Acres

Species	HRV min.Ac.	HRV max.Ac.	Existing Ac.	Status
Olive sided flycatcher	18,805	30,092	19,117	Within range
Varied Thrush	3,596	9,605	4,835	Within range
Chipping sparrow	19,251	31,448	19,027	Below range
Lewis' woodpecker	13,640	18,639	14,303	Within range
Hermit Thrush	2,873	6,269	3,600	Within range
McGillivray's Warbler	136	208	97	Below range

Alternative 1

No activities outside of the on-going operation and maintenance that occur on the forest would occur. By delaying the implementation of Viable Ecosystems, this alternative would continue to perpetuate the abundance of wildlife species associated with dense forests having true-fir and Douglas fir understories such as the varied thrush. Alternative 1 would not directly change the existing acres of habitat. Under this alternative there would be a continued decline in habitat abundance for all species, including the white-headed woodpecker, Lewis's woodpecker, flammulated owl and chipping sparrow, that select open forest and early seral conditions as denser, mid to late seral conditions continue to develop. In the long-term, Alternative 1 would result in the least amount of habitat for species that select for open forest or early seral conditions. In the long-term, this alternative would result in the most habitat for those species associated with denser, mid to late seral conditions. This alternative does not propose any treatments that would directly modify the existing amount of habitat; therefore post-treatment acres are the same as existing acres. Habitat would compare to HRV as described above (Table 115) in the short term. The amount of habitat projected to be available to these species after 30 years of forest development area displayed in Table 119, assuming that large scale disturbances do not occur within that period of time. However, this alternative does result in a higher risk of habitat change due to insects, disease or wildfire. Please refer to the Silviculture Report for details on risk of insect and disease, and to the Fire and Fuels Report for risk of large scale and high intensity wildfire. Barring large scale disturbance the amount of habitat for four species that are currently below HRV would be farther below HRV in 30 years (white-headed woodpecker, chipping

sparrow, Lewis's woodpecker, and olive-side flycatcher). The species all select for open forest, woodland or shrub/steppe conditions. Under the same scenario of no large scale disturbance within the next 30 years, one species currently within HRV moves to below HRV (MacGillivray's warbler). This species requires brushy thickets in riparian areas. Assuming no large scale disturbance in the next 30 years, one species currently within HRV moves to above HRV (hermit thrush). This species selects for dense forest conditions.

The red-eyed vireo, veery, Lewis's woodpecker, and willow flycatcher are associated with riparian woodland and shrub plant communities. These habitats exist within the planning area, but are small in size and fragmented. These species may be present and utilizing the habitats as available. The no action alternative would retain the current trends in displacement of riparian vegetation due to encroachment by young conifers in portions of this habitat type. The red-napped sapsucker is a bird that uses aspen dominated vegetation and riparian woodlands almost similar to the vireo, veery and willow flycatcher. Alternative does not propose aspen or cottonwood restoration activities involving thinning of conifers which are competing with these species.

Conclusion: This alternative maintains habitat for species that select for dense forest conditions and continues the decline in habitat conditions for species that use open forest conditions, open shrubland habitats and riparian hardwoods such as aspen and cottonwood until one or more disturbance events (insects or fire) create open conditions in the future.

Effects Common to Alternatives 2 and 3

Measures prescribed to restrict activities within nesting seasons for goshawk and other raptors would also afford reduced disturbance to nesting birds where their home ranges overlap with restricted areas. In addition, due to logistical limitations on harvest, thinning and burning activities, some of the work would be scheduled outside of the nesting season. However, a portion of the project work would occur during the nesting season and some individuals would likely be impacted by management activities. Since most migratory birds occupy relatively small nesting season home ranges and are present in relatively large numbers, it is expected that suitable habitat outside of active treatment units would provide alternate cover for birds that are displaced during activities. The area outside of active treatment units would also provide source populations for reoccupation of areas after treatment activities are completed. Birds that are disturbed early in the nesting season may move out of the treatment area during operations and may re-nest later, or outside of the area of activity. In some cases, habitat outside of the unit may be limiting or fully occupied, in which case the displaced birds may become non-reproductive during the year of operation. These are short-term impacts to individual birds or pairs of birds. This is a trade-off under the action alternatives for the long term benefits of providing increased amounts of habitat for the focal species (and the communities they represent) that are currently below the minimum historic levels within this watershed. This trade-off also allows for the restoration of habitat for species that utilize herbaceous and shrubby vegetation and for protection of habitat against risk of future large scale or high intensity disturbance. The project also proposes treatments to promote the longevity, vigor and extent of riparian hardwood habitats and the development or retention of stands of large diameter live pine. These treatments are consistent with the goals and objectives for these habitats as listed in the Partners In Flight, Landbird Conservation Strategy for the Northern Rocky Mountains (Altman, 2000).

Alternative 2

This alternative would treat a total of 24,292 acres, including: 5,744 acres of commercial thinning; 1,358 acres of riparian noncommercial thinning; 7,779 acres of upland noncommercial thin, 295 acres of aspen treatments, including commercial and noncommercial thinning, and up to 1,939 acres of natural fuels underburning. Some of this treatment would occur in habitat for Neotropical birds during the nesting season and potentially impact nesting birds. This alternative results in increases in habitat for species that select for open forest and early seral conditions due to stand density reduction and the

favoring of early seral species. The abundance of habitat relative to HRV is displayed below (Table 116). The amount of habitat relative to HRV moves to within the historic range for chipping sparrow and increases within the historic range for Lewis's woodpecker and olive-sided flycatcher due to increases in open forest conditions. However, the amount of habitat remains below the minimum for MacGillivray's warblers, due to thinning of understory vegetation in moist grand fir sites. This effect on MacGillivray's warblers should be short term as thick patches of understory vegetation should recover relatively quickly on these mesic sites, especially in riparian areas and other seasonally moist areas. Alternative 2 results in the highest amount of habitat for the open forest and upland shrub associated species over time. Proposed treatments would cause a reduction in the amount of habitat for species that select for denser forests or late seral conditions (varied thrush and hermit thrush), however, it remains within HRV for varied thrush and hermit thrush as shown in Table 116. In the long-term, alternative 2 increases the amount of habitat for all open forest species as well as those that select for large tree size.

This alternative would alter the current trend in displacement of riparian vegetation due to encroachment by young conifers in the portions of this habitat type where prescribed fire or silvicultural treatments are employed. This would result in a beneficial effect to species associated with riparian woodland and shrub plant communities (red-eyed vireo, veery and willow flycatcher). This alternative also proposes aspen restoration activities involving thinning of conifers within existing aspen clones. Fences would be constructed to protect aspen sprouts following treatments where necessary. Treatments would occur on 128 aspen clones within the analysis area. These treatments would result in a beneficial effect to species associated with aspen dominated vegetation, such as the red-naped sapsuckers.

Conclusion: These treatments are consistent with the goals and objectives for these habitats as listed in the Partners In Flight, Landbird Conservation Strategy for the Northern Rocky Mountains. Specific design criteria for maintenance of riparian shrub habitat are included the EIS. This alternative reduces the decline in habitat conditions for species that use open forest conditions, open shrubland habitat and riparian hardwoods such as aspen.

Table 116. Habitat projections (acres) for Alternative 2.

Species	Minimum HRV Acres	Maximum HRV Acres	Post Treatment Ac.	HRV
Chipping sparrow	19,251	23,495	13,730	Within
Lewis' woodpecker	13,640	18,639	17,865	Within
Varied Thrush	3,596	9,605	3,745	Within
Olive-sided flycatcher	18,805	30,092	21,701	Within
Hermit Thrush	2,873	6,269	2,895	Within
McGillivray's Warbler	136	208	89	Below

Alternative 3

Like Alternative 2, this alternative results in increases in habitat for species that select for open forest and early seral conditions due to stand density reduction and the favoring of early seral species. The abundance of habitat relative to HRV post treatment (within or below) is displayed below (Table 117). This alternative would treat a total of 19,970 acres, including: 5,545 acres of commercial thin; 6,564 acres of upland noncommercial thin; 293 acres aspen treatments, including commercial and noncommercial thinning, and up to 1,812 acres of natural fuels underburning. This alternative would have the same effects as described above for Alternative 2, but with fewer acres of noncommercial treatment and less acres of commercial treatment. As with Alternative 2, habitat for chipping sparrow moves within the historic range relative to HRV and Lewis's woodpecker and olive-sided flycatcher remain within the historic range relative to HRV due to increases in open forest conditions; habitat

remain below the minimum for MacGillivray's warblers due to thinning of understory vegetation in moist grand fir sites. The effect on MacGillivray's warblers should be short term as thick patches of understory vegetation should recover relatively quickly on these mesic sites, especially in riparian areas and other seasonally moist areas.

This alternative would not alter the current trend in displacement of riparian vegetation due to encroachment by young conifers in the portions of this habitat type where prescribed fire or silvicultural treatments are employed. No commercial treatments and only 113 noncommercial treatments would occur under this alternative. This alternative would not result in a beneficial effect to species associated with riparian woodland and shrub plant communities (red-eyed vireo, veery and willow flycatcher). This alternative also proposes aspen restoration activities involving thinning of conifers within existing aspen clones. This alternative proposes treatment on 142 existing clones within the analysis area, a slight increase when compared to alternative 2. Fences would be constructed to protect aspen sprouts following treatments where necessary. These treatments would result in a beneficial effect to species associated with aspen dominated vegetation, such as the red-naped sapsucker.

Conclusion: These treatments are consistent with the goals and objectives for these habitats as listed in the Partners In Flight, Landbird Conservation Strategy for the Northern Rocky Mountains. Specific design criteria for maintenance of riparian shrub habitat are included the EIS. Alternative 3 reduces the decline in habitat conditions for species that use open forest conditions, open shrubland habitats and riparian hardwoods such as aspen. In the long-term, this alternative increases the amount of habitat for all open forest species, as well as those that select for large tree size.

Table 117. Habitat projections (acres) for Alternative 3.

Species	Minimum HRV Acres	Maximum HRV Acres	Post Treatment Ac.	HRV
Chipping sparrow	19,251	23,495	21,562	Within
Lewis' woodpecker	13,640	18,639	17,649	Within
Varied Thrush	3,596	9,605	3,794	Within
Olive-sided flycatcher	18,805	30,092	21,519	Within
Hermit Thrush	2,873	6,269	2,923	Within
McGillivray's Warbler	136	208	92	Below

Table 118. Summary of focal species Primary Reproductive Habitat

	Chipping Sparrow	Lewis' Wood-pecker	Varied Thrush	Mac-Gillivray's Warbler	Olive sided fly-catcher	Hermit Thrush
	Acres	Acres	Acres	Acres	Acres	Acres
Alt. 1	*19,027	*14,303	1,424	*97	19,117	1,504
Alt. 2	21,748	17,865	1,107	*89	21,701	*1,308
Alt. 3	21,562	17,649	1,131	*92	21,519	*1,330
HRV-L	19,251	13,640	3,596	136	18,805	2,873
HRV-H	31,448	18,639	9,605	208	30,092	6,269

*shaded cells indicate habitat acres below the Historic Range of Variability(HRV)

Table 119. 30 Year Projection of Primary Nesting Habitat for Focal Landbird Species

Species	Alt. 1	Alt. 2	Alt. 3
Chipping sparrow	13,631 (below)	16,035 (below)	13,287 (below)
Lewis' woodpecker	10,752 (below)	13,652 (below)	10,889 (below)
Varied Thrush	7,759 (within)	6,215 (within)	6,281 (within)
MacGillivray's warbler	69 (below)	67 (below)	67 (below)
Olive-sided flycatcher	14,046 (below)	16,304(below)	13,581 (below)
Hermit Thrush	6,519 (above)	5,241 (within)	5,292 (within)

Cumulative Effects:

Timber harvest activities have occurred on the majority of acres within the project area in the last 50 years. Much of this harvest history resulted in a reduction of large pine and Douglas fir. Past harvest activities combined with fire suppression activities have reduced the amount of open forest conditions dominated by large diameter trees that is believed to be more abundant historically within the project area. The outcomes of past activities modify the trajectory of stand development and the amount of habitat available in the future. The primary nesting habitat for these species, projected 30 years into the future, and as affected by the alternatives is displayed in Table 119. Generally, the species that select open forest or shrub habitat are projected to be below HRV, while species that select for dense forest habitats are expected to be within or above HRV in the future. The majority of the current LOS stands are dominated by late seral species and lacking the large diameter early seral species composition. Since the mid 1990's the Forest's emphasis has shifted from removal of large pine to re-establishment of large pine and larch, and other single-strata LOS stands.

Through the foreseeable future, the Forest will continue to manage forested stands to increase the abundance of open, single storied ponderosa pine dominated stands on dry sites. This is the type of forest structure thought to be the historic condition on the majority of ponderosa pine sites. The Forest would also continue to manage forests to increase the abundance of large tree structure in both multi and single story structural classes on more mesic sites. This management trend is likely to continue until the multi-strata LOS and single-strata LOS is within the historic range of variability that has been defined for this watershed. This process would reduce the amount of habitat available for species that prefer dense forest canopy, while increasing the amount of habitat available for species that select more open stands and larger trees. Thinning of stands with relatively small trees should promote the development of large tree habitat in the future. The recruitment of large trees and large snags would contribute potential habitat for species that nest high in tall trees, or that require large branches or large snags to accommodate appropriately sized nests. Ultimately, all species habitat would move toward an abundance and distribution that is thought to be within the historic range of variability based on site conditions within the watershed.

Specific present and reasonably foreseeable future projects include the Westside EA and the Wheeler Aspen Stewardship Agreement. The Westside EA was completed in 2005 and encompasses grazing allotments in the Deep Creek Watershed. The EA strengthened grazing standards in riparian areas with the goal of expediting recovery of riparian vegetation. The activities enacted in the Westside EA have encouraged livestock to move into the uplands and disperse more evenly thereby reducing grazing pressure on riparian areas. For species that nest riparian woodland habitats, like the willow flycatcher, this has had a positive effect.

The Wheeler Aspen Stewardship agreement timber sale would help restore three aspen stands (19 acres) in the upper part of the project area along the 30 Road. Commercial and noncommercial sized conifers that are shading the aspen clones are planned to be removed from these stands. The project may have the effect of increasing stand stands in the project area which would benefit birds dependent on riparian woodland habitat.

Forest Plan Consistency: There are no specific standards and guidelines in the LRMP for neotropical migratory birds or focal species other than raptors, primary cavity excavators or threatened, endangered and sensitive species. The Regional Forester's Plan Amendment does not contain wildlife screens specific to neotropical birds or focal species other than through habitat requirements for LOS, goshawk, snags and down logs. These standards are addressed elsewhere in this document. The Landbird Conservation Strategy for the Northern Rocky Mountains is supportive of restoration of historic forest types and conditions, as well as restoration of riparian habitats, natural ecological processes and road closures. For these reasons this project is determined to be consistent with the LRMP.

Sensitive Plants

The Sensitive Plants section is summarized from the Botany Report, which is located in the Jackson project file at the Paulina Ranger District, Prineville, Oregon. The Sensitive Plants section primarily discusses immediate, short-term (<10 years) effects of the proposed action and Alternatives. Long-term (>10 years) effects are included where trends and other information is available and discussion is not speculative.

Pre-field Review

Each area to be affected by management actions is investigated for sensitive plant habitat in the pre-field review. The following sources were consulted to determine whether potential habitat exists: USFWS list of Proposed, Endangered and Threatened Plant Species (USFWS 2009), Regional Forester's (R-6) Sensitive Plant Species List (USDA 2008), Oregon Natural Heritage Information Center Rare, Threatened and Endangered Species List (ORNHIC 2010), USFS personnel and District botanical survey records, USGS topographical maps, current literature, and knowledge provided by individuals familiar with the area. Effects of actions on sensitive plant populations are analyzed and the Ochoco NF Plan is consulted to determine whether actions are consistent with direction.

There are no known occurrences of federally listed endangered or threatened plant species within the Jackson project area and no habitat is present for listed species (USDA 2008, and USFWS 2009). Therefore, for all alternatives, no effect to proposed, endangered, or threatened plant species is expected. These species will not be discussed further.

The regional forester's sensitive species list includes thirty-nine sensitive plant species documented or suspected of occurring on the Ochoco National Forest and the Crooked River National Grassland. Twenty-five listed plant species have been documented in or near the project area, or have potential habitat that has not been surveyed (Table 120). Resources used to identify potential sensitive plant habitat include aerial photographs, vegetation maps, as well as personal knowledge of the project area.

Table 120. Summary of Prefield Review for Sensitive Plants in the Jackson Project Area.

Species	Habitat	Rationale
Achnatherum hendersonii Henderson's needlegrass	Sagebrush scablands	Habitat Present
Achnatherum wallowaensis Wallowa needlegrass	Sagebrush scablands	Habitat Present
Astragalus diaphanus var. *diurnus* John Day milkvetch	Western juniper woodland	No Habitat Present
Astragalus peckii Peck's milkvetch	Sage/juniper/lodgepole pumice/coarse soils	No Habitat Present
Astragalus tegetarioides Deschutes milkvetch	Sage steppe/ponderosa pine forest	Habitat present
Botrychium ascendens	Wet meadows, springs,	Habitat Present

Species	Habitat	Rationale
Ascending moonwort	seeps	
Botrychium crenulatum Crenulate moonwort	Wet meadows, springs, seeps	Habitat Present
Botrychium minganense Mingan's moonwort	Wet meadows, springs, seeps	Habitat Present
Botrychium montanum Mountain moonwort	Wet meadows, springs, seeps	Habitat Present
Botrychium paradoxum Twin-spike moonwort	Wet meadows, springs, seeps	Habitat Present
Botrychium pinnatum	Wet meadows, springs, seeps	Habitat Present
Calochortus longebarbatus Wats. var. *peckii* Peck's mariposa lily	Seasonally wet meadows, stream margins	Habitat Present
Camissonia pygmaea Raven dwarf suncup	Low elev plains/washes w/ coarse soil or gravel	No Habitat Present
Carex abrupta abrupt-beaked sedge	Montane, mid/high elev moist meadow	Habitat Present
Carex diandra lesser panicled sedge	Sphagnum bog, lakeshores	Habitat Present
Carex lasiocarpa var. *americana* Slender sedge	Wet sedge meadows lakes/streams	Habitat Present
Carex retrorsa Retrorse sedge	Swamps, marsh, meadows, along lakes, streams	Habitat Present
Cheilanthes feei Fee's lip fern	Basalt cliffs but occasionally limestone	Habitat Present
Cyperus lupulinus ssp. *lupulinus* Great Plains flatsedge	Dry exposed sand, gravel riparian edge	No Habitat Present
Elatine brachysperma Short-seeded waterwort	Muddy shores, shallow pools	No Habitat Present
Eleocharis bolanderi Bolander's spikerush	Moist/wet meadow and openings	Habitat Present
Eriogonum cusickii Cusick's buckwheat	Juniper/big sage and low sage scabland	Habitat Present
Heliotropium curassavicum Salt heliotrope	Moist to dry saline soils	No Habitat Present
Lipocarpha aristulata . Aristulate liptocarpa	Wet soils on beaches, sand bars, bottomlands	No Habitat Present
Lomatium ochocense Ochoco lomatium	Basaltic scablands on shallow lithosoic soils	Habitat Present
Mimulus evanescens Disappearing monkeyflower	Sage/juniper vernally moist streambanks	No Habitat Present
Muhlenbergia minutissima Swallen annual dropseed	Weathered lava soils in riparian areas	Habitat Present
Penstemon peckii Peck's penstemon	Seasonally moist habitats in open forest	No Habitat Present
Potamogeton diversifolius Waterthread pondweed	Lakes, ponds, including created habitat	Habitat Present
Rorippa columbiae Columbia yellowcress	Wet meadows, moist plains, streams	No Habitat Present
Rotala ramosior Lowland toothcup	Sand and silt below high water	No Habitat Present
Salix wolfii	High elevations/wet	Habitat Present

Species	Habitat	Rationale
Wolf's willow	meadows and fens	
Talinum spinescens Spiny fameflower	Cliffs, ledges, outcrops in basaltic soils	No Habitat Present
Thelypodium eucosmum Narrow leaf thelypody	Dry slopes in vernal drainages	No Habitat Present
Utricularia minor lesser bladderwort	Lowland and montane fens, sedge meadows	Habitat Present
Helodium blandowii Blandow's bogmoss	Montane fens	Habitat Present
Tomentypnum nitens Tomentypnum moss	Montaine fens	Habitat Present
Tortula mucronifolia mucronleaf tortula moss	Riparian *Populus* montane *Abies*	Habitat Present
Dermatocarpon meiophyllizum silverskin lichen	Rocks inundated at least most of the year	No Habitat Present
Texosporium santi-jacobi Woven spore lichen	Arid/Semi-arid shrub steppe grasslands	No Habitat Present

Field Review and Surveys

Surveys were done for the 25 plant species that have been documented in or near the project area, or have potential habitat that has not been surveyed. Proposed activity units identified as having high probability habitat during the pre-field review were surveyed. Surveys included a thorough search of all high probability habitats during the season when identification is possible. When a sensitive plant species is found, that information is entered into the Regional NRIS TESP (Threatened Endangered and Sensitive Plant) data base so that the effects on the plant population can be analyzed. Surveys documented the following sensitive plant species within the analysis area: *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium minganense*, *Botrychium montanum*, *Calochortus longebarbatus* var. *peckii*.

Riparian Habitats

Existing Condition

Riparian habitat in the Jackson analysis area is characterized by willow (*Salix spp*), sedge (*Carex spp*), rush (*Juncus spp*), and grass communities lining streams, rivers, lakes and springs. Deciduous riparian habitats dominated by quaking aspen (*Populus tremuloides*), black cottonwood (*Populus trichocarpa*), and willow (*Salix spp*), provide important ecological functions on the landscape. Riparian communities made up of these species are extremely diverse in plant and wildlife. Hydrologically, these deciduous plant communities provide excellent stability to stream banks and soil surfaces. Their deep spreading root systems can resist flooding and slow water velocity, and shade stream channels keeping temperatures low.

To some extent, these riparian communities have been greatly reduced within the last 200 years. In the early 1800s, settlers reported extensive stands of willows and wide, wet meadows along stream systems throughout the western rangelands (Elmore 1992). By the 1900s, many of these stream systems were severely damaged or eliminated because of improper livestock use (Elmore1992). Estimates are that the riparian vegetation and in-stream habitats of 85% of the streams and rivers of the arid west are significantly degraded (Braatne et al. 1996). The current pattern of distribution of aspen and willow suggests that in the past, the majority of streams in these watersheds were connected aspen, willow communities. Today, aspen and willow establishment in the Jackson

analysis area is highly limited and fragmented. This suggests that the riparian habitat is also reduced and fragmented, affecting associated sensitive plant species.

Moonwort *(Botrychium)*

There are six species of *Botrychium*, also known as moonworts or grapeferns, on the Regional Forester's Sensitive Species List (USDA 2008) that occur on the Ochoco National Forest. All of them occur or have potential habitat in the Jackson project area. *Botrychium ascendens, Botrychium crenulatum, Botrychium paradoxum* are on the ORNHIC List 1 (2010), meaning these species are considered to be threatened with extinction throughout their range. *Botrychium montanum* is on the ORNHIC List 2, meaning this species is of conservation concern but is not currently listed, by the State of Oregon, as threatened or endangered. *Botrychium minganense* has been determined to be less at risk, and is currently on the ORNHIC List 4, meaning this species is of conservation concern but is not currently listed by the State of Oregon as threatened or endangered. *Botrychium pinnatum* is an ORNHIC List 4 species and is also determined to be less at risk.

The Jackson project area contains 4 species of *Botrychiums*, for a total of 23 locations of *Botrychium crenulatum*, two locations of *Botrychium montanum*, and one population of *Botrychium ascendens* growing together with one population of *Botrychium crenulatum*. New surveys were conducted in the Jackson project area during the summer of 2011 and no new populations were found. However, these plants are small in stature, may be dormant underground for several years, and therefore are easily overlooked. While populations are difficult to locate, their habitat is readily identifiable and their presence will be assumed in high probability habitat.

Botrychium spp. are found in a variety of habitats in Oregon, from old growth Western red cedar forests to xeric open meadows, seeps, and springs. On the Ochoco National Forest, moonwort species occupy primarily moist meadow sedge/forb communities associated with seeps, drainages, and the edges of wet meadows, to lightly shaded forested riparian areas. The habitat requirements of moonwort species on the Ochoco National Forest are similar, with several species often growing together, therefore they will be considered as one group for this analysis.

Peck's Mariposa Lily *(Calochortus longebarbatus var. peckii)*

Calochortus longebarbatus var. *peckii*, Peck's mariposa lily, is a local endemic to the Ochoco National Forest. It is currently on the Oregon Natural Heritage Information Center (ORNHIC 2010) List 1, which is considered to be threatened with extinction throughout its range. Peck's mariposa lily is a sterile triploid, which reproduces exclusively through the asexual production of bulblets that form at the base of the plant and are presumably dispersed downstream (Fredericks 1989). *Calochortus longebarbatus* var. *peckii* is found in habitats ranging from riparian strips along seasonal streams and meadows within open Ponderosa and lodgepole pine forests to open meadows, but is restricted to seasonally moist areas with patches of open, exposed, moderately deep to shallow soil . Very wet meadows and wetter portions of meadows tend not to support Peck's mariposa lily; however the drier margins of these meadows and meadows that are seasonally dry or moist overall tend to support the largest populations of the lily.

The Jackson project area contains many known populations and substantial habitat, most of which are located near Little Summit Prairie. There are 180 existing entries for *Calochortus longebarbatus* var. *peckii* in the rare plant database (NRIS-TESP) occupying 1,320 acres within the Jackson analysis area. Several new populations were discovered during surveys conducted in 2011. All known populations would be managed with the goal of maintaining or increasing the overall population of Peck's mariposa lily. If the management recommendations in the Conservation Strategy (Dewey 2011) are followed, viability of the species would not be compromised.

Road construction, grazing, timber harvest and other management activities has resulted in hydrological changes; especially stream down cutting that has lowered water tables and in some

areas, has resulted in loss of riparian habitat for *Calochortus longebarbatus* var. *peckii* (USDA 2004b). Also, invasive weeds such as Canada thistle and other non-native plants common in riparian habitats may have contributed to a decline in Peck's mariposa lily.

Sensitive Sedge Species *(Carex)*

There are four sedge species listed as sensitive on the Regional Foresters list and are suspected of occurring on the Ochoco National Forest. Abrupt-beaked sedge (*Carex abrupta*), lesser-panicled sedge (*C. diandra*), slender sedge (*C. lasiocarpa* var. *americana*)and retrorse sedge (*C. retrorsa*) are on the ORNHIC (2010) List 2. *Carex abrupta* has been found on moist sites, while the other species occupy moist to very wet habitats. They are found over a wide geographic range in Oregon. *Carex abrupta* is limited to the western states, while the others are found over a wider range across N. America.

Environmental Effects

Riparian Habitats

Soil disturbance from heavy machinery can directly impact individual rare plants. Soil compaction or erosion caused by logging activities can impact future recruitment by changing hydrological patterns in riparian habitat. Heavy slash resulting from both commercial and noncommercial thinning activities can bury plants and burning this slash, particularly as grapple piles, can scorch soils, damaging plants and their habitat.

The Species Management Guide for Peck's mariposa lily (Dewey 2011) provides conservation strategies to protect the viability of the species. These management strategies would be followed for all action alternatives and are described in the design elements section of this report. Similarly, the Conservation Assessment for 13 species of Moonworts (Ahlenslager & Potash 2007) would be used to protect *Botrychium* populations and its habitat in the Jackson project area. No other riparian species were located within the sale area and would not be addressed individually.

While effects such as damage by falling trees, logging equipment, and road construction can directly impact sensitive plants and their habitats, one particular indirect effect is the lowering of the water table in riparian zones, and associated sensitive plant habitat, due to stream down cutting. This can be caused by road construction, logging, wildfire, and livestock grazing that removes vegetation and exposes stream banks, increasing runoff effects and the potential for channel erosion (USDA 2004b). Therefore, analysis of effects to rare plant populations in riparian habitats is intricately tied to hydrological changes in their habitat (Seymour 2009).

Alternative 1

This alternative would have no disturbance through road construction, timber harvest, burning, or other activities that could directly or indirectly affect the viability of sensitive plant species. Habitat would be maintained as is, at least in the short term (<10 years). Therefore, for species associated with riparian habitats, no direct impact would be expected. However, no beneficial indirect effects through improvements to habitat would be made through a decrease in competition from surrounding plants or from stand density reduction as a result of timber harvest, noncommercial thinning, or prescribed natural fire. Natural wildfires prevent these early successional species from being outcompeted by plant species, including encroaching conifers. With wildfire suppression, overstocked stands, and lack of prescribed burning, a long-term decline of early successional species such as *Calochortus longebarbatus* var. *peckii,* and several species of *Botrychium,* may continue if competition is not set back (Kagan 1996, Farrar 2006). However, livestock grazing may offset the risk of being outcompeted by lack of fire. Grazing will be discussed further in the cumulative effects section.

Alternative 2

Calochortus (longebarbatus var. peckii)

Fifty proposed timber sale harvest units are adjacent to or encompass Peck's mariposa lily populations. In this alternative, 62.3 acres of the 1,320 total acres of *Calochortus longebarbatus* var. *peckii* would be affected by commercial timber harvest. Design elements, based on recommendations in the Species Management Guide for Peck's mariposa lily, would avoid direct effects to these populations. No slash piling or ground based equipment would be used within 100 feet of Peck's mariposa lily populations or habitat. Exceptions would be reviewed by the botanist for specific activities including the use of existing roads or landings, pulling cable from existing roads, constructing spur roads to access landings within units and aspen treatments. Layout of harvest units would be coordinated with the district botanist to ensure all Peck's mariposa lily populations are protected. There would be a restriction of spring burning activities within 100 feet of documented populations. There would be no piling of activity fuels, commercial or noncommercial, within 100 feet of documented populations.

Several Peck's mariposa lily populations occur in proposed commercial harvest units in RHCA's that would be winter logged. For example, unit 310a would have approximately nine acres of treatment within an RHCA and a core Peck's lily population. This unit would be logged over snow or frozen ground sufficient to prevent ground disturbance. The harvest prescription for this unit has been designed to meet riparian management objectives. The harvest would be light, with the majority of the trees removed being in the 7-14" diameter range. Large populations of Peck's mariposa lily have been observed under previously harvested, partially opened canopies. While complete opening of the canopy through clearcut or shelterwood harvests appears to have detrimental effects to this species, a partially open canopy appears to be beneficial (Kagan 1996). This harvest, which would reduce competition and shade from smaller trees, would be expected to maintain or benefit the population. The direct impacts from ground disturbance associated with harvest activities would be avoided by winter logging. Therefore, it is determined that timber harvest in unit 310a would have no direct impacts on Peck's mariposa lily. Several proposed units with Peck's mariposa lily populations would be winter logged to mitigate direct impacts to those populations including units 299, 300, 304,310, 417, 418, 501, 502, and 509.

Another 27.4 acres of commercial riparian treatment in the RHCA would occur within Peck's mariposa lily habitat. There are 126 acres of commercial harvest, (conifer removal) proposed in aspen stands, and although harvest prescriptions would be designed to meet riparian management objectives, there would be a direct effect to 6.4 acres of Peck's mariposa lily habitat. Short-term indirect impacts are possible within all the populations in or adjacent to RHCA harvest units. Localized increases in sedimentation in and around sensitive lily habitat could change microsite conditions as stream pools expand or contract, causing a short-term negative impact on sensitive lily populations.

Alternative 2 proposes 244 acres of noncommercial thinning in sensitive riparian plant habitat. Design criteria for Peck's mariposa lily specifically state that noncommercial thinning should be done after the growing season (July-August); noncommercial thinning would be done by hand without ground disturbing equipment and no slash from noncommercial thinning would be piled in lily habitat. These design criteria would reduce the potential for burying sensitive plants and therefore no direct impacts would be anticipated. Short-term indirect effects would be expected to be negligible as well, with indirect long-term effects benefiting the lily populations. Units that have sensitive riparian plants are listed in Appendix C. Where some benefit to the Peck's mariposa lily could occur through vegetation management, such as noncommercial thinning adjacent to habitat, implementation would occur through coordination with the botanist.

In Alternative 2, there are 264 acres of activity fuels treatment and 41 acres of natural fuels treatment in Peck's mariposa lily habitat. Fuels treatments have the potential to directly impact these populations if there are heavy fuel loads in the area and if the fire intensity is high. Historically, riparian habitats in which this species occupy, was subject to low intensity, low frequency, late summer fires that removed competing vegetation and prevented fuel build up. Currently, fuels have accumulated as a result of decades of fire suppression, and therefore, may sustain fires of greater intensity than under the historical fire regime, possibly sterilizing soil and damaging bulbs.

There are design elements specified to address these concerns. Broadcast burning would occur in these sensitive plant areas, but no activity slash would be piled within sensitive plant populations, thereby reducing unnatural fuel loading. Timing of fuels treatment is also important to maintaining viable Peck's mariposa lily populations. Spring burning can have a negative effect on plants by damaging the newly emerged vegetative material. *Calochortus* individuals are adversely affected by the removal or damage of leaves, which depletes carbohydrate reserves (Fredericks, 1989). Prescribed fire would take place in the fall after the plants are dormant, to avoid leaf damage. Design criteria should prevent direct adverse effects to Peck's mariposa lily.

In a study of the effects of fire and grazing on Peck's mariposa lily on the Ochoco National Forest, Kagan (1996) observed that cool burns appeared to reduce competition to the lily, and did not affect the moisture gradient in the meadows. This burn was conducted in a high moisture year and the burn did not carry well through the majority of the study plots. Thus, there were no data on the effects of hot burns on the population. On the Winema National Forest, a wildfire burned a population of *Calochortus longebarbatus* var. *longebarbatus*, a close relative of Pecks mariposa lily. Flowering individuals greatly increased in the year following the fire (Kagan 1996). Long-term indirect effects should be beneficial for the species by returning to a more historical fire regime.

To access harvest units, there is 0.42 miles of temporary road development on existing disturbance proposed within Peck's mariposa lily habitat. The effects to habitat should not increase beyond what has already occurred if activities are confined to the existing roadbed. There are 0.3 miles of new road reconstruction proposed, none of which would impact Peck's mariposa lily habitat.

There are 1,021 acres of grapple piling which would cause a direct effect to 9.58 acres of Peck's mariposa lily habitat. Grapple piles are composed of heavy fuel loads that burn very hot and if placed within the lily habitat could sterilize the soil and kill the plants even in a dormant state. Units with proposed grapple piles in lily habitat would be marked and pile locations would be determined by district botanist to avoid direct impacts. There are 569 acres of hand piling proposed with a direct impact to 31.8 acres of Peck's mariposa lily habitat. Although hand piles are not as large as grapple piles, they still have the potential, due to increased fuel loads, to sterilize soil and kill or severely damage the lilies.

In conclusion, this alternative has a potential for direct and indirect impacts to Peck's mariposa lily habitat. Peck's mariposa lily is influenced by changes in hydrology and stream bank condition, and vegetation changes (Kagen 1995). Noncommercial thinning and prescribed burning along the forest/meadow interface with habitat for Peck's mariposa lily, would have positive long- term effects (>10years), by removing shade and reducing competition from neighboring plants. This alternative would affect 238.9 more acres of riparian habitat for Peck's mariposa lily than Alternative 3, which may lead to changes in Pecks mariposa lily habitat. Design criteria would minimize short-term negative impacts to Peck's mariposa lily populations.

Botrychium species

Four species of Botrychium (moonworts) are documented in the Jackson project area. They include: *Botrychium ascendens, Botrychium crenulatum, Botrychium minganense* and *Botrychium montanum.*

Two species *Botrychium crenulatum* and *Botrychium montanum* occur in activity units. These species occupy the same major habitat type, wet meadows and riparian forests and will be analyzed together.

There is one commercial timber harvest unit adjacent to a *Botrychium crenulatum* population. Direct impacts would not be anticipated because design criteria would establish a 100 foot no disturbance buffer around the population. There would be the possibility of indirect effects to this population because *Botrychiums* occupy rare, ecologically diverse calcareous habitats, and are very sensitive to changes in soil moisture, soil temperature, mycorrhizae associations, and canopy cover (Ahlenslager and Potash 2007). Moonworts can be found on small hummocks under lodgepole pine within wet meadows. There is typically partial shading in these habitats, and which is thought to be beneficial to the species (Zika, 1992).Conventional ground based logging equipment could increase soil compaction and runoff which could have indirect effect to the adjacent wet habitat.

Noncommercial thinning, affecting 2 acres of habitat, are within or adjacent to *Botrychium* populations. Based on the established microsite conditions of the affected *Botrychium* populations, noncommercial thinning activities would be determined as beneficial or harmful on a site by site basis by the district botanist. If noncommercial thinning in *Botrychium* habitat is determined to be beneficial, design criteria would be followed (see design criteria, Chapter 2) and would protect moonwort populations from any negative direct effects.

There are 2.56 acres of natural and activity fuels treatments proposed in *Botrychium* habitat. Much of this habitat is considered too wet to carry fire and therefore is naturally buffered from any adverse direct effects. For populations that may be susceptible to fire, careful monitoring during burning operations would be necessary to avoid harmful direct or indirect effects of hot fire that includes complete duff consumption, which would increase sediment loading. Of particular concern are grapple piling and hand piling activities, both of which have the potentials to sterilize soils and kill or severely damage these ferns. The district botanist would review burn plans and conduct site visits with fuels personnel for all units with *Botrychium* populations. This would minimize any direct or indirect effects to moonwort populations

Other sensitive riparian species

Species associated with riparian habits but were not found in the analysis area include: Carex abrupt, *C. diandra, C. lasiocarpa*, var. *Americana, C. retrorsa, Eleocharis bolanderi, Muhlenbergia, minutissima, Potamogeton diversifoliius, Salix wolfii, Utricularia minor, Helodium blandowii, Tomentypnum nitens,* and *Dermatocarpon meiophyllizum*. These species occupy riparian habitats similar to Peck's mariposa lily and *Botrychium* species and would be protected from heavy equipment. Moist habitat associated with riparian areas would unlikely burn during prescribed burning and though the fringes of this habitat may burn, direct or indirect effects on these species would be minimal. In addition, other activities including road maintenance, reconstruction, noncommercial thinning, and fuels treatments that, would occur within the RHCA's, may damage some individual *Calochortus longebarbatus* var. *peckii, Botrychium* spp., sensitive *Carex* spp. or other sensitive plant species associated with riparian areas. However, these activities are expected to 1) only affect the periphery of such habitat (thinning along a meadow edge); 2) would not expected to burn with high intensity; 3) would affect areas already heavily disturbed or 4) would otherwise occur in marginal habitat or areas unlikely to affect viability of populations. Therefore, for sensitive plant species associated with riparian habitats (including seasonally-moist habitats, wet meadows, seeps, springs, and aquatic habitats), anticipated short-term effects (< 10 years) would be that some individuals or habitat may be affected, but would not be likely to contribute to a trend towards federal listing or loss of viability.

Alternative 3

Calochortus longebarbatus var. peckii

In this alternative, 27 acres of *Calochortus longebarbatus* var. *peckii* would be affected by commercial timber harvest. Direct impacts to 10.8 acres Peck's mariposa lily habitat would be mitigated by winter logging. The remaining 16.2 acres of would be protected from direct impacts by a 100 foot no harvest buffer. Design elements would adequately protect this species from direct impacts to individuals and any indirect effects that could occur are unlikely to impact the long-term viability of these populations. Alternative 3 proposes approximately 100 acres of noncommercial thinning within Peck's mariposa lily habitat. This is a reduction of over 59 percent of the area affected in Alternative 2 and although there may be some short-term impacts from noncommercial thinning on Peck's mariposa lily habitat, there would be long term benefits by reducing shade and competition.

Natural and activity fuels treatments in Alternative 3 would affect 144 acres of Peck's mariposa lily habitat. This is a 53 percent reduction in area as proposed in Alternative 2. There are 7.3 acres of grapple piles and 52.4 acres of hand piling proposed in Peck's mariposa lily habitat. Light burning along meadow edges that are being encroached by conifers could have long term beneficial effects to Peck's mariposa lily populations. Proposed pile placement within these units would be coordinated with district botanist.

Botrychium species

Alternative 3 proposes the same commercial harvest unit adjacent to a *Botrychium crenulatum* population as in Alternative 2 and the population would be protected by a 100 foot no disturbance buffer. Noncommercial thinning in *Botrychium* habitat would be reduced to only 0.02 acres and natural and activity fuels treatments are proposed for 1.19 acres of *Botrychium* habitat. This is a 42% reduction in the area affected by prescribed burning in Alternative 2. Design criteria would mitigate direct and indirect effects to *Botrychium* populations.

Other Riparian species

Alternative 3 avoids the majority of timber harvesting and noncommercial thinning in RHCAs. There is a decrease of 107 acres of commercial thinning and a decrease in 1,245 acres of noncommercial thinning in RCHAs for Alternative 3 compared to the proposed action. There would be a slight increase of 24 acres of noncommercial thinning in aspen stands but a 25 acre decrease in commercial thinning in aspen, for Alternative 3 compared to the proposed action. Other riparian species such as sensitive sedges, willows and mosses would be less impacted by Alternative 3 than Alternative 2 because less riparian habitat would be affected.

Non-Forested Habitats (Scabland Species)

Existing Condition

There are approximately 10,900 acres of high probability habitat for *Achnatherum hendersonii, Achnatherum wallowensis,* and *Lomatium ochocense* habitat in the Jackson project area. This alternative would have no direct effects on these species. There is no difference between Alternative 2 and 3 for scabland habitats and will be analyzed together.

The Ochoco NF has no management guide for these species though a draft species management guide for *Oryzopsis hendersonii* on the Wallowa-Whitman National Forest provides some guidance (Vrilakas 1990).

Scablands are characterized by rocky clay soils that are very dry, shallow, gravelly lithosols with cryptogenic soils, characterized by frost heaves in the winter. There is a general lack of vegetation

with much of the gravelly soils being bare. Plants that do colonize these scablands include *Artemesia rigida*, *Poa segunda* and *Danthonia unispicata.*

Alternative 1

This alternative includes no disturbance, such as road construction, timber harvest, burning or other activities on scablands that provide the primary habitat for *Achnatherum hendersonii* and *A. wallowaensis*. Habitat would be maintained. Therefore, this alternative would be expected to result in no impact to these species.

Alternative 2 and 3

No harvest activities would take place on non-forested scablands in any alternative. No direct effects from logging would occur to sensitive scabland plant species or habitat. Indirect effects to habitat could occur from increased runoff, incidental tree falling, and slash accumulation outside of harvest unit boundaries.

No new system road construction is proposed within scabland habitat for any alternative. Proposed roads for re-use within scabs were surveyed and no sensitive species were found. There are 3.04 miles of proposed temporary road on existing disturbance and 0.38 miles of proposed new temporary roads. No rare scabland plant species were found in areas with proposed temporary roads. There should be no direct effects to high probability needlegrass habitat for the 3.04 miles of temporary road construction on existing disturbance, because there is already a pre-existing road bed that is considered to be a permanent disturbance due to the nature of road impacts on scabs.

However, implementation of action alternatives would adversely impact sensitive *Achnatherum spp.* and *Lomatium ochocense* populations if present on the 0.38 miles of proposed new temporary road construction. There is approximately 3.04 miles of temporary roads proposed on scabland with high probability needlegrass habitat. Design elements were developed to address some of these issues and the district botanist would help coordinate new road and landing locations to avoid high probability scabland habitat.

There are 1,584 acres of prescribed fuels treatment in scabland habitat. Natural and activity fuels burning are not designed to burn across scablands. However, no control lines would be constructed to keep fire out of these habitats. Therefore, they are included in the total acres of prescribed fire. No lighting will occur within the scabs. It is unlikely that high probability Needlegrass or *Lomatium* habitat would carry a fire; by nature it is rocky and bare with no fuel accumulation. *Achnatherum hendersonii* and *A. wallowensis* probably evolved in an infrequent, light intensity fire regime; however prescribed fire effects on these species are unknown. Natural or activity fuels treatments are not expected to have direct or indirect effects on rare scabland plant species.

In Alternative 3, there is no significant difference in proposed activities for scabland habitat. Direct and indirect effects of Alternative 3 on scabland species would be the same as discussed above for Alternative 2.

Upland Forested Habitats

Existing Condition

The most common upland forest plant associations include grand fir /pinegrass, ponderosa pine /Idaho fescue, and Douglas-fir /pinegrass. There has been an increase in density of fire intolerant conifers and a reduced density of understory vegetation (grasses and shrubs) due to fire exclusion and grazing (Miller and Rose 1999, USDA 2004 b, 1999, Arno 2000, Agee 1993).The only sensitive plant associated with upland forested habitats is the Deschutes milk-vetch, *Astragalus tegetarioides*

Alternative 1

Alternative 1 would have no direct effects on Deschutes milk-vetch. However, no beneficial indirect effects to Deschutes milk-vetch, through habitat improvement activities, would be made in this alternative.

Alternative 2 and 3

No harvest or road building is proposed within known Deschutes milk-vetch populations or high probability habitat. Therefore, no direct or indirect effects from these activities would occur. Deschutes milkvetch is usually found on volcanic soils in openings of shrublands and dry ponderosa pine forests. The most common associated plants are *Artemesia arbuscula*, *Poa sandbergii*, *Festuca occidentalis* and *Phlox hoodii*. Of the 19,857 acres of proposed prescribed burning, approximately 5,927 acres would occur in moderate to high probability habitat. Despite the assumption that Deschutes milk-vetch is an early successional, fire tolerant species like its congeners, the effects of prescribed burning on the plants' biology and habitat is unknown. Current fuel loadings due to fire suppression are greater than these species may have evolved with. Therefore, in the short-term, some localized populations could be negatively impacted by prescribed fire. Long-term effects of burning may be beneficial by reducing dense stands of brush and understory ponderosa pine, creating more milk-vetch habitat.

Recommendation, Removing, Avoiding, or Compensating Adverse Effects to Sensitive Plant Species

The effects to sensitive plants from actions proposed within the Jackson EIS were analyzed and written with the assumption that all design elements in Chapter 2 of the EIS would be adhered to. See Sensitive Plants/Habitats in Appendix C Unit Design Criteria.

Protection of sensitive plant habitat is included in the Ochoco Forest Plan. All proposed, endangered, threatened, and sensitive plant and animal species will be considered (LRMP Chapter 4, pp. 246-247). If any new species or populations are found during project implementation, these species would be considered as described in the policy guidelines found in FSM 2670, regardless of the date of sale or other contract.

Cumulative Effects

Cumulative effects are those that are expected from the impact of the no-action, and action alternatives, when added to other past, present, and reasonably foreseeable actions.

Past, present and reasonably foreseeable actions that affect sensitive plants in the Jackson analyses area include:

- Past Timber Sales (see Table 138)
- Noncommercial thinning across the Deep watershed (6,026 acres accomplished Since 1999)
- Conifer planting (204 acres planted in Summit Timber Sale)
- Meadow Restoration (268 acres of conifer removal in meadows)
- Riparian Planting (Big Springs, Little Summit creek, Toggle Creek, Derr Meadow)
- Happy, Little Summit, Deep and Derr allotments covered under the Westside Allotment Ea
- Fire suppression-Suppression of wildfire during fire season will continue
- Road maintenance is expected to continue. Maintenance (road grading, brushing) would occur intermittently throughout the watershed
- Other activities-Firewood cutting, mushroom picking, ATV and other off road vehicle use

- Planned Activities (Wheeler Aspen units, 22 acres)

Continuing influences, such as grazing and roads, contribute to negative effects on sensitive plants and their habitat. Repeated and lengthy grazing by livestock in riparian areas can dramatically alter the plant community, compact the soil, change soil surface hydrology, microclimate, create down cutting of streams by removing vegetation that would otherwise stabilize stream banks and function to trap and deposit sediment creating wet meadows and floodplains (Elmore 1992). Grazing also causes trampling of actual Peck's mariposa lilies and consumption of their basal leaves reduces photosynthate available for bulb renewal (Fiedler 1987).

Calochortus longebartus var. *peckii* requires particular edaphic conditions for its recruitment and survival. It tends to occupy sites whose soil moisture levels are transitional between wet meadow and near-stream plant communities, and distinctly drier upland plant communities, it is reasonable to expect that the taxon would be very sensitive to minor, but persistent changes in local hydrology (Dewey 2011). Altering the hydrology of stream channels is one of the largest threats to Peck's mariposa lily (Fredricks 1989). Over time, many activities in the Jackson analysis area have detrimentally affected stream channels. Down cutting, caused by cattle grazing, timber harvest, road construction, and inadequate sized culverts, has lowered the water table resulting in a loss of riparian habitat. This in turn has fragmented the *Calochortus* populations within the Deep, Jackson and Little Summit watersheds and the affected rare calcareous habitats where Botrychium species occur.

Road building, even temporary roads, alter stream drainage patterns. It is speculated that Peck's mariposa lily is spread by bulblets moving downstream during high water flow. Roads that cross drainages can affect bulblet dispersal. Road building on scabs and other sensitive ecosystems can permanently alter or remove habitat for sensitive species.

Biological Evaluation (BE) for Sensitive Plants

The biological evaluation (BE) was prepared for the Jackson Vegetation Management project to determine the effects of the proposed action and alternatives on plant species : 1) listed or proposed for listing by the US Fish and Wildlife Service as Endangered or Threatened (USFWS 2009); and 2) designated by the Pacific Northwest Regional Forester as Sensitive (USDA 2008). This BE is consistent with the requirements of the Endangered Species Act of 1973, Forest Service Manual 2630.3(FSM, USDA 1995a), FSM 2670 and R-6 Supplement 2600-95-3 (1995) and the Ochoco National Forest Land and Resource Management Plan (USDA 1989). The intent of these requirements is to ensure that management activities would not likely jeopardize the continued existence of proposed, endangered, or threatened species, or adversely modify critical habitat, and for sensitive species, determine if the alternatives would result in a trend toward Federal listing.

Table 121 contains the expected effects to sensitive plants for each of the proposed alternatives in the Jackson EIS. The Jackson analysis area has several large populations of *Calochortus longebarbatus* var. *peckii*. The Species management guide (Dewey 2011) has specific management recommendations that have been incorporated into the design criteria. While the Jackson project area may impact some individual and habitat, it is unlikely to adversely affect the viability of the species or contribute toward its listing.

Table 121. Expected Effects to Sensitive Plant Populations and Habitat for Jackson Alternatives

Species	Alt. 1	Alt. 2	Alt. 3
Achnatherum hendersonii	NI	MIIH	MIIH
Achnatherum wallowaensis	NI	MIIH	MIIH
Astragalus diaphanus var. diurnus	N/A	N/A	N/A
Astragalus peckii	N/A	N/A	N/A
Astragalus tegetarioides	NI	MIIH	MIIH
Botrychium ascendens	NI	MIIH	MIIH
Botrychium crenulatum	NI	MIIH	MIIH
Botrychium minganense	NI	MIIH	MIIH
Botrychium montanum	NI	MIIH	MIIH
Botrychium paradoxum	NI	MIIH	MIIH
Botrychium pinnatum	NI	MIIH	MIIH
Calochortus longebarbatus var. *peckii*	NI	MIIH	MIIH
Camissonia pygmaea	N/A	N/A	N/A
Carex abrupta	NI	MIIH	MIIH
Carex diandra	NI	MIIH	MIIH
Carex lasiocarpa var. americana	NI	MIIH	MIIH
Carex retrorsa	NI	MIIH	MIIH
Cheilanthes feei	NI	MIIH	MIIH
Cyperus lupulinus ssp. Lupulinus	N/A	N/A	N/A
Dermatocarpon meiophyllizum	N/A	N/A	N/A
Elatine brachysperma	N/A	N/A	N/A
Eleocharis bolanderi	NI	MIIH	MIIH
Eriogonum cusickii	NI	MIIH	MIIH
Heliotropium curvassavicum	N/A	N/A	N/A
Helodium blandowii	NI	MIIH	MIIH
Lipocarpha aristulata	N/A	N/A	N/A
Lomatium ochocense	NI	MIIH	MIIH
Mimulus evanescens	N/A	N/A	N/A
Muhlenbergia minutissima	NI	MIIH	MIIH
Penstemon peckii	N/A	N/A	N/A
Potamogeton diversifolius	NI	MIIH	MIIH
Rorippa columbiae	N/A	N/A	N/A
Rotala ramosior	N/A	N/A	N/A
Salix wolfii	NI	MIIH	MIIH
Talinum spinescens	N/A	N/A	N/A
Texasporium santi-jacobi	N/A	N/A	N/A
Thelypodium eucosmum	N/A	N/A	N/A
Tomentypnum nitens	NI	MIIH	MIIH
Tortula mucronifolia	NI	MIIH	MIIH
Utricularia minor	NI	MIIH	MIIH

NI No impact
MIIH May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or 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 toward federal listing or cause a loss of viability to the population or species
BI Beneficial impact
N/A No Habitat or species present
*Trigger for a significant action as defined in NEPA

Non-native Invasive Plants

Introduction

An invasive plant is defined as “a non-native plant whose introduction does or is likely to cause economic or environmental harm or harm to human health” (Executive Order 13122). Noxious weeds are a subset of invasive plants and are designated as “noxious” by the Secretary of Agriculture or state agencies (USDA 2000, ODA 2001). An estimated 420,000 acres of Forest Service lands in Region 6 are infested with invasive plants (USDA 2005). Invasive non-native plants, including noxious weeds, are a threat to native plant communities, biological diversity, and proper ecosystem functioning on National Forest Land as well as other land ownerships. Invasive plants lead to many negative environmental impacts including: displacement of native plants; reduction in habitat and forage for wildlife and livestock; loss of threatened, endangered, and sensitive species; increased soil erosion and reduced soil productivity; and changes in the intensity and frequency of fires (Sheley and Larson 1994, Scott and Pratini 1995, Di Tomaso 2000, USDA 2005).

These invasive plant species thrive in a new environment because they arrive without the complement of predators, disease, and other natural control agents found in their native region of the world. Most of these species take advantage of disturbances such as logged units and associated skid trails and landings, roads, rock quarries, burned areas, and heavily impacted areas caused by overgrazing and trails. Weed seeds and other propagules can be introduced by vehicles, wind, water, animals, humans and hay brought in for livestock. Once established, weed populations serve as a seed source for further dispersal, generally along roads and trail corridors.

Forest Service policy is to prevent and manage noxious weeds (FSM 2080). However, although this direction includes avoiding activities that increase the potential for spreading noxious weeds, the Forest Service is also directed to sell timber, implement thinning and fuels treatments, issue grazing permits, and maintain a road system for administrative use and recreationists. Because these ongoing activities can increase the risk of spreading invasive weeds, the Forest Service is directed to implement prevention measures to reduce the risk of introduction and spread of noxious weeds (USDA 2005, 2006).

Ground disturbing activities such as those proposed for Jackson, including timber harvest, road construction and prescribed fire require a noxious weed assessment and analysis of prevention measures that reduce the risk of introduction and spread of noxious weeds. This report discusses and compares potential risks and effects of noxious weeds for the Jackson Vegetation Management Project proposed action and alternatives. Site specific weed concerns (high risk activities) are discussed in the effects analysis. Project design elements include prevention measures and recommendations that reduce the risk of introduction and spread of noxious weeds.

Affected Environment

During the past half century, many non-native plant species have expanded their range in the western United States. Existing conditions favor the establishment and spread of noxious weeds, and weeds are likely to continue to be introduced and spread to new areas within the Ochoco National Forest. Introduced annual grasses such as cheat grass (*Bromus tectorum*) and ventenata (*Ventenata dubia*) are widespread throughout the Ochoco National Forest and have displaced native perennial bunchgrasses such as *Festuca idahoensis, Poa secunda ,Psuedoroegneria spicata, Elymus elemoides, and Achnatherum occidentalis* in some areas (Billings 1994, pers com. Mafera). Grazing, road construction, and logging has increased the potential for introduction and spread by removing native vegetation and exposing mineral soils which many invasive plants need for establishment. Wildfires, wildfire suppression activity and prescribed burning can also increase the risk of spread of noxious weeds (Asher et al 2001). Vehicular traffic and other ongoing recreation uses are expected to continue to introduce weeds to the area.

Weed infestations within the Jackson analysis area are considered moderate to low, occupying less than one percent of the sale area, however the potential risk of rapid spread as a result of ground disturbing activities is high. Currently, there are approximately 57 sites of weed infestations totaling approximately 123 acres. These weed sites range from a couple individuals to many acres of scattered plants. Table 122 lists the weed status within the Jackson analysis area. The majority of the weed sites are located along Little Summit, Buck Hollow, Deep and Thornton Creeks. There are major roads along these riparian areas, and most weeds occur along the road shoulders, although some are beginning to invade the surrounding native habitat.

These creeks contain major populations of sensitive plants, notably Peck's mariposa lily (*Calochortus longebarbatus* var. *peckii*). Canada thistle is of particular concern because it readily establishes in riparian zones, and has the ability to form large patches of rhizomatous growth. There is no effective manual or chemical control of this species to date because of its rhizomatous growth form, and proximity to water. Biological control is being tried with limited success. Other common noxious weeds, particularly knapweeds (*Centaurea spp.*), occupy over 80 acres in the Jackson Analysis area along roadsides and have spread into adjacent meadows and other open sites. In addition to invading disturbed sites with annual grasses, knapweeds can also invade relatively undisturbed perennial native plant communities (DiTomasi 2000).

Medusahead (*Taeniatherum caput-medusae*) also occurs in the Jackson Area and is a high priority species for control. Medusahead is an extremely competitive winter annual that displaces native plant species, causes habitat loss, reductions in forage productivity, and enhances ignition and spread of wildfires (Miller et al. 1999). Once it becomes well established in an area, rehabilitation or restoration becomes very difficult and expensive. Therefore, controlling small isolated populations such as those occurring in the Jackson analysis area are critical to reducing its spread across the forest.

Table 122. Non-native invasive weeds within the Jackson Analysis area

Scientific Name	Common Name	Acres in Analysis Area
Acroptilon repens	Russian knapweed	0.66
Cardaria draba	White top	0.1
Centaurea diffusa	Diffuse knapweed	0.3
Centaurea stoebe	Spotted knapweed	83.6
Cirsium arvense	Canada thistle	4.5
Convolvulus arvensis	Field bind weed	0.69
Cynoglossum officinale	Common Hound's-tongue	30.3
Cytisus scoparius	Scotch broom	0.1
Dipsacus sylvestris	Teasel	0.1
Hypericum perforatum	St. John's wort	0.1
Linaria dalmatica	Dalmation toadflax	0.1
Potentilla recta	Sulfur cinquefoil	0.3
Taeniatherum caput-medusae	Medusa head	1.72

Regulatory Framework/ Management Direction

The Final EIS for Pacific Northwest Region, Preventing and Managing Invasive Plants (USDA 2005) amended the Forest Plan and prescribes the need for prevention, inventory, early detection and rapid response on new populations, restoration of treatment sites and cooperation with other agencies and landowners, and outlines the standards that must be met. The Ochoco NF is currently managing noxious weeds under the Integrated Weed Management Plan and the Environmental Assessment/Decision Notice (1998). Control methods include a variety of strategies, including manual hand pulling and grubbing, herbicides, and biocontrols, depending on the size of the infestation and the species of non-native invasive weed. Monitoring of treated infestations has shown that weed control has been effective, and herbicide use has declined where treatment has occurred. Weed treatments are expected to continue under the existing integrated management plant, until a

new management plan is adopted. Currently there is a Draft Invasive Plant EIS for the Ochoco and Deschutes National Forests but at the time of this report, it has not been approved for implementation. However, new infestations of all invasive plants are occurring and are likely to continue.

The treatment strategy varies with the weed species to be managed. For aggressive noxious weed species such as medusa head, spotted knapweed and common hound's tongue the treatment strategy is also aggressive, treat all infestations to reduce current population size and prevent seed production to reduce the rate of spread. For these weed species populations are stable or decreasing. However, for the majority of sites, some seed production still occurs from individuals that germinate after treatment, re-sprout after incomplete pulling, or otherwise escape the control. As long as seed production continues, total eradication is difficult. In addition, seed from most invasive species remains viable in the soil for many years (Eddleman 1996).

New infestations of a variety of species have been documented in the analysis area that were not included for chemical control in the 1998 Noxious weed EA. Currently, treatment of new infestations is limited to hand pulling, and not all new infestations are treated each year. Some infestations are likely to expand without increases in funding for manual treatment or the expanded ability to use chemical herbicides.

Prevention measures

The Forest Service is directed to manage noxious weeds and implement prevention standards (US Congress 1994, USDA 1989, 2005, 2006). Controls will continue under the existing Integrated Weed Management Plan and Environmental Assessment (USDA 1998). Design elements for preventing the introduction and spread of noxious weeds are outlined in Table 123. Specific prevention measures described in Chapter two of the EIS are designed to reduce the risk of spread of noxious weeds and to meet the standards outlined in the FEIS record of decision (USDA 2005).

Table 123. Design elements for reducing the risk of introduction and spread of noxious weeds.

Action measure	Rationale
Retain shade and do not burn within 100 ft of infestations	Will reduce risk of weed introduction and spread
Avoid re-use of log landings that have or had infestations	Will reduce risk of weed introduction and spread
Avoid or minimize disturbance within existing infestations	Will buffer high risk areas by 100 feet to prevent weeds from spreading
Mineral material will come from weed free areas	Weed free material sources have been identified and will prevent the introduction of new infestations
Straw bales used for soil retention or mulching will be certified weed-free	Will reduce the risk of weed introduction
Equipment used for timber harvest as well as hauling material sources are required to be certified free of weed seed and plant parts	Will reduce risk of introduction of weeds from off forest sites
Revegetate decommissioned roads, landings and skid trails using native seed as soon as possible	Reduces establishment sites for noxious weeds
Document and buffer weed infestations discovered during implementation	Early detection and rapid response to new infestations will limit spread
Include a noxious weed locator map in projected	This will identify all known infestations so marking crews and fire crews can avoid infested areas
Pre-treat existing weed infestations along major haul routes before sale activity begins	Will reduce spread of existing weeds along road corridors. Requires sale administrator to notify botanist BEFORE sale activity begins.
Water for fire control, road construction and maintenance or other activity would come from weed-free sites or use other measures to reduce risk	Reduces introduction of new infestations; need to involve botanist in reviewing watering sites
Minimize soil disturbance to the extent practical	Forest Plan Guidelines require detrimental soil disturbance be limited to less than 20% of treatment unit area.

Contract Provisions

As a prevention measure to reduce the potential for transport or spread of noxious weeds by road construction or logging equipment, the timber sale contract would include BT 6.35 provision. This provision requires: 1) certification that equipment be clean of all plant or soil material that may result in the establishment or spread of noxious weeds; and 2) Notification of location where equipment was most recently used.

To reduce the potential for weed spread through rock used on roads, Ochoco NF rock sources would be inspected to ensure materials are weed-free. Additionally, the sale contract would include provisions requiring any material used from other sources is weed-free.

Noxious Weed Risk Assessment

Forest Service Manual (FSM) direction requires that noxious weed risk assessments be prepared for all projects involving ground-disturbing activities. The Forest Service is required to determine factors that would increase the risk for introduction and spread of noxious weeds, and design projects to reduce these risks, especially for ground disturbing and site altering activities (FSM 2081.03, 2081.2, 1995). Proposed logging activities would remove vegetation and disturb the soil organic layer, increasing the potential for introduction and spread of noxious weeds. Prescribed burning is normally low-intensity, however burning slash piles or intense burning that results in scorched soils can exacerbate risk by increasing time for establishment of vegetation and the soil organic layer. Factors that influence the risk of weed introduction and spread are outlined below. These factors are discussed in the effects analysis and incorporated in a risk assessment for each alternative in the Jackson analysis area.

Factors related to weed risk

- Most non-native invasive plants are pioneer species that are shade intolerant, and therefore have a greater potential to invade forested sites that have been disturbed. Existing conditions favor establishment and spread of noxious weeds. Many areas have had road construction and timber harvest. Proposed activities would create an ideal seedbed for noxious weeds (Borman et al 1991, Alexanian 2000).
- Road construction would create new disturbed areas and pathways into weed-free areas. Roads act as corridors for dispersal and provide suitable habitat for invasive weeds. (Perendes & Jones 2000). Weed seed can be introduced from weed-infested areas through soils attached to vehicles and road maintenance or other equipment. A corridor of habitat along a closed road system can allow for expansion of weeds into a weed-free area even if future vehicle traffic is eliminated (Perendes & Jones 2000).
- Non-native plants are often difficult to replace with native species. On many sites, especially where roads or log landings have been constructed, soil disturbance, notably loss of the soil A-horizon, has resulted in sites not capable of returning to native plant communities for many years, or even decades. Weeds and non-native grasses often out-compete native species on altered sites (DiTomasi 2000).
- The potential for introduction of noxious weeds due to logging activity is much greater than other activities because of the soil disturbance and removal of vegetation by log skidding, road and landing construction activity. Logging equipment (skidders, cats, feller-bunchers, etc.) can bring noxious weed seed or plant material from one site to the next with soil and weed propagules attached.
- Project activities would reduce tree density and result in more ground vegetation, potentially resulting in greater distribution of livestock that can serve as vectors for weed introduction and spread
- Burning natural and activity fuels (from logging and thinning slash) would increase susceptibility to invasion of non-natives. In general, prescribed burns occur in the spring and

fall, with low intensity, so vegetation recovers quickly, and the majority of the soil organic layer is retained (an estimated 5% of area burned results in mineral soil exposure (Scholtz per comm.) . Conversely, burning dozer, grapple, or hand piles creates fuel levels that result in soil scorching that removes the soil organic layer and increases susceptibility to noxious weed establishment.

- Maintaining native vegetation and the soil organic layer results in less susceptibility to noxious weeds introduction and spread.
- Present and foreseeable livestock grazing can delay recovery of native vegetation, resulting in increased potential for introduction and spread of noxious weeds by selective grazing of more palatable natives and desirable non-natives and spreading weed seeds from existing populations to new sites (Callihan and Evans 1991, Olson 1999, Belsky 2000).
- Present and foreseeable vehicle use, road maintenance, recreation, would all contribute to weed risk.
- Current weed management limits herbicide use to knapweed and a few other species on previously established sites dictated by the 1998 Integrated Weed Management Plan. Few controls are available for some species in certain locations, such as Canada thistle in riparian zones. Prevention measures that limit the potential for introduction and spread of these species are essential in maintaining existing desirable vegetation.

Alternative 1 includes no disturbance that would increase risk for introduction and spread of noxious weeds. Alternatives 2 and 3 involve high risk of spread where ground disturbance from logging, road construction or fuels treatment is proposed near existing infestations. The increase in weed risk is reflected in the soil disturbance analysis portion of the noxious weed risk assessment discussed below.

Two types of analyses are included in the risk assessment. The first compares the amount of exposed soils that the proposed activities would create, increasing susceptibility to noxious weed introduction and spread. The other uses a combination of risk factors, such as commercial timber harvest activities, fuels treatments, or road construction near known weed infestations, type of weed, life history, rate and method of spread etc., and incorporates those factors into the exposed soil risk. Table 124 outlines a risk factor assessment as the inherent risk for each alternative if no prevention measures are followed.

Table 124. Risk factor assessment and soil disturbance by alternative

Activity	Alt. 1	Acres of exposed soil	Alt. 2	Acres of exposed soil	Alt. 3	Acres of exposed soil
Acres of Commercial Harvest**	0	0	3	1,200ac.	3	1, 128 ac.
Construction of new temporary roads*	0	0	3	17 ac.	3	17 ac.
Reconstruction of existing roads*	0	0	3	0.50 ac	3	0.50 ac
Temporary road on existing disturbance*	0	0	3	26. ac.	3	26 ac.
Activity fuels treatment***	0	0	2	717 ac.	2	661 ac.
Natural fuels treatment***	0	0	2	77 ac.	2	70. ac.
Grapple Piling****	0	0	3	51 ac	3	50. ac
Hand Piling****	0	0	3	29 ac.	3	29 ac
Assigned risk values of 0=no risk, 1=small risk, 2=moderate risk, 3=high risk. Derived from relative risk of invasive weed introduction and establishment by alternative based on the level of weed promoting activities within each alternative. Acres of exposed soil was calculated:*estimated total soil exposure is 1.7 ac/mile.**Est. 20% exposure of total area.*** Est. 5% exposure for 80% of area burned.****5% exposure of total area.						

Direct and Indirect Effects of the Alternatives

The degree of environmental impact due to noxious weeds is relative to the species and density of the weed infestation. Of the 57 known weed infestations occurring within the Jackson analysis area, 13 infestations occur in or immediately adjacent to proposed commercial timber harvest units (Table 125). Due to ongoing weed management, these infestations are typically small, less than 0.10 acres, and collectively occupy 0.22 % of the analysis area. Although a relatively small percentage of the analysis area is occupied by non-native invasive weeds, they continue to expand and spread.

The potential for non-native invasive plants to expand in the Jackson analysis area is directly related to the amount of ground disturbing activities proposed, and the risk of spread would be evaluated for each alternative.

Alternative 1

This alternative would create no new ground disturbance from logging or road construction and there would be no fuels treatments or other activities. Because no ground disturbance would occur, risk for introduction and spread of noxious weeds would not increase as a result of proposed activities.

Weed introduction and spread could potentially continue through vehicular traffic along roads, off-road vehicular use, recreational users (particularly horseback riders that camp and bring weed infested hay) or other vectors such as cows, wildlife, wind, and water dispersal.

Alternative 2 and 3

Commercial timber harvest is the greatest threat for spreading noxious weeds of all the proposed activities. There are 5,744 acres of proposed commercial timber harvest in Alternative 2, and 5,545 acres of proposed commercial timber harvest in Alternative 3. There are an additional 126 acres of commercial harvest in aspen units and a proposed 94 acres of commercial harvest in aspen units for alternative 3, and the effects are generally the same for both alternatives. Heavy equipment, the amount of disturbed area (up to 20% of treatment area), landing sites taken down to mineral soil, road construction, reconstruction, and increased traffic due to log hauling and administration, have the potential to introduce new weed infestation and spread existing infestations.

There are 17.9 acres of noxious weeds in commercial timber harvest units for both Alternative 2 and Alternative 3 (Table 125). There would be a risk of spreading these weeds throughout these units along connecting road corridors, as well as increasing the current infestation size. There would be a direct negative impact on the native plant community if ground disturbance occurs in or adjacent to weed infestations because native plants will have to compete with the non-native invasive plants to re-establish themselves. Broad-leaf invasive weeds such as Hound’s tongue and Canada thistle often germinate sooner, grow more quickly and are larger than many native plant species and effectively out-compete them on disturbed sites. Noxious weeds such as knapweeds have the ability to prevent the establishment of native plants by chemically inhibiting seed germination (DiTomasi 2000).

These non-native invasive weeds would likely alter the composition of the surrounding native plant communities by pre-empting establishment sites, changing site conditions, or displacing native plants. This can reduce habitat, cover and forage for wildlife, and cause reductions in abundance and diversity of wildlife (USDA/USDI 2000, DiTomasi 2000).

Table. 125. Commercial timber harvest units in alt 2 and 3 with noxious weed infestations

Species	Infestation ID	Unit	Acres	Risk Factor
Canada thistle	0607020200	507	0.067	2 moderate
Canada thistle	0607020192	417	0.098	2 moderate
Canada thistle	new	134	0.095	3 high
Hound’s tongue	0607020559	356	5.231	3 High
Hound’s tongue	0607020559	354	2.807	3 High
Hound’s tongue	0607020559	353	4.1850	3 High
Hound’s tongue	0607020178	355	2.771	3 High
Hound’s tongue	0607020559	351	1.737	3 High
Spotted knapweed	0607020573	215	0.0216	3 High
Spotted knapweed	0607020573	215a	0.005	3 High
Spotted knapweed	0607020607	214	0.530	3 High
Spotted knapweed	0607020607	214c	0.450	3 High
Spotted knapweed	0607020180	357	0.008	2 moderate

Canada thistle infestations in units 507 and 417 would likely expand through underground rhizomes, and also by its wind dispersed seeds landing on adjacent exposed soil. However, if this infestation is not disturbed and adjacent ground disturbance is minimized; the risk of spread would be reduced. Unit 134 has a population of Canada thistle in the middle of the unit, adjacent to the creek. The rare plant, Peck’s mariposa lily, occurs along portions of the creek and it is likely that we would see an increase in the Canada thistle population as a result of ground disturbance caused by logging activity and a corresponding decrease in this rare plant population. Preventative measures outlined in the design criteria buffer weed infestations from ground disturbing activity by 100 feet. This measure would prevent disturbing the seed bank as well as reduce the risk of dispersing weed seeds via logging equipment into other areas of the unit or along haul routes. However, thistle seed could still disperse by wind and other vectors such as birds and other wildlife into adjacent areas of disturbed soil. Although design criteria would reduce the risk of spreading these noxious weed infestations within the 100 foot buffer, both proposed action alternatives would increase the amount of bare ground and therefore increase the risk of spreading this invasive species into surrounding disturbed areas.

Hound’s tongue populations in table 125 are considered high risk due to the high competitive ability, toxicity, and rate of spread of this species. Units 356, 354, 353, 351 are included in both alternatives and have common hound’s tongue populations within the unit boundary. Hound’s tongue has Velcro like seeds which attach to clothing, boots, machinery, and can be carried long distances before landing on exposed soil which they readily colonize. Further disturbance from logging activity followed by any kind of traffic (tractors, skidders, cables pulling logs and foot traffic) through these infestations would expand current populations by exposing the seed bank and introducing new infestations in disturbed sites up to several miles away. Preventative measures included in the design criteria would buffer these populations from ground disturbing activity by 100 feet. This would prevent the seed bank from becoming exposed and activated, as well as reduce the amount of seed dispersal from logging equipment. However, because hound’s tongue is readily dispersed by wildlife and livestock, there would still be a high risk of spreading this invasive species to areas of disturbed ground caused by logging activity well beyond the 100 foot buffer.

Proposed units 213, 214, 214c, 215,215a, and 207 have spotted knapweed infestations in or adjacent to the unit boundary along the 30 road between the 700 and the 720 spurs. Spotted knapweed is also growing along the 30-705 spur. It is highly likely that this noxious weed would be further dispersed

along these road corridors and would continue to spread and colonize disturbed ground in adjacent units. Design criteria would prevent disturbing the seed bank in proposed units, and treating any existing weed populations established along roadsides before activities begin would greatly reduced the risk of dispersing seeds from vehicular traffic.

Road construction

The 4256 road, which runs along Happy Camp Creek, has a large spotted knapweed infestation. This road would be a major haul route for both action alternatives. The 4250 road also has small infestations of spotted knapweed, diffuse knapweed and field bindweed close to commercial unit 178. The risk of spreading these weeds further along the road corridor and into commercial timber harvest units as a result of the proposed activities is moderate because these populations are well established but have been treated regularly for many years. The six corners area, the junction of the 4250/4254, the 4250-100 junction, the 42 road along Buck Hollow Creek and junction with the 42-650, and the 4256-010 road all have knapweed infestations along the road corridor and are also treated regularly.

Unit 354 has a proposed temporary road on an existing disturbance through a hound's tongue population. Seeds dormant in the soil would germinate when the soil is disturbed through road construction activities. It is highly likely that seeds from the existing infestation as well as those from the seed bank would disperse and colonize exposed soil if the proposed road is used. Design criteria are in place to re-route the proposed temp road 100 feet away from this weed infestation, therby reducing the risk of spreading this weed.

Noncommercial thinning

Noncommercial thinning would cause no direct risk of spread of noxious weeds because there is no associated ground disturbance. There could be an indirect effect of spread of existing infestations as a result of opening the canopy to allow more light which could potentially increase growth and reproduction of noxious weeds. The greatest impact to the spread and introduction of noxious weeds through pre-commercial thinning is the treatment of the slash, which will be covered in the fuels treatment section below.

Fuels treatment

Fuels treatments in both action alternatives would have a direct effect of increasing the risk of introduction and spread of noxious weeds when burning occurs in or near weed infestations and exposes soil. Units with proposed prescribed fuels treatments for both action alternatives are listed in table 126. Bolded items in the table are units common to both Alternative 2 and 3. There is a total of 68.9 acres of weed infestations in proposed fuels treatment units in alternative 2. There is a total of 50.6 acres of weed infestations in proposed fuel treatment units for alternative 3. Units with invasive weeds are listed in Table 126. The risk factor ranks each weed population by the risk of spread based on the weed species, size of infestation, method of dispersal, and amount of bare ground created by the various fuels treatments. Canada thistle infestations are relatively small and have a moderate risk of spread with proposed fuel treatments compared with Hound's tongue infestations such as the 5 acre population in unit 356. Medusa head infestations in unit 240 and 291 are of particular concern because it is highly competitive with native species and spreads extremely rapidly.

Prevention measures outlined in the design criteria state that there would be no burning within 100 feet of weed infestations. As a result, the amount of bare ground created in or directly adjacent to the infestation would be minimized, reducing the risk of disturbing the seed bank. However, there is still a risk of spreading these high risk weed populations to other areas of disturbed ground caused by fuel treatment activities via seed dispersal from wildlife, livestock, wind, and human traffic.

Table 126. Prescribed fuels treatments units with non-native invasive weed infestations

Common Name	Unit	Fuels Treat	Acres
Canada thistle	315	Activity fuels	0.02
Canada thistle	315	Activity fuels	0.06
Canada thistle	315	Activity fuels	0.01
Canada thistle	402	Activity fuels	0.10
Canada thistle	**417**	**Activity fuels**	**0.10**
Canada thistle	**434**	**Activity fuels**	**0.01**
Canada thistle	452	Activity fuels	0.05
Canada thistle	**507**	**Activity fuels**	**0.07**
Canada thistle	**521**	**Hand piling**	**0.06**
Canada thistle	**643**	**Hand piling**	**0.02**
common St. Johnswort	**439**	**Activity fuels**	**0.05**
diffuse knapweed	**685**	**Hand piling**	**0.10**
field bindweed	185	Activity fuels	0.03
gypsyflower	**152**	**Natural Fuels**	**0.87**
gypsyflower	315	Activity fuels	0.02
gypsyflower	315	Activity fuels	0.06
gypsyflower	315	Activity fuels	0.01
gypsyflower	**322**	**Activity fuels**	**0.17**
gypsyflower	**324**	**Natural Fuels**	**1.53**
gypsyflower	**350**	**Activity fuels**	**2.81**
gypsyflower	**351**	**Activity fuels**	**1.74**
gypsyflower	**353**	**Activity fuels**	**4.19**
gypsyflower	**354**	**Activity fuels**	**2.81**
gypsyflower	**355**	**Hand piling**	**2.77**
gypsyflower	**356**	**Activity fuels**	**5.23**
gypsyflower	396	Activity fuels	0.09
gypsyflower	**471**	**Activity fuels**	**0.03**
gypsyflower	**475**	**Activity fuels**	**0.19**
medusahead	240	Activity fuels	0.19
medusahead	291	Activity fuels	0.01
russian knapweed	**475**	**Activity fuels**	**0.29**
Scotch broom	185	Activity fuels	0.10
spotted knapweed	**214**	**Activity fuels**	**0.52**
spotted knapweed	**215**	**Activity fuels**	**0.02**
spotted knapweed	**220**	**Activity fuels**	**14.78**
spotted knapweed	**262**	**Activity fuels**	**5.02**
spotted knapweed	263	Activity fuels	0.32
spotted knapweed	324	Natural Fuels	0.09
spotted knapweed	**357**	**Activity fuels**	**0.01**
spotted knapweed	468	Activity fuels	3.17

Common Name	Unit	Fuels Treat	Acres
spotted knapweed	**470**	**Natural Fuels**	**12.30**
spotted knapweed	**686**	**Hand piling**	**0.06**
spotted knapweed	**184a**	**Activity fuels**	**8.17**
spotted knapweed	**214c**	**Activity fuels**	**0.45**
sulphur cinquefoil	470	Natural Fuels	0.08
Bolded items are units common to both alt 2 and alt 3			

Indirect effects

Indirect effects to native plant communities caused by proposed activities that result in a high risk of weed invasion are similar for both action alternatives. Along the 2360 road there is an infestation of common hound's tongue to the north of unit 77. There are several populations of the rare plant, Peck's mariposa lily adjacent to that unit and the risk of hound's tongue invading rare lily habitat is high. It is likely that hound's tongue seeds would be dispersed into the unit by livestock and big game, and become established in areas with ground disturbance caused by timber harvest and associated activities. Hound's tongue grows much larger than the lily and it is likely to displace the rare plant as well as other native riparian plants in the area if it is not treated. There is also a Canada thistle infestation on the 2630/830 road by commercial harvest units 78a, and 78c. Canada thistle has windblown seeds that can be dispersed far distances. It is also likely that this infestation can spread into adjacent rare peck's mariposa lily habitat and other disturbed areas caused by commercial harvest and associated activities.

Cumulative Effects

The area analyzed for cumulative effects is the Jackson analysis area and the road system accessing the analysis area. Ground-disturbing activities such as ground-based yarding systems used during timber harvest, road construction and reconstruction, vehicular traffic, cattle grazing, and recreation use contribute to the incremental increase in invasive weeds. Analysis included reviewing all proposed harvest units, and proposed roads in the field to determine existing weed infestations. The pattern of known invasive weed sites was then reviewed along with the mechanisms for introduction, establishment, and expansion of invasive weeds and comparing this with similar past, present, and future foreseeable actions to determine potential impacts.

The impact of non-native invasive weeds on native plant communities is cumulative. The more disturbance and activity any given area is subject to, the higher the risk of noxious weed introduction and establishment, and/or expansion. Current conditions resulting from past management activities in the Jackson analysis area (up to 1978) include 3,371 acres of regeneration harvest, 7,095 acres of overstory removal, 4,681 acres of commercial thinning, 364.7 miles of road construction and maintenance. These past activities have resulted in considerable ground disturbance and have provided vectors for the introduction, establishment and spread of noxious weeds. Non-native invasive weeds are likely to continue to be introduced and spread to new areas within the Ochoco National Forest.

Non-native invasive and noxious weeds can have major negative impacts by 1) reducing plant diversity 2) threatening rare plant species such as Peck's mariposa lily, 3) reducing quality wildlife habitat and forage by replacing structurally diverse plant communities with large monocultures of unpalatable noxious weeds, 4) altering fire frequency through the introduction of non-native exotic winter annual grasses that produce fine fuels increasing fire intervals from more than 60 years to less than 5 years, 5) increasing erosion by displacing native plant communities with varying root depth and growth forms that hold the soil in place better than non-natives and 6) depleting soil moisture and nutrient levels compared with diverse native plant communities (DiTomasi 2000).

Current grazing activity will likely spread weeds to new areas. Cattle graze on native vegetation and often avoid eating noxious weeds such as common hound's tongue and knapweed, as well non-palatable annual grasses such as cheat grass and ventenata (Callihan and Evans 1991). Perennial bunchgrasses do not have good seedling vigor or readily recover from grazing and are replaced by non-native exotic annual grasses and noxious weeds (Young and Longland 1996, DiTomaso 2000). Introduced annual grasses such as cheat grass (*Bromus tectorum*) and ventenata (*Ventenata dubia*) are widespread throughout the Ochoco National Forest and have displaced native perennial bunchgrasses such as *Festuca idahoensis, Poa secunda ,Psuedoroegneria spicata, Elymus elemoides, and Achnatherum occidentalis* in some areas (Billings 1994, pers. observation). Medusa head has even higher potential to displace native grasses and can even outcompete cheatgrass (Miller et al. 1991). It spreads by animals including livestock, elk and deer, vehicles and foot traffic.

Grazing, road construction, and logging has increased the potential for introduction and spread by removing native vegetation and exposing mineral soils which many invasive plants need for establishment. Common hound's tongue will continue to spread by its velcro like seeds which attach to logging and road construction equipment as well as cattle and native mammals such as elk and deer, and readily establish in overgrazed areas across the forest.

Wildfire and fire suppression activity can also increase the risk of spread of noxious weeds by equipment brought in from different areas that may contain weed seed or plant parts. Due to the emergency nature of wildfire, prevention measures including equipment cleaning are not always implemented, or feasible. Dozer lines, hand lines, drop points, safety zones, staging areas, etc. create bare ground with heavy travel and disturbance. Vehicular traffic, during and after suppression activity, can introduce weeds to highly susceptible soils. Fire rehabilitation efforts are normally implemented that can mitigate many of the negative effects of fire line rehabilitation, area vehicle closures, weed washing stations, and post fire weed monitoring and treatment.

Many sites across the Jackson Analysis area have had native plant communities overgrazed in the late summer, particularly in riparian communities along the 2630 road, which has several small populations of Canada thistle and spotted knapweed. The risk of spread into rare plant habitat is high if these infestations are not treated. Several infestations of hound's tongue and Canada thistle occur in or adjacent to sensitive plant habitat and pose a high risk of displacing these rare species.

There are very large infestations of hound's tongue south of the Jackson analysis area and cattle are brought from those infested areas into the Deep watershed. There is a high risk of new hound's tongue infestations in the Jackson analysis area under current grazing practices, but preventative measures are being introduced such as a holding pasture to allow hound's tongue seeds to drop off before entering the Deep watershed.

Summary of noxious weed risk by alternative

Alternative 1

Alternative 1 creates no additional ground disturbance, and is the baseline for comparison. This alternative would have no potential for increasing the risk for introduction and spread of noxious weeds from proposed management activities. However, new infestations would still likely be established within the analysis area as a result of present and reasonably foreseeable activities, such as vehicle use, public recreation, and livestock grazing.

Alternative 2 and 3

These alternatives would include ground disturbance, burning and other activities that could increase the risk of noxious weed introduction and spread. There would a reduction of 136 acres of ground disturbing activities proposed in Alternative 3 compared to those in Alternative 2. Additional commercial timber harvest and fuels treatment associated with Alternative 2 would likely create more

opportunities for infestation compared with fewer acres of ground disturbing activities in Alternative 3.

Table 127. Summary table for noxious weed risk, by alternative.

	Alt 1	Alt 2	Alt 3
Total area of disturbed soils	0	2,117 ac	1,981 ac
Risk factor	1 LOW	3 HIGH	3 HIGH

All action alternatives have high risk factors due to ground disturbing activities proposed adjacent to infestations. Design criteria described in Chapter 2 would lower the direct risk of spread of noxious weeds as a result of proposed activities, however livestock grazing activities would continue near infestations within the Jackson analysis area creating a high risk of seed dispersal to newly disturbed areas. Vehicle use and other activities would continue in the Jackson area regardless of the alternative chosen. There is the inherent risk of new infestations from sources outside the Jackson analysis area (cattle moving from the Roba allotment to the Deep allotment) as well as seed dispersal from wildlife, air and water and vehicles in all alternatives.

Recommendations for Removing, Avoiding, or Compensating Adverse Effects

In addition to the typical design criteria outlined in Chapter 2, we would 1) treat all non-native invasive weed infestations within or adjacent to proposed units with a high risk factor ranking listed in Tables 125 and monitor and treat any remaining High risk populations for 5 years post-ground disturbing activity implementation. Treating weed infestations for two consecutive years would ensure that the majority of individual weeds would be removed the first year and that flowering stocks on biennials or individuals missed the first year would be removed before seeds were produced the second year. This treatment strategy would greatly reduce the number of weed seeds dispersing from these high risk infestations to newly disturbed ground as a result of the proposed activities. Five years of post-activity monitoring would ensure that these high risk infestations and new infestations would continue to be treated if persistent in the Jackson sale area. Five years of post-activity weed monitoring and treatment would give the native vegetation enough time to re-colonize the disturbed areas. Heavily disturbed areas such as landings and skid roads would be seeded with native grasses to facilitate native plant establishment.

Preventative measures and design criteria outlined in Chapter 2, would reduce the risk of spreading noxious weeds as a result of the proposed action alternatives and would meet the standards for noxious weed prevention and management.

Monitoring

As part of the Ochoco National Forest Integrated Weed Management Plan, proposed activities listed in Table 125 with High Risk weed infestations would be surveyed for, treated and monitored for 2 consecutive years prior to the initiation of ground-disturbing activities. In addition, these high risk infestations would continue to be monitored for five years after ground-disturbing activities are implemented to assess the effectiveness of the treatments and remove any remaining individuals.

Heritage Resources

Affected Environment

The geography of the Ochoco Mountains contributed to its use over thousands of years by tribal bands and also historically by Euro-Americans. The eastern half of the Ochoco National Forest, including this project area, borders an interface between the lower grasslands below and, above, the forested foothills of the Ochoco Mountains. This interface was visited and used often by pre-contact tribal bands (those using the geography of Oregon before 1804) for seasonal habitation, and both

ecological areas were used for resource gathering. Today, these areas also reflect a high probability for finding the remains of this use in the archaeological record.

Project area lands are now within the ceded areas of Confederated Tribes of the Warm Springs Indians of Oregon after the 1855 signing of the Tribes of Middle Oregon treaty. These tribes reserved the right to use their ceded lands for the natural yearly round of plant and animal resource extraction known to their people for thousands of years.

Historically, these lower foothills were an entrance way into the forest for grazing, hunting, and early-day homesteading and logging. Stock grazing and agricultural practices were introduced to this area in the late 1800s with the influx of Anglo exploration and settlement. The high elevation meadow known as Little Summit Prairie provided excellent stock grazing opportunities and attracted early homesteaders. Near-by Connolly Spring was named for the family that homesteaded this prairie beginning in the 1860s. A small wooden building in this privately owned meadow, left from the Connolly homesteading, can still be seen today. Beginning in the 1880s, and continuing through the 1940s, thousands of sheep and livestock ranged over the present Jackson project area by allotment permittees. Beginning in the mid-1940s, the Forest Service greatly reduced the number of animals allowed on the Forest for summer range. This early activity left the remains of sheep herding camps and carved aspen, range war fences and log water troughs, and structures used for homesteading. In addition, remnants of the Forest Service presence in the Ochoco Mountains, with their lookout towers, guard stations, phone lines, and packing trails can also be found within the Jackson project area.

Existing Conditions

The existing condition of archaeological sites within the project area varies. Euro-American sites (wooden structures, log troughs) are better protected against logging, livestock grazing, and road building due to their location and structural qualities, however, weathering from age and fires affect their integrity. The majority of pre-contact sites within the project area have undergone decades of disturbance to their surface and subsurface components from livestock grazing, logging, road building, both natural and prescribed burning across the landscape, and surface collecting of artifacts by Forest visitors.

Environmental Effects

The effects analysis is based on the potential for damage to artifacts, features, environmental settings and alteration of the surface and subsurface arrangement by machinery, fuel loadings, potential temperatures and duration of fire treatment. Heritage data indicates that all proposed units in the Jackson project area have been surveyed in the past for cultural sites. Some of the surveys date to the late 1970s-early 1980s, and many large scale timber sales followed these surveys. A comprehensive inventory of the land within the Jackson project took place in 1999-2000 when the Deep Vegetation Management project was proposed on the Paulina District, Ochoco National Forest. A total of 53 sites have been found and recorded during these past surveys. All archeological sites within the project area were indentified and analyzed for their eligibility to the National Register of Historic Places. Of those 53 sites, 20 were found eligible for nomination to the National Register. The eligible sites are predominantly pre-contact tribal sites with either complex tool assemblages or features. These sites were visited in the field and were each given specific design criteria to protect those features that make these sites Eligible. The types of specific damage mentioned in site records from past management activities include the disassembly/removal of historic structures by the Forest Service; the removal of carved aspen bark by past logging operations and fuel reductions; the trampling and displacement of surface artifacts by livestock congregating at watering places (streams, springs, developed ponds, watering troughs) and the displacement and destruction of surface and subsurface artifacts from timber harvesting operations and road construction.

The damage component that is of most concern, and that offers the most opportunity for improvement would be the protection of archaeological sites and their surface and subsurface materials adjacent to streams, springs, developed ponds, and within meadows and rock flats.

The measure used to characterize this damage component would be the assessment of those qualities of an archaeological site that contribute to its eligibility to the National Register of Historic Places, specific to disturbance from livestock grazing, timber harvesting, and road building activities. The objective to be attained is the prevention of disturbance to ground surface cultural artifacts, and to preserve the integrity of the site's subsurface materials (by definition, those cultural materials lying at least 10 centimeters below the surface of the ground) against the damage from proposed Jackson project activities.

Forest Service Standards and Guidelines, and federal laws and regulations that apply to Heritage Resources are found in the Ochoco National Forest Resource Management Plan, Forest Service Manual section 2360, 36CR64 and 36CFR800 (amended December 2000), the National Historic Preservation Act (NHPA) of 1966 (as amended), the National Environmental Policy Act, National Forest Management Act, and the Programmatic Agreement Among the USDA, FS, Region 6, The Advisory Council on Historic Preservation, And The Oregon State Historical Preservation Officer (SHPO).

Alternative 1

Existing management practices would continue under the No Action Alternative but no new vegetative treatments would be scheduled. Levels of natural fuels would continue to accumulate. Densely stocked understory trees would not be treated and thinning of larger trees would not occur. Untreated fuels under this alternative would increase the potential for unplanned high intensity wildland fire. Catastrophic stand replacement fire would have a negative effect on physical materials, historic features and natural setting.

Archeological sites within the project area would continue to degrade from stock grazing, weathering, erosion, wildland fire suppression, recreation events, firewood cutting and surface collecting. Natural fuels would continue to accumulate, exposing lithic tool sites to heat of fires and possible damage from suppression activates. Fuel loading would not be reduced using commercial harvest methods and natural fuels burning along the Summit Trail. These types of conditions would increase the risk for unplanned wildfire and the subsequent need for fire suppression activities. Suppression activities have the potential to be more damaging than fire itself. This linear historic site, eligible for the National Register of Historic Places, would continue to age and deteriorate from natural causes.

Tribal access, gathering and collection activities would continue under the No Action alternative because there would be no change to the current road system or current condition of vegetation.

Alternatives 2 and Alternative 3

Both Alternatives would have the potential to disturb archaeological sites; however, design criteria built into this proposed project would protect those qualities of a site that make it eligible to the National Register of Historic Places. For those sites within proposed harvest units, buffers would be placed around them. All skid trails and landings near sites would need approval before harvesting. Vulnerable historic sites would also be protected from fuel reduction activities proposed for both Alternatives. These site types would either have fuel lines dug around them for avoidance from flames, or fuels surrounding the site would be pulled back to reduce the heat and flame. With the design criteria included for both Alternatives 2 and 3, these Alternatives conform to those federal laws and guidelines for the protection of NRHP-eligible sites. These Alternatives would have no impact on the treaty rights of Warm Springs tribal members because no roads would be closed that may affect access to traditional use areas.

The historic Summit Trail corridor (MA-F7) is managed to retain the natural setting as well as physical features. Under all the action alternatives, the Historic Summit Trail would be managed to protect and retain all cultural features and manage vegetation within the visual management areas. Harvest has been designed to avoid the foreground area. Noncommercial thinning of young trees, hand piles and under burning would be allowed to reduce fuels and benefit long term fire protection. There would be no visible commercial harvest activities or new roads along Road 2630 and proposed harvest activities would not be visible to the forest visitor. Design criteria were developed with emphasis on the natural setting and foreground area (varies to 300 feet on both sides of the road depending on terrain). Thinning of young trees and underburning would be used to reduce ladder fuels and slash in the foreground areas adjacent to Road 2630. Stand density would be reduced and clumps of young trees would be left to retain a more natural setting. Thinning slash in the foreground areas would be hand piled.

The features, integrity and natural setting of the historic Summit Trail would benefit from these treatments in the long-term. Fuels would be reduced and the potential for stand replacement fires would decrease. The natural setting would be modified in the short-term with the mechanical removal of young trees and hand piles. The casual forest visitor would see stumps from the removal of young trees, hand piles and scorched bark and black or yellow needles from underburning in the short-term (1 to 3 years) but would not see evidence of logging or ground based equipment.

Cumulative Effects

The Heritage design criteria for the Jackson project would prevent damage that could affect archeological sites within the proposed units for these Alternatives, however, the cumulative effects of past logging, grazing, wildfire suppression activities, looting, recreation, rock hounding, firewood cutting, and off-road activities have contributed to the current degraded condition of archeological sites within the project area.

Range Resources

Affected Environment

The Jackson Vegetation Management Project area is approximately 54,600 acres and is located on the Ochoco National Forest in Crook County and Wheeler County. The Project area is located within portions of seven grazing allotments. Allotments are located on the inside and outside of the Jackson Vegetation Management Project area. The four primary Allotments include: Deep Creek Cattle Allotment, Little Summit Cattle Allotment, Happy Cattle Allotment and Derr Cattle Allotment. In addition, negligible portions of the Roba, Wolf Creek, and Rock Creek Cattle Allotments fall within the project boundary. For the purpose of discussing livestock grazing, all of the area located within the allotments will be included in discussion.

History of Grazing on Allotments

Records indicate that intense, unregulated sheep grazing occurred within the Jackson project area from 1880-1907. Grazing pressure during that time period denuded native vegetation, contributing to increased amounts of bare soil, loss of topsoil, soil compaction, stream bank degradation and channel erosion. The inception of the Forest Service in the Paulina area in 1907 began the regulation of grazing use, with changes occurring slowly as fences were built, livestock numbers were limited, seasons of grazing use were shortened, and land ownership adjacent to the public land changed.

In the 1940s, the amount of fence and the number of water developments that were constructed by permittees and CC crews quickly increased. Across the Paulina Ranger District from the late 1950s through the early 1960s, upland range conditions were monitored through Condition and Trend

studies which were then used to develop allotment management plans. These plans often further reduced the livestock numbers, shortened or changed season of use, and identified projects to improve livestock distribution. In the early 1960s many of the allotments were converted from sheep to cattle. From 1907 to 1960, the amount of grazing use, measured in AUMs (animal unit months), was reduced from approximately 689,000 AUMs to 81,600 AUMs (Hall, 1967). This reduction was primarily associated with change in grazing suitability when converting from sheep cattle. The first detailed studies of livestock impacts to riparian areas within the Jackson project area were not completed until 2005 and will serve as a baseline for several indicators contributing to riparian health.

Current Management

Presently, the Jackson project area (Deep Creek Watershed) contains all or part of four grazing allotments: Deep Creek, Little Summit, Happy, and Derr Allotments. In addition, very small portions of the Roba, Wolf Creek, and Rock Creek Allotments fall within the project boundary. Livestock control and distribution is primarily dependent on forage quality, location and availability, fences (and other obstacles to livestock travel), herding practices, water developments, salting, and pasture rotation. Available forage for domestic livestock use is expressed in terms of Animal Units (AUs) or Animal Unit Months (AUMs). An animal unit is a 1,000 pound mature cow, or its equivalent based on an average daily forage consumption of 26 pounds dry matter per day, while an AUM is the amount of forage required by an animal unit for one month (LRMP 1991). A cow/calf pair is currently equivalent to 1.32 animal units.

Table 128. Allotment information in the Jackson project area.

Allotment	Total Acres	Acres In Project Area	Kind/Class	Permitted Number	Season of Use	AUMs
Deep Creek *	16,622	16,622	Cattle-cow/calf	200	06/16- 9/30	929
Little Summit	16,199	16,199	Cattle-cow/calf	200	06/21- 9/30	886
Happy	12,383	12,383	Cattle-cow/calf	230	06/21- 09/30	1,018
Derr	9,737	9,737	Cattle-cow/calf	150	07/01-09/30	599

*Actual use from 2006-2010 grazing season as displayed in Table 128, is not the same as permitted use for the Deep Creek Allotment. The change in season and number was due to a temporary reduction which was agreed to in the resolution of an appeal of the Westside Allotments EA decision in 2005. The Deep Creek Allotment has been used by 300 cow/calf pair from 7/1 through 8/31, after the same herd (300 pair) grazes from 6/01 thru 6/30 on the Roba Allotment. The reduction will be reviewed prior to the 2011 grazing season to determine if it will continue or not.

Deep Creek Allotment

The Deep Creek allotment (16, 662 acres) has a total of 2 pastures: North (8,324 acres) and South (8,297). The Term Permit authorizes 300 cow/calf pairs from June 16th through September 30th, for a total of 929 AUMs. A deferred rotation grazing system has always been used in the allotment and is described in the Allotment Management Plan. Range readiness criteria have consistently been met prior to turn-out (2210 Range File, Deep Creek Allotment Inspection Notes).

Derr Allotment

The Derr allotment (9,737 acres) has a total of 2 pastures: East (4,530 acres) and West (5,208 acres). The Term Grazing Permit authorizes 150 cow/calf pairs from July 1st through September 30th, for a total of 599 AUMs. A deferred rotation grazing system has been used in the allotment. In the past, actual turn-out dates and permitted numbers have been consistent with the permit. Range readiness criteria have consistently been met prior to turn-out (2210 Range File, Derr Allotment, Inspection Notes).

Happy Allotment

The Happy allotment (12,383 acres) has a total of 3 pastures: North (293 acres), East (5,623 acres), and West (6,467 acres). The permit authorizes 230 cow/calf pairs from June 21st through September 30th, for a total of 1,018 AUMs. A deferred rotation grazing system has been used in the allotment and

is described in the Allotment Management Plan. In the past, actual turn-out dates and permitted numbers have been consistent with the permit. Range readiness criteria have consistently been met prior to turn-out (2210 Range File, HappyAllotment, Inspection Notes).

Little Summit Allotment

The Little Summit allotment (16,199 acres) is comprised of a single pasture. The Term Grazing Permit authorizes 200 cow/calf pairs from June 21st through September 30th, for a total of 886 AUMs. A deferred rotation grazing system is described in the Allotment Management Plan. The cattle move from the east to west side of the allotment through the grazing season. In the past actual, turn-out dates and permitted numbers have been consistent with the permit. Range readiness criteria have consistently been met prior to turn-out (2210 Range File, Little Summit Allotment, Inspection Notes).

Existing Upland Range Condition

The Jackson Vegetation Management Project area is mainly comprised of dry mountain meadows, open mixed conifer stands dominated by the grand fir/pinegrass plant association, and transitory rangeland consisting of ponderosa pine/fir/lodgepole timber types. Dominant grass species include: Pinegrass, elk sedge, bunchgrass, Idaho fescue, and bluebunch wheatgrass. Dominant tree and shrub species include: grand fir, ponderosa pine, big sagebrush and antelope bitterbrush.

Recent Condition and Trend studies have been evaluated in the Deep Creek Allotment, Derr Allotment, Happy Allotment, and Little Summit Allotment. These studies indicate that upland vegetation and soils are in fair to good condition with a slight upward to stable trend. The number of plants and the amount of litter, moss, and lichen showed a slight increase across the allotments with a corresponding decrease of bare soil.

There has been a change in the upland forest vegetation within the project area due to several factors: livestock grazing, fire suppression, introduction of noxious plants, and decrease in timber harvest. The combination of these factors has lead to a decrease in upland forage production and transitory range (USDA FS 2008).

Existing Riparian Condition

Forested riparian communities within the Jackson Vegetation Management Project area are dominated by coniferous tree species within the small tree category (9-20.9 dbh). Riparian shrubs such as aspen, willow and alder are also present, but their distributions are widely scattered and localized. Other shrub species include: snowberry, currant and serviceberry. Mountain alder communities are the most common riparian hardwood communities with the watershed at the lower elevations and in the more open reaches of streams. These systems generally have understories dominated by sedges, but also include Kentucky bluegrass and other non-native species. Meadow systems are dominated by grasses and forbs, with most areas seeing a relatively increase (last 30 years) in sedges and rushes along the wetter edges.

Currently, the physical conditions that promote regeneration and vitality of hardwood species are lacking in many riparian areas. This is due to a number of factors including; extirpation of beaver, fire suppression, conifer competition, over browsing of young plants by deer, elk and cattle, lower water tables resulting from historic logging practices and shifts in vegetation from grazing pressure, and road building.

Grazing management in the project area includes several practices that improve livestock distribution and riparian habitat. Practices include: active management and riding, riparian fencing, water developments, rotational grazing strategies and pasture division fences.

Environmental Effects

Effects Common to All Alternatives

Livestock grazing would continue to occur within the Jackson Vegetation Management Project area. Current stocking rates and management practices would remain the same.

Alternative 1

Under this alternative there would be no thinning of trees, under-burning of both live and dead fuels, treatment of activity-generated fuels, temporary road construction and maintenance.

Taking no action would maintain current vegetative trends and livestock distribution would remain the same in the uplands. Upland vegetation would continue to evolve towards a later seral plant community dominated by forested types and juniper woodlands. In the plant communities found in the scab areas, juniper would continue to increase resulting in a decrease in the shrub, grass, and forb system components. Understory grass and shrubs production (pounds per acre) in the stringer areas would also decrease with the increase in tree density and canopy cover (Hall, 1986). Riparian species vigor and recruitment in portions of the project area would be decreased with the increase in shade and competition. Overall, the quantity and quality of forage available for livestock would decrease over time. As forage in the uplands decreases, grazing pressure on meadows and riparian areas would be expected to increase because forage is more available and palatable in these areas.

Range improvements including troughs, ponds, exclosures and pasture fences would not be at risk of damage by logging activities and fire management. Ecological plots such as C&T plots and Winward plots would not be affected by management activities as well.

Some sources maintain that livestock grazing has had definitive impacts on forest health, leading to dense stands of fire prone small trees (Belsky and Blumenthal are often sited). Currently prescribed intensities of livestock grazing are expected to result in negligible local reductions in fine fuels and, therefore, are not expected to contribute to the forest health issue of tree overcrowding. In addition, many sources indicate that, although reduced competition due to livestock grazing may result in greater individual tree growth rates, tree survival associated with grazing has either not been appreciably affected (Karl 1991)(Seidel, Geist, Stickler 1990)(Skoulin, Harris, Strickler, Garrison 1976), or has been reduced (Karl 1991)(Kingery and Graham 1991)(Krueger 1983)(Currie, Edminster, Knot 1978)(Allen, Bartolome 1989)(McLean, Clark 1980)(Eissenstat, Mitchell, Pope 1982).

Effects of Action Alternatives

Under both alternatives there would be thinning of trees, underburning of both live and dead fuels, treatment of activity-generating fuels, and temporary road construction. A majority of the burning would occur after the mechanical work is completed.

Both the proposed action and Alternative 3 would increase access and available forage for livestock while livestock distribution throughout the seven allotments would improve. Utilization would be spread more evenly throughout the allotments and riparian areas would receive less grazing pressure.

Commercial and noncommercial thinning would open up dense tree stands and allow understory production to increase. Increased availability of space, light and nutrients would increase forage quantity amdf may increase forage quality. There would be an increase in species such as: pinegrass, elk sedge and bunchgrasses. Treatments that open up the tree canopy would create more transitory range for domestic livestock (see Table 129). Grazing management practices would be expected to improve with the increase of accessibility for herding cattle.

It is assumed that all harvest activities would take place between 2013 and 2014; approximately one-third of the harvest accomplished each year, and would result in a mosaic pattern on the landscape. Noncommercial treatments (noncommercial thinning, juniper thinning, and hardwood treatments) would be completed over a span of ten years. Loss of forage would be short-term, minimal, and would not be expected affect livestock stocking rates.

Prescribed burning would most likely reduce available forage for the first year or two, post burn, but after recovery, forage would increase. Burns would take place in a mosaic pattern, and over a span of ten years; loss of forage would be short-term, minimal, and would not be expected to affect livestock stocking rates. Forage species would no longer have to compete with small trees and shrubs. It is possible that permittees would be impacted economically if a rest period is required after a burning a large area at the same time. Burned areas would be evaluated to determine if rest is needed; the necessity of rest depends on plant composition, accessibility for livestock, the degree of heat impact upon species, and how many acres are burned within each pasture.

During management activities it is possible that domestic livestock would be temporarily displaced. Displacement would be minimal due to the fact that all harvest and burning activities would take place in a mosaic pattern and over a span of several years. This would be a short-term effect. Long-term benefits would include increased access and availability of forage.

Management activities may reduce the effectiveness of fences and water developments. Both are used to disperse domestic livestock throughout the allotment. Design elements have been included into the Proposed Action to avoid or reduce the likelihood of damage to improvements.

Table 129. Increase in transitory range by Alternative.

	Acres		
	No Action	**Proposed Action**	**Alternative 3**
Acres of increased access and forage	0	5,744	5,545

Cumulative Effects

Within the project area there are several past actions that have affected current range condition and vegetation. Past activities include: historic livestock grazing, timber harvest, road construction and wildfire. Many practices have since been altered, but range condition continues to show evidence.

Federal livestock grazing has been altering upland forest vegetation in the project area since the early 1920s. According to Fleischner (1994), “livestock grazing is the most widespread land management practice in the western North America.” Timber management activities in the past have affected stand condition in the project area. Past timber harvest concentrated on removal of large mature trees while thinning of small diameter understory trees was limited. As these stands matured and canopies became denser, many understory forage species would have been negatively affected by an increase in shading, competition for moisture, and a buildup of needle litter on the forest floor.

Historically, fire was the primary control factor for vegetation within the Jackson project area. The estimated historic acres burned by wildfire in the Deep Creek watershed, based on a 10-year fire return interval for the lower elevations and south slopes, and a 30-year fire return interval for the higher elevations and north slopes, is 2500 acres per year (Viable 2004). However, during the past century, fire suppression in the project area has caused a significant decrease in the number of acres burned. Within the Jackson project area, prescribed fire has been used since the 1980s to reduce fire hazard, but not at a rate that would maintain condition within the historic range.

Through implementation of the Deep Vegetation Management Project (2001), prescribed fire treated approximately 8980 acres and noncommercial thinning treated 5,080 acres. These activities would continue to improve understory vegetation, enhance transitory range and encourage livestock to move

into the uplands. In addition, these thinning and burning activities would continue to promote understory grasses, forbs and shrubs while forage would continue to become more readily available for livestock.

Present activities within the project area include the Deep Restoration EA (2004 Decision) and the Deep Creek, Derr, Happy, and Little Summit Allotment Management Plans (AMPs). The Deep Restoration EA includes four livestock exclosures totaling 226 acres, which properly maintained, will protect riparian areas that are in a less than desirable condition from impacts associated with livestock grazing. There is the potential to lose approximately 91 AUMs due to the construction of the exclosures. The Deep Restoration EA also identified seven springs for development or reconstruction. These springs will be fenced to exclude livestock access to access the water source, protect soil resources and promote riparian vegetation. Short and long term consequences to the rangeland resources would be minor as water would still be available for livestock use and the excluded areas are relatively small. Also, one new riparian pasture totaling approximately 341 acres would be provided to livestock. Riparian pastures allow for improved livestock distribution and control in areas with sensitive plant communities and soils. The greater of livestock utilization will benefit vegetation, soils, water, fish and wildlife habitat. Eventually, the pasture size may be expanded to 500 acres to utilize more existing fencelines.

The Deep Creek, Derr, Happy and Little Summit AMPs strengthen grazing standards in riparian areas with the goal of expediting recovery in those areas. The AMPs include: re-authorizing grazing in 4 allotments on a “pasture by pasture” basis, improving and creating new springs developments, increasing livestock exclosure fences, and active management. These activities will encourage livestock to move into the uplands and disperse more evenly and reduce grazing pressure on riparian areas.

Reasonably foreseeable projects within the project area include Travel Access Management, Ochoco Summit OHV Management, and Invasive Non-native Weed Environmental Impact Statement. Both the Travel Access Management and the Ochoco Summit OHV Management projects would improve range condition. Currently, off-highway vehicles can travel anywhere on forest that is not posted closed and or not in an area where resource damage would be created. Currently OHV use is causing a decline in upland vegetation and riparian vegetation, which negatively impacts both livestock and wild horses. Once these projects are signed and implemented, OHV use would only be in designated areas. Vegetation would recover and forage would increase. The Invasive Non-native Weed EIS would aid in controlling invasive species across the forest. Native species, including native forage species, would have a chance to recover and reclaim their natural sites. Overall range condition will improve.

All Alternatives

Past actions that affect the current range condition include historic livestock grazing, timber harvest, fire suppression, and wildfire.

Present activities affecting range condition within the project area include the Deep Restoration EA (2004 Decision) and the Deep Creek, Derr, Happy, and Little Summit Allotment Management Plans (AMPs). The Deep Restoration EA includes four livestock exclosures totaling 226 acres, which properly maintained, will protect riparian areas that are in a less than desirable condition from impacts associated with livestock grazing. There is the potential to lose approximately 91 AUMs due to the construction of the exclosures. The Deep Restoration EA also identified seven springs for development or reconstruction. These springs would be fenced to exclude livestock access to access the water source, protect soil resources and promote riparian vegetation. Short and long term consequences to the rangeland resources would be minor as water would still be available for livestock use and the excluded areas are relatively small. Also, one new riparian pasture totaling approximately 341 acres would be provided to livestock. Riparian pastures allow for improved

livestock distribution and control in areas with sensitive plant communities and soils. The greater of livestock utilization will benefit vegetation, soils, water, fish and wildlife habitat. Eventually, the pasture size may be expanded to 500 acres to utilize more existing fence-lines.

The Deep Creek, Derr, Happy and Little Summit AMPs strengthen grazing standards in riparian areas with the goal of expediting recovery in those areas. The AMPs include: re-authorizing grazing in 4 allotments, improving and creating new springs developments, increasing livestock exclosure fences, and active management. These activities will continue to encourage livestock to move into the uplands and disperse more evenly and reduce grazing pressure on riparian areas. Present activities will improve understory vegetation, enhance transitory range, and encourage livestock to utilize the uplands.

Reasonably foreseeable projects within the project area that would affect range condition include: Travel Access Management, Ochoco Summit OHV Management, and the Invasive Non-native Weed Environmental Impact Statement. Both the Travel Access Management and Ochoco Summit OHV Management projects would affect range condition. Currently, off-highway vehicles can travel anywhere on forest that is not posted closed and or not in an area where resource damage would be created. Currently OHV use is causing a decline in upland vegetation and riparian vegetation, which negatively impacts both livestock. Once these projects are signed and implemented OHV use would only be in designated areas. The Invasive Non-native Weed EIS would aid in controlling invasive species across the forest. Foreseeable activities will improve understory vegetation, enhance transitory range and encourage livestock to move into the uplands. The increase in upland utilization will also help increase distribution of livestock. Forage production will increase, which will benefit livestock and wildlife.

Cumulative effects of the past, present, and reasonably foreseeable activities in the project area will improve understory and riparian vegetation abundance and condition.

Recreation

Recreational use in the Jackson project area includes wildlife viewing, hunting, fishing, sightseeing, camping, hiking, biking, horseback riding, cross-country skiing, snowmobiling, and off-highway vehicle use. See Map 11 (Appendix D) for locations of some recreation features in the Jackson project area.

The Jackson project area includes the entire Deep Creek Recreation Area and several developed recreation sites including: Big Springs Campground, Cottonwood Pit, Little Summit Campground, two trail heads (Keeton, Fry), and general forest dispersed sites.

Deep Creek Recreation Area

The Deep Creek Recreation Area consists of 873 acres and is located approximately 40 miles east of Prineville, along FS Road 4250, on the slope break of either side of the Deep Creek drainage. The area offers recreational opportunities for hunting, fishing, sightseeing, and dispersed camping. The Recreation Opportunity Spectrum (ROS) is Roaded Natural. The Forest Plan emphasis for the Deep Creek Recreation Area is to “provide a near natural setting for recreational pursuits within the area where management activities are not visually evident.

Alternative 1

This alternative does not include any vegetative treatments within the Deep Creek Recreation Area. The recreational experience would not be directly affected by harvest or non-harvest activities. Understories would continue to develop and increase the amount of multi-storied conditions. The amount of open, park-like stands of ponderosa pine and western larch would continue to decrease.

Stand densities would continue to increase placing additional stress on older overstory trees. Shade-tolerant grand fir would continue to become more abundant, while ponderosa pine and larch dominance would decrease. Fuel loadings, including small understory trees, would continue to increase. Susceptibility to wildfire and/or insects and disease would not be decreased and would continue increasing over time. Dense, multi-storied stands are susceptible to disturbance and as these conditions increase over time, additional stand replacement wildfires would be expected to occur. In the long term, scenic quality would be degraded as open stands of large diameter ponderosa pine become less abundant.

Alternatives 2 and 3

Management activities including commercial thinning, noncommercial thinning, and underburning are proposed within the Deep Creek Recreation Area. Commercial harvest and noncommercial thinning activities would focus on reducing small trees from the understory. Large trees would be retained. Stand densities would be decreased, single-storied open conditions would become more abundant, and fire tolerant ponderosa pine and larch would be maintained. Competitive stress within stands would be reduced which would increase growth rates and encourage the development of older and larger trees over time. Forest stands would move toward conditions that are more sustainable and resistant to stand-replacement wildfire and to large-scale insect and disease outbreaks. A variety of stand conditions, including both ponderosa pine and mixed conifer, would be retained in the view shed from the Deep Creek Recreation Area.

Proposed activities would create short term (3-5 years) and long term (10-15 years) effects that would be evident to the casual viewer. Such effects include impacts to visual quality, recreational experiences, and trails. Recreation visitors may see evidence of vegetation treatments if traveling adjacent to a treated unit such as slash. These users may experience activities when adjacent units are being treated. In the short term, the scenic quality of the area would be affected as visual evidence (stumps, slash, etc.) of the activities would be apparent. See Table 130 for acres of activity within the Deep Creek area. Users could also encounter noise, dust, smoke, and activity-related traffic if they are present when these activities occur. In the long term, scenic quality would be enhanced as more large ponderosa pines and mixed conifer develop and views of open park-like stands become more evident. Design elements have been incorporated to reduce impacts to recreational users (See Chapter 2).

Table 130. Acres of activities within the Deep Creek Recreation Area

Activity	Alternative 2	Alternative 3
Commercial Thinning	7.0	7.0
Noncommercial Thinning	372	327
Underburn	540	406
Total Acres	919	740

Cumulative Effects

The Access Travel Management Rule will be implemented starting 2011on the Ochoco National Forest. Any OHV use off of approved roads is prohibited. However, coupled with thinning and prescribed burning activities, prohibited OHV access may be increased in specific, isolated locations as understory vegetation is reduced. Depending on implementation of thinning activity, there may be some immediate interface between recreation visitors and harvest activity when these units are treated. It is also quantitatively unknown what compliance will be achieved with Access Travel Management EIS implementation both short and long term.

Dispersed Camping

Dispersed recreation camping sites are located throughout the Forest but are generally located along roads with many situated near riparian areas and streams. The site applies to the barren core of centered activity and the influence area immediately around it. As stated in the Ochoco National Forest Management Area (LRMP), "The dispersed campsites will exhibit a relatively natural appearance, even though management activities (such as timber harvest) may be highly visible nearby". There are 125 dispersed campsites, as identified by the Ochoco Land and Resource Management Plan within Jackson project area treatment units (see Tables 131 and 132). It is likely that other dispersed camping sites have not been identified at this time due to the fact that users are continually creating new sites. Within the Jackson project area, dispersed sites tend to concentrate near the major travel routes and streams such as FS Road 4250 and 4258 (within and outside of Deep Creek Recreation Area), FS Road 2630 (Historic Summit Trail) and FS Road 30.

Table 131. Dispersed Campsites within Treatment Units- Alternative 2

Treatment Type	Unit #s	# of campsites
Commercial Thinning	78b,80,142,145,162b,203,213,257,388,415,506a	11
Noncommercial Thinning	78b,80,142,145,162b,203,213,257,388,415,506a	11
Fuels Treatments	14,21,22,28,30,78b,80,142,145,162b,163,172,185,203,213,218,242,257 ,270, 315,388 415,490,492,519,506a,523,685	36

Table 132. Dispersed Campsites within Treatment Units-Alternative 3

Treatment Type	Unit #s	# of campsites
Commercial Thinning	78b,80,142,145,162b,203,207,257,388,415,506a	11
Noncommercial Thinning	22,30,78b,80,142,145,162b,163,172,203,207,218,257,388,415,490,492, 506a, 519,523	24
Fuels Treatments	14,22,28,30,78b,80,142,145,162b,163,172,203,207,218,242,257,270,38 8 415 , 490,492,506a,519,523,685	32

Alternative 1

There would be no direct effect on dispersed camping sites in the project area. Use of these sites is not expected to change. This alternative does not include any treatment units. Over time, the visual character of the areas would change as understory trees are allowed to grow and stands become denser. Large diameter ponderosa pine would become less common. Associated risk of overstock stands could increase risk to disease, insect infestation and wildfire, which if occurs, would alter the character of the recreation experience at these sites.

Alternatives 2 and 3

Treatment would improve the long-term health of timber stands adjacent to the above camping areas; however, short-term impacts (3-5 years) to the affected camping areas from commercial harvest activities would include increased noise from tractors, and dust from logging operations; increased traffic for log hauling; reductions in visual quality from logging slash, stumps, and post-logging treatments; slash from noncommercial thinning treatments; smoke and blackened ground and vegetation from under burning activities. Some dispersed site users may be temporarily displaced due to loss of access during harvest activities. This could increase camping use at other dispersed sites. Using developed campgrounds and heavily used dispersed sites for industrial camps would not be

allowed. Visual evidence of treatment activities may be apparent to the casual forest visitor at or near some of these camping areas.

Noncommercial thinning and underburning activities would have short-term impacts on users such as noise from thinning activities, smoke during underburning, and visible blackened ground and vegetation. There are 35 recognized dispersed sites within proposed noncommercial thinning units and 68 within natural fuels under burn units. Visual evidence of treatment activities may be apparent to the casual forest visitor at or near some of the camping sites.

Cumulative Effects

Over the past decade, the nature of dispersed camping activities has changed with an increase in larger motor homes, trailers and All-Terrain Vehicles (ATV's). To accommodate these larger vehicles, the dispersed camping sites have been inadvertently enlarged and the consequence has been increased soil compaction, soil erosion, and the volume of human trash.

The Ochoco Travel Management Plan establishes conditions for motorized access for dispersed camping by limiting vehicle access to approved roads and overnight camping within 300 feet. Forest data does not support analysis to determine which campsites meet this criteria and it is unknown which sites or how many will be available as the Travel Management Plan is implemented.

No additional cumulative effects to camping areas are anticipated at this time.

Developed Recreation Sites

There are five developed recreation sites within the Jackson project area including both campgrounds and trailheads. The objective of these management areas is "to provide safe, healthful, and aesthetic facilities for people to utilize while they are pursuing a variety of recreational experiences within a relatively natural outdoor experience". Timber activities will normally not be visually evident, but may be used for safety and visual enhancement. Facilities, roads, and trails will have a well maintained appearance and provide a safe recreational environment.

Big Springs Campground consists of five campsites with basic amenities as picnic tables, fire rings, one toilet and a basic information kiosk. This campground receives little public use throughout the spring and summer. Hunting season in fall into early winter encompasses the majority of use which generally is moderate with campsites still available. Commercial thinning activity within a ¼ mile includes units 353, 355, and 357, noncommercial thinning includes units 323 and 357b, and underburning includes unit 324. Dust, noise, smoke, and hauling activity may be observed during times of treatment for short durations that would include a portion or entire length of stay. Depending on location and timing of treatment activity, hunting and scenic values may be affected in specific locations.

The Cottonwood Pit recreation site is a locally utilized rock pit that attracts recreational use for its small water pond and remnant gravel piles. The site has three user created campsites, an information kiosk, one toilet, and attracts OHV use, camping and fishing visitor use. This site is located on the Western boundary of the project area and would have limited direct activity such as dust, noise and smoke from treatments, but would experience such as indirect activity. Commercial thinning activity within ¼ mile includes units 176, 534, 537, 537a, noncommercial thinning includes unit 536, and underburning includes units 430, 438. It is also located on what would be used as a hauling route and visitors would expect to see and hear temporary increased truck traffic during times of treatments.

Little Summit Campground is not actively managed as a developed site. It lacks all amenities and is not afforded a development scale. However, it does afford itself as a dispersed opportunity and attracts hunters during season for use. Activities in Alternative 2 and 3 would have direct and indirect activity in the general location and visitors would experience some temporary noise and smoke

depending on treatment type during their stay. Parts or whole campsites maybe temporarily closed for public safety when activity is occurring.

Both alternatives would present no long term direct changes to these facilities for its uses. Observations of treatment activity from these facilities would be limited to the time frames necessary to complete and would reasonably include only those treatments at and within a one quarter, (¼) mile.

Keeton and Fry Trailheads are located on the North boundary of the project area. These trailheads are minimally developed and, taken together, comprise less than a half mile of length within the project area. These trails are extremely primitive, receive very low use, and have not received maintenance for over eight years. Both of these trails intersect or pass through treatment commercial harvest unit 80 and which may be affected by the treatment activities in the short term. Design criteria stipulate that after activities are complete, disturbed sections of the trails would be reconstructed to the existing (pre-harvest) condition within 2 months of activity or funds would be collected for reconstruction. This includes replacing any trail markers that are removed as a result of activities.

Alternative 1

This alternative does not include any treatment units and over time, the visual character of the areas would change as understory trees are allowed to grow and stands become denser. Large diameter ponderosa pine would become less common. Associated risk of overstock stands could increase risk to disease, insect infestation and wildfire which if occurs would alter the character of the recreation experience at these sites.

Alternatives 2 and 3

Activities in Alternative 2 and 3 would have direct and indirect activity in the general location and visitors would experience some temporary noise and smoke depending on treatment type during their stay. Parts or whole recreation sites may be temporarily closed for public safety when activity is occurring. Both alternatives would present no long term direct changes to these facilities for its uses. Observations of treatment activity from these facilities would be limited to the time frames necessary to complete and would reasonably include only those treatments at and within a half mile.

Cumulative Effects for all Alternatives

A final decision on the Ochoco Summit OHV Trail EIS is pending. There are three alternatives identified and all have slightly different mileage within the project area. The proposed OHV trail system would have varying trail lengths pending selected alternatives as represented in Table 133 (limited to Deep Creek Watershed)

Table 133. Ochoco Summit OHV Trail Miles within the Deep Creek Watershed

Alternative	Total New Miles within Deep Creek Watershed
#2	65.94
#3	42.97
#4	83.09

See Ochoco Summit OHV EIS for specific analysis. For general discussion, should OHV trails be constructed, it is unknown if or how much additional total use would vary. There exists the possibility of increased OHV use in the vicinity of the Keeton and Fry trails. Existing trail systems in Central Oregon has experienced increased use over time and have become a popular destination for local and out of area recreationists. It is likely that cumulative effects of thinning and burning would create a more open stands. This coupled with varied, but low gradient terrain would afford more accessible acres to OHV use.

Wilderness, Potential Wilderness Areas, Inventoried Roadless Areas, and Other Undeveloped Lands

This section of the EIS discloses the affected environment and environmental consequences for wilderness areas, potential wilderness areas (PWAs), Inventoried Roadless Areas (IRAs) and other unroaded or undeveloped lands[16]. Additional information may be found in the report titled "Potential Wilderness Areas (PWA)/Roadless, Undeveloped Characteristics," which is located in the Jackson project file on the Paulina Ranger District, Prineville, OR.

The area for each analysis is the Jackson project area. The vast majority of the area has been managed in the past.

Wilderness

Affected Environment

A wilderness area is designated by congressional action under the Wilderness Act of 1964 and other wilderness acts. Wilderness is undeveloped Federal land retaining primeval character and influence without permanent improvements or human habitation. The Ochoco National Forest contains about 36,200 acres of designated wilderness in three Wilderness Areas: Black Canyon (13,400 acres), Bridge Creek (5,400 acres) and Mill Creek (17,400 acres) (Forest Plan p. 4-46).

Environmental Consequences – All Alternatives

There are no designated wilderness areas within or directly adjacent to the Jackson project area; the closest wilderness area is several miles away. Activities proposed in the action alternatives would have no effect on the wilderness character, including solitude, on any Wilderness Area on the Ochoco National Forest because of the distance between the Jackson project area and the nearest wilderness. No activities would occur adjacent to or within any designated wilderness area.

Inventoried Roadless Areas

Affected Environment

Inventoried Roadless Areas (IRAs) were identified in the 2001 Roadless Area Conservation Rule 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 Ochoco Forest Plan 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.

[16] The term "other undeveloped lands" is presented and used in this document to provide a consideration for lands that do not contain roads and evidence of timber harvest.

Environmental Consequences – All Alternatives

There are no IRAs within or directly adjacent to the Jackson project area. The closest IRA (Rock Creek/Cottonwood Creek) is located approximately 0.6 miles to the east of the project area. The area separating the Jackson project and Rock Creek/Cottonwood Creek IRA is extensively roaded. Due to the distance to the nearest IRA, the Jackson project would have no direct, indirect or cumulative effects to any IRA.

Potential Wilderness Areas (PWA)

Affected Environment

Potential wilderness areas (PWAs) are identified using inventory procedures found in Forest Service Handbook (FSH) 1909.12 Chapter 71. The inventory is conducted by the Forest Service with the express purpose of identifying potential wilderness areas in the National Forest System. Potential wilderness areas are identified during the forest planning process.

Potential wilderness areas 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 IRA.

Typically, PWAs substantially overlap, and/or are contiguous with IRAs, and PWAs also may be contiguous with wilderness. Some newly inventoried PWAs may be stand-alone areas that were not identified as ‘roadless areas’ in Appendix C of the 1989 Ochoco Forest Plan and ‘inventoried roadless areas’ as identified in a set of maps in the 2001 Roadless Area Conservation Rule (RACR). 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.

Methodology for Potential Wilderness Inventory for the Jackson project

District Databases for the existing road system and past harvest were combined with local knowledge of the area and examination of aerial photography to make this analysis. Seven areas were identified within the Jackson project area as candidate areas to be analyzed. These areas range in size from 100 acres to 859 acres. Table 134 depicts these candidate areas. For more information, see the report titled “Potential Wilderness Areas (PWA)/Roadless, Undeveloped Characteristics” located in the Jackson project file on the Paulina Ranger District, Prineville, OR.

Table 134. Areas to be analyzed for inclusion in potential wilderness inventory.

Unroaded Analysis Area	Acres Inside Jackson Project Area	Acres Outside Jackson Project Area	Total Acres
Area 1	508	2,027	2,535
Area 2	100	539	639
Area 3	828	0	828
Area 4	647	0	828
Area 5	859	0	859
Area 6	466	878	1,344
Area 7	247	6,849	7,095
Total	3,665	10,293	13,947

The Jackson interdisciplinary planning team analyzed the seven areas against the “Wilderness Inventory Criteria” found in Forest Service handbook 1909.12 Chapter 71.1. Each area was examined against the following criteria:

- Area is more than 5,000 acres in size or;
- Area contains less than 5,000 acres but can meet one or more of the following:
  a) Areas can be preserved due to physical terrain and natural conditions.
  b) Areas are self-contained ecosystems, such as an island, that can be effectively managed as a separate unit of the National Wilderness Preservation System.
  c) Areas are contiguous to existing wilderness, primitive areas, Administration-endorsed wilderness, or potential wilderness in other Federal ownership, regardless of their size.
- Areas do not contain forest roads (36 CFR 212.1) or other permanently authorized roads, except as permitted in areas east of the 100th meridian (see FSH 1909.12, section 71.12).

Additionally, the Handbook provides guidance when it is acceptable to include areas with past management actions.

As indicated in Table 135, none of the areas meets the criteria for potential wilderness.

Table 135. Summary of analysis of unroaded areas against potential wilderness "inventory criteria."

Area	More than 5,000 acres	Can be preserved or is self-contained	Contiguous to existing wilderness, IRA, etc.	Evidence of past harvest or road construction	Summary
1	No 2,535 ac. (508 acres within the project area)	No Area is small in size and existing roads penetrate into the interior of the area	No	Extensive past harvest/decommissioned road prism.	Does not meet criteria due to size, physical terrain, easy access, and past harvest is extensive and easily recognizable.
2	No 639 ac.	No Area is small in size, existing roads and proximity to private lands allows for easy access	No	Extensive past harvest	Does not meet criteria due to size, physical terrain, easy access, and past harvest is extensive and easily recognizable
3	No 828 ac.	No Area is small in size, physical terrain and vegetation allow for easy access.	No	Extensive past harvest/decommissioned road prism.	Does not meet criteria due to easy access and physical terrain while both decommissioned road prisms and past harvest are extensive and easily recognizable.
4	No 647 ac.	No Area is small in size, physical terrain and vegetation allow for easy access.	No	Some past harvest/decommissioned road prism	Does not meet criteria due to easy access and physical terrain while both decommissioned road prisms and past harvest are extensive and easily recognizable.

Area	More than 5,000 acres	Can be preserved or is self-contained	Contiguous to existing wilderness, IRA, etc.	Evidence of past harvest or road construction	Summary
5	No 859 ac.	No Area is small in size, physical terrain and vegetation allows for easy access, area cannot be preserved.	No	Some past harvest/ Most of the area is nonforest scab.	Does not meet criteria because its physical terrain and vegetation allow for easy access and the area contains conspicuous evidence of past management activity and human use.
6	No 1,344 ac. (466 acres within the project area)	No Area is small in size, physical terrain and vegetation allows for easy access, area cannot be preserved.	No	Some past selection harvest/ Most of the areas is nonforest.	Does not meet criteria because it is small in size while physical terrain and vegetation allows for easy access.
7	Yes 7,095 ac. (247 ac. within project area)	Partially yes The terrain outside of the project area is steep and relatively accessible, although it is dissected by an existing road system which provides access to the interior.	No	Extensive past selection and intensive harvest	Does not meet criteria because past harvest and road construction has significantly altered the landscape.

Summary

Within the area planned for activities, there are no Inventoried Roadless Areas or potential wilderness areas as defined by Forest Service handbook 1909.12 Chapter 71.1 "Wilderness Area Criteria." The seven unroaded/undeveloped areas were, in general, altered by past management activities; those activities proposed in the action alternatives would have no measurable effect, and in many cases would improve characteristics over the long term. The closest Inventoried Roadless Area (Rock Creek/Cottonwood Creek) is located approximately 0.6 miles to the east of the project area. The area separating the Jackson project and Rock Creek/Cottonwood Creek IRA is extensively roaded and activities within the Jackson project would have no effect on the Rock Creek/Cottonwood Creek IRA.

Other Unroaded/Undeveloped Lands

These areas of land should have no modern history of harvest activity, should not contain forest roads, and are not classified as a wilderness area, potential wilderness area, or IRA.

The criteria used to analyze for these areas are contained in the Roadless Rule 294.11 "Roadless Area Characteristics." These are as follows:

High quality or undisturbed soil, water, and air: These three key resources are the foundation upon which other resource values and outputs depend. Healthy watersheds catch, store, and safely release water over time, protecting downstream communities from flooding; providing clean water for domestic, agricultural, and industrial uses; helping maintain abundant and healthy fish and wildlife populations; and are the basis for many forms of outdoor recreation.

Sources of public drinking water: National Forest System lands contain watersheds that are important sources of public drinking water. Maintaining these areas in a relatively undisturbed condition saves downstream communities millions of dollars in water filtration costs.

Diversity of plant and animal communities: Roadless areas are more likely than roaded areas to support greater ecosystem health, including the diversity of native and desired non-native plant and animal communities due to the absence of disturbances caused by roads and accompanying activities. Inventoried roadless areas also conserve native biodiversity by serving as a bulwark against the spread of non-native invasive species. Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land: roadless areas function as biological strongholds and refuges for many species.

Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land: Roadless areas function as biological strongholds and refuges for many species. Roadless areas support a diversity of aquatic habitats and communities.

Primitive, Semi-Primitive Non- Motorized, and Semi-Primitive Motorized classes of dispersed recreation opportunities: Roadless areas often provide outstanding dispersed recreation opportunities such as hiking, camping, hunting, fishing, nordic skiing and canoeing. While they may have many wilderness-like attributes, unlike Wilderness, mountain bikes and other mechanized uses are often allowed.

Reference landscapes: Knowledge about the effects of management activities over long periods of time and on large landscapes is very limited. Reference landscapes of relatively undisturbed areas serve as a barometer to measure the effects of development on other parts of the landscape.

Natural appearing landscapes with high scenic quality: High quality scenery, especially scenery with natural-appearing landscapes, is a primary reason that people choose to recreate.

Traditional cultural properties and sacred sites: Traditional cultural properties are places, sites, structures, art or objects that played an important role in the cultural history of a group. Sacred sites are places with special religious significance to a group. Traditional cultural properties and sacred sites may be eligible for protection under the National Historic Preservation Act. However, many of them have not yet been inventoried, especially those that occur in inventoried roadless areas.

Other locally identified unique characteristics: Roadless areas may offer other locally identified unique characteristics and values. Examples include uncommon geological formations, valued for their scientific and scenic qualities, or unique wetland complexes.

Affected Environment/Environmental Effects Unroaded/Undeveloped: The areas analyzed for these unroaded/undeveloped characteristics are identified in Table 136.

Table 136 summarizes the activities proposed within these areas and the environmental effects of the alternatives on these characteristics. The complete analysis and maps of these areas are available in the Jackson project record.

Table 136. Unroaded/Undeveloped Attribute Evaluation.

Area	Alt. 1 - No Action	Alt. 2 – Proposed Action	Alternative 3
Area 1 2,535 acres. (508 acres within the project area)	No activities proposed. The landscape has been altered by over 500 acres of past harvest and associated road construction.	Commercial thinning (68ac.), noncommercial thinning (54ac,), and hardwood treatment (1 ac.) would have some short-term impacts with long-term benefits.	Commercial thinning (68 ac.), noncommercial thinning (54 ac.), and hardwood treatments (1 ac.) would have some short-term impacts with long-term benefits.

Area	Alt. 1 - No Action	Alt. 2 – Proposed Action	Alternative 3
Area 2 639 acres.	No activities proposed. The landscape has been altered by over 340 acres of past harvest and associated road construction.	Commercial thinning (8 ac.) and noncommercial thinning (61 ac.) and hardwood treatments (6 ac.) would have some short-term impacts with long-term benefits.	Commercial thinning (8 ac.) and noncommercial thinning (61 ac.) and hardwood treatments (6 ac.) would have some short-term impacts with long-term benefits.
Area 3 823 acres	No activities proposed. The landscape has been altered by approximately 30 acres of past selective harvest and road construction.	Commercial thinning (129 ac.), noncommercial thinning (17ac.), Rx fire (35 ac.) and hardwood treatment (6 ac.) would have some short-term impacts with long-term benefits. There is 0.25 miles of new temp road construction and 0.39 miles of reuse of existing temps.	Commercial thinning (124ac.), noncommercial thinning (17ac.), Rx fire (35 ac.) and hardwood treatment (6 ac.) would have some short-term impacts with long-term benefits. There is 0.25 miles of new temp road construction and 0.39 miles of reuse of existing temps.
Area 4 647 acres	No activities proposed. The landscape has been altered by 160 acres of commercial harvest and road construction.	Commercial thinning (16 ac.), and noncommercial thinning (59 ac.) would have some short-term impacts with long-term benefits.	Commercial thinning (16 ac.) and noncommercial thinning (59 ac.) would have some short-term impacts with long-term benefits.
Area 5 859 acres	No activities proposed. Approximately 21 acres on the northern edge was harvested in 1985. Most of the area is non-forest scab.	Noncommercial thinning (103 ac.), juniper treatment (18 ac.), and Rx fire (125 ac.) would have some short-term impacts with long-term benefits.	Noncommercial thinning (86ac.), juniper treatment (18 ac.) and Rx fire (113 ac.) would have some short-term impacts with long-term benefits.
Area 6 1,344 ac. (466 acres within the project area)	No activities proposed. There is evidence of past selective harvest from the 1960's and 1970's. The area is more than 90% non-forest.	Commercial thinning (15 ac.), noncommercial thinning (21 ac.), juniper treatments (45 ac.) and Rx fire (132 ac.) would have some short-term impacts with long-term benefits.	Commercial thinning (15 ac.), noncommercial thinning (21 ac.), juniper cutting (44 ac.) and Rx fire (132 ac.) would have some short-term impacts with long-term benefits.
Area 7 7,095 ac. (247 ac. Within project area)	There are no treatments proposed. The landscape has been altered by 1,430 acres of commercial harvest since the 1980's. There are numerous decommissioned roads associated with past harvest visible on the ground.	Noncommercial thinning (8ac.) and hardwood treatments (1 ac.) would have short term impacts and long term benefits.	Noncommercial thinning (8ac.) and hardwood treatments (1 ac.) would have short term impacts and long term benefits.

Two of the areas analyzed, Areas 1 and 7, overlap areas also identified by Oregon Wild as unroaded. Area 7 encompasses all of the area identified by Oregon Wild as "Badger Creek" and about half of the area identified as "Broadway Lava." Area 1 contains the remaining portions of the Broadway Lava area. Both areas identified by Oregon Wild are located outside of the Jackson project area except for a small portion of Broadway Lava which extends into the northern boundary. Both

Broadway Lava and Badger Creek are smaller than the areas identified in this analysis. For more information, see the report titled "Potential Wilderness Areas (PWA)/Roadless, Undeveloped Characteristics," located in the Jackson project file on the Paulina Ranger District, Prineville, OR.

Summary

The analysis showed that the seven identified areas were, in general, altered by past management activities and that activities proposed in the action alternatives in the Jackson project would not affect existing roadless/undeveloped characteristics and in many cases would improve these characteristics over the long term.

Visual Quality

The existing scenery has a variety of disturbed and undisturbed areas. Human-caused activities have altered the natural-appearing landscape. Diverse vegetation stands and species (with various age, size classes, and health conditions) can be found throughout the project area. These vegetation stands include: ponderosa pine, lodgepole pine, western larch, Douglas-fir, white fir, and riparian species. They provide strong diverse lines and textural and color patterns broken up only by occasional filtered-view openings into the foreground landscape.

Although the existing forest conditions may appear natural to a casual visitor, the forest conditions are not natural. Older trees are being suppressed by the densely stocked understory due to the change in fire regime caused by fire suppression. Densely stocked forest and canopy closure, due to the lack of low intensity fire regime, has led to the loss of the open, park-like ponderosa pine stands historically found within the area. Overstocked and dense stands in parts of the project area have led to serious fire risk. The natural processes can no longer function as they did historically because of these dense stand conditions. The competition for available space, nutrients, and the encroachment from shade-tolerant understories is prevalent, especially along the travel and scenic corridors (within 0.25 miles). The depth-of-field view deep into the forest is restricted to mostly the immediate foreground area of the landscape due to the high level of vegetation density.

The Jackson project area includes three areas allocated, through the LRMP, to visual management, including corridors for the Historic Summit Trail, and Forest Roads 12 and 42. These management areas provide opportunities for scenic vistas, wildlife viewing, and access to dispersed and developed camping. Maintaining a natural appearance and protection of natural resources along these roads accommodates visitors seeking of natural scenery and provides a high quality recreational experience. The general emphasis in these areas is to maintain the natural-appearing character of the forest.

Alternative 1

Under this alternative, the existing vegetation within the project area would not be altered or changed by any management activity.

Scenery would remain essentially the same during the short-term duration (0-5 years) and may be adversely altered through time (5 years and longer) as multi-strata conditions continue to increase. Encroachment by shade-tolerant species would continue and stand densities would continue to increase. Views of open, park-like stands of older and larger ponderosa pine would become less frequent. Risk to disease and stand replacement high intensity wildfire would continue to increase.

Alternatives 2 and 3

To the casual forest visitor, the differences between Alternatives 2 or 3 would not be noticeable. Therefore, both alternatives are being presented together. The Forest visitor could expect to see stumpage, hand piles, blackened woody debris from under burning and slash pile activity. Burning evidence would be evident from 1-3 years with fuel reduction benefits lasting much longer. After the

short term effects of treatment activities recovered, the diverse scenic views would be expected to enhance a visitor's experience along visual corridors. Field of view would increase more consistently while traveling within these visual corridors. Multi- strata stands would decrease as overstory selections are retained. With field of view enhanced, more topographic features may be observed.

Management activities would occur within the Scenic Corridors, within Retention and Partial Retention visual management allocations. The long term (20 years and longer) scenic quality within the treatment areas may improve slightly or would remain the same as the existing condition. Less alteration to the scenery would occur due to the removal of smaller, understory trees.

Historic Summit Trail

A portion of the Historic Summit Trail resides in the current location of road 2630 within the Jackson project area. Ochoco National Forest land management plan designated this historic trail as "partial retention" emphasizing to protect the integrity of the Summit Trail. The visual management boundary would not exceed 600 feet either side of road. As stated in the Ochoco FLMP Desired Condition: "The Summit Trail would be a place where Forest visitors can enjoy the cultural and recreational resources offered in a visually pleasing environment. Vegetation may appear manipulated in widely dispersed areas in order to enhance the cultural and recreational resources, but would generally not dominate the landscape."

Traveling FS Road 2630, the observer would expect to see noncommercial thinning and possibly hand pile burning. Noise and thinning activity exposure would be temporary. See above "General Discussion" for anticipated visual change descriptions.

Visual Management Corridors

FS Road 12 and FS Road 42: Emphasis for these corridors is to maintain the natural appearing character of the Forest along major travel routes, where management activities are usually not evident or are visually subordinate to the surrounding landscape. The management boundary would not exceed 600 feet either side of road. Partial Retention objective would result in long term management where activities may be evident but are visually subordinate to the characteristic landscape. Vegetation would be manipulated but would reflect a natural forest setting.

Common observations may view within the 600 feet of roadway, cut stumps, hand piles, and blackened remains from burning to be visible for 1-3 years. Noise and hauling traffic would be present at varying times of year summer and winter. Approximately nine miles of Rd 22 would experience burning prescriptions. Such treatments would vary over length of time and seasons. Recovery of grass, forbs and perennials would also vary differing stages of recovery contributing to a tapestry of open mosaics.

Forest Plan direction for Scenic Resources would be met with the retention of residual trees, post-treatment cleanup activities, implementation of design elements, and on-site monitoring.

Air Quality

The Oregon Department of Environmental Quality is responsible for ensuring compliance with the Clean Air Act. The DEQ monitors the emissions from prescribed fire through the Oregon State Department of Forestry smoke management program. Site specific fuels data is entered into a state database along with observations of environmental conditions taken while burning. This data is used to determine the amount of emissions produced statewide by prescribed fire and maintain compliance with the Clean Air Act.

The Oregon Administrative Rules regarding smoke management encourages using wood or other biomass for making products or for energy production in order to reduce emissions from prescribed

fire (629-048-0200b,c). Slash piles would be available for market. As the market for biomass increases, more piles would be removed from the forest, reducing the smoke from pile burning.

The OARs define Smoke Sensitive Receptor Areas as areas that are provided the highest level of protection under the smoke management plan because of their history of smoke incidents, density of population or other special legal status related to visibility. The nearest SSRAs to the project area are Redmond, 55 miles to the west (into the prevailing winds), and John Day, 55 miles to the east.

The OARs define Class I Areas are wilderness areas designated by Congress that are subject to visibility protection under the Environmental Protection Agency's Regional Haze Rule and the federal Clean Air Act. The nearest Class I wilderness is the Strawberry Mountain Wilderness, 55 miles to the east.

Due to distance, prevailing winds, and the short duration and low volume of smoke from prescribed fire, smoke from burning in the Jackson project area would not likely effect Class I wilderness areas or Smoke Sensitive Receptor Areas. There is no history of smoke from burning in the Jackson project area effecting Class I wilderness areas or Smoke Sensitive Receptor Areas.

Smoke from prescribed fire sometimes pools in the Paulina Valley. This pooling occurs in the late evening/early morning hours, and generally lifts by mid-day as the valley heats up. Smoke from prescribed fires could impact hunter camps and forest roads, for the same reason. Prescribed burning would be suspended during persistent inversion conditions to avoid having smoke pool in the valley for more than a few days.

A high percentage of wildfire smoke (by mass) is within the PM 2.5 particle class size. These are respirable particles less than 2.5 micrometers in diameter, which are of the most concern to human health because they can be inhaled deeply into the lungs. The table below compares the production of PM 2.5 from a wildfire in Jackson unit 39 before treatment, and from a wildfire after treatment. Unit 39 has fuels conditions characteristic of Condition Class 3; closed canopy, heavy surface fuels and ladder fuels. Condition Class 1 is the condition in the unit after it has been harvested, which opens the canopy; thinned, which reduces ladder fuels, and; burned, which reduces surface fuels.

Table 137. Smoke production, PM 2.5

Jackson 39 Condition Class 3 Wildfire before treatment	**Jackson 39 Condition Class 1 Wildfire after treatment**
.63 tons per acre PM 2.5 (total consumption 60.0 tons per acre)	.30 tons per acre PM 2.5 (total consumption 27.8 tons per acre)

Climate Change and Carbon Cycling

Activities proposed in the Jackson Vegetation Management Project would affect between 5,545 acres (Alternative 3) and 5,744 acres (Alternative 2) of forest by commercially thinning smaller trees from the stand, retaining a residual stand of about 40 to 70 percent of the original stand density by basal area. This scope and degree of change would be minor relative to the 28 million acres of forested land in the state of Oregon as a whole. A project of this magnitude would have such minimal contributions of greenhouse gasses that its impact on global climate change would be infinitesimal. Therefore, at the global scale, the proposed action's direct and indirect contribution to greenhouse gasses and climate change would be negligible.

In addition, because the direct and indirect effects would be negligible, the proposed action's contribution to cumulative effects on greenhouse gasses and climate change would also be negligible.

The Intergovernmental Panel on Climate Change has summarized the contributions to climate change of global human activity sectors in its Fourth Assessment Report (IPCC 2007). The top three anthropogenic (human-caused) contributors to greenhouse gas emissions (from 1970-2004) are: fossil fuel combustion (56.6% of global total), deforestation (17.3%), and agriculture/waste/energy (14.3%). IPCC subdivides the deforestation category into land use conversions, and large scale deforestation. Deforestation is defined as removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed landscapes (IPCC 2000).

This vegetation management project does not fall within any of these main contributors of greenhouse gas emissions. Forested land would not be converted into a developed or agricultural condition. In fact, forest stands are being retained and thinned to maintain a vigorous forested condition that can continue to support trees and sequester carbon long-term.

This project is also consistent with IPCC recommendations for land use to help mitigate climate change. The 2007 IPCC report summarizes sector-specific key mitigation 'technologies." For the forestry sector, the report recommends forest management including management to "improve tree species" and increase biomass. The proposed activities are consistent with these recommendations because they would result in improved stand health and increased vigor and rate of growth in the remaining trees (see the section titled "Forested Vegetation" on page 39 of this EIS).

Timber management projects can influence carbon dioxide sequestration in three main ways: (1) by increasing new forests (afforestation), (2) by avoiding their damage or destruction (avoided deforestation), and (3) by manipulating existing forest cover (managed forests). Land-use changes, specifically deforestation and regrowth, are by far the biggest factors on a global scale in forests' role as sources or sinks of carbon dioxide, respectively (IPCC, Intergovernmental Panel on Climate Change, 2000). Projects that create forests or improve forest conditions and capacity to grow trees are positive factors in carbon sequestration. The proposed activities fall into this category.

Civil Rights and Environmental Justice

Civil Rights legislations, especially the Civil Rights Act (CR) of 1964, Title VI, prohibit discrimination in Forest Service program delivery. The underlying principal behind the Civil Rights Act is that no activity shall negatively affect minorities, woman, or persons with disabilities by virtue of their race, color, sex, national origin, religion, age, disability, or material or familial status.

Environmental Justice, Executive Order 12898, demands the fair treatment and meaningful involvement of all people. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from the execution of our actions. Environmental Justice focuses on minority, low income groups, and subsistence lifestyles (including Indian Tribes). The purpose of involving these groups and analyzing the effects upon them is to determine whether adverse civil rights impacts are anticipated, or whether disparate or disproportionate impacts associated with the alternatives is anticipated on any of these groups.

With this project, there is no known potential for disparate or disproportionately effects, or to discriminate or negatively impact any individual or subset of the population described above. The vegetation treatments in Alternatives 2 and 3 would provide for easier access to firewood (landing/harvest units) which should positively affect low-income, older, or those with disabilities, who are not able to afford the type of vehicle needed to access, or physically manage gathering firewood from anything but very accessible sites. Also, the types of employment opportunities provided by the alternatives, timber harvest activities (logging, hauling, etc.), prescribed burning, noncommercial thinning, and millwork, etc., would have positive effects on the categories of individuals and population groups these laws and regulations are intended to protect.

Alternatives 2 and 3 would provide for human health and safety of all members of the public by reducing the risk of falling snags along travel ways, as well as reducing the risk of wildfire. The road closure and decommissioning, given the nature of the project area, there would still provide ample access throughout the project area. The actions proposed under Alternative 2 and 3 would not have any measurable impacts on Tribal rights (ceded lands) or Tribal traditional uses. The project is not located in a minority community nor would it affect residents of low or moderate income. Any impacts would not affect any specific subset of the American population at a disproportionately higher rate than others.

The effects of this project on the social and economic context of these groups are within those described in the Forest Plan. The benefits and risks associated with implementation of the proposed action are provided to all members of the public. Therefore, the project would not pose disproportionately high or adverse effects to minority communities or to low income groups. As a result, no formal Civil Rights Impact or Environmental Justice Analysis was undertaken.

Short-term Uses 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 the 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).

The action alternatives propose short-term harvest of timber, while enhancing the long-term health of forested stands. Existing conditions are outside the HRV and may not be sustainable over the long term. Proposed treatments including prescribed fire, in part, mimic natural disturbance processes and move conditions toward a balance of sustainable vegetative conditions. Soil and Water are two key factors in ecosystem productivity and protection of these resources is provided by the design criteria discussed in Chapter 2. Sustainable wildlife habitat, water quality and other resources depend on maintaining the long-term soil productivity upon which vegetation relies. Quality and quantity of water from the project area would fluctuate as described previously, but no long-term effects to water resources are anticipated as a result of commercial harvest, noncommercial thinning, and fuels reduction treatments. All alternatives provide fish and wildlife habitat at levels necessary to maintain viable populations of the species within the project area. The amounts of suitable habitat vary with the level of density management in each alternative.

Unavoidable Adverse Effects

All of the alternatives considered result in some adverse effects. Many of these adverse effects would be minimized through implementation of design criteria and resource protection measures identified in Chapter 2 or through mitigation measures. Even with implementing these measures, there would still be adverse effects that cannot be avoided.

Soils

Additional detrimental soil conditions are expected as a result of implementing Alterative 2 or 3. The use of ground-based tractor logging would result in additional compaction and displacement. The design criteria described in Chapter 2 and Appendix B provide resource protection measures to minimize these unavoidable adverse effects. The alternatives were designed to limit the amount of

detrimental soil conditions consistent with R6 Supplement 2500-98-1 (Regional Guidelines), effective August 24, 1998.

Road construction would also result in adverse effects on soils. Both reconstructive and temporary road construction results in soil compaction and displacement. On temporary and decommissioned roads, the road surface can be revegetated, but soil productivity is reduced because of compaction. These adverse effects to soils cannot be avoided.

Noxious Weeds

The potential for introduction and spread of noxious weeds exists under every alternative considered, including no action. A noxious weed risk assessment concluded that the potential for introducing and spreading noxious weeds cannot be completely avoided. Both action alternatives create conditions that are conducive to the introduction and spread of noxious weeds. Implementation of design criteria and resource protection measures would minimize these adverse effects. However, proposed activities such as temporary road construction, commercial timber harvest, grapple piling, and prescribed fire would result in conditions conducive to the introduction and spread of noxious weeds.

Sedimentation/Turbidity

Both action alternatives propose temporary roads. Most sediment delivered to streams would come from stream crossings, road drainage close to streams and harvest and fuels treatments adjacent to Class IV streams and in ephemeral draws.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Irreversible commitments are decisions affecting nonrenewable resources such as soils, wetlands, roadless areas, and cultural resources. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at great expense or at great expense or because the resource has been destroyed or removed.

Irretrievable commitments of natural resources involve the loss of production or use of resources. This represents opportunities foregone for the period of time that the resource cannot be used.

Timber stands that are not managed at this time present an irretrievable loss of growth potential. Although the lost growth is irretrievable, it is not irreversible because the stands could be managed at a later date.

Cumulative Effects

There are essentially two methodologies the individual resource subjects use in discussing cumulative actions and consequences. The first method would be to describe each individual past, present, and reasonably foreseeable action – including mitigation (cataloging). The second would be to “lump” individual actions if the information regarding those actions would not be useful to illuminate or predict the effects of the proposed action and its alternatives. A mere “cataloging” of effects does not provide the most useful discussion. In some cases, lumping past actions and describing them in terms of “where we are today” can be the most informative. No matter which method is used, it would be

formulated to provide the most relevant, useful, helpful, necessary and informative format for the public and deciding official.

The Environmental Consequences disclosures in this EIS include discussion of cumulative effects. Where there is an overlapping zone of influence, or an additive effect, this information is disclosed. In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

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

The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

> CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives would add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR 1508.7)

Tables 138 and Table 139 are listings of past, present and foreseeable actions that have potential to overlap with the effects of proposed activities within the project area. Because the project appears on one of these tables does not necessarily mean it has an additive effect. Each resource specialist has

reviewed this table and if there is a past, present, or foreseeable effect, it is disclosed in the individual resource area in Chapter 3.

There have been numerous timber sales within the project area that implemented a variety of harvest Past Timber Sales in the Jackson Project Area.

Table 138. Past Timber Sales in the Jackson project area

Years	Timber Sale Names
1951 - 1959	Big Happy, Big Springs/Beaverslide Salvage, Buck Hollow, Deep Creek Right-of-Way, Paulina Butte, Ridge Road Salvage, West Paulina Salvage.
1960 - 1969	Big Happy Salvage, Connally Spring Salvage, Crazy Creek, Crazy Creek Salvage, Little Summit Creek, Little Summit Creek Sanitation Salvage, Ridge Road Salvage II, Shown Trough, Thornton Creek, Thornton Sanitation Salvage, West Buker.
1970 - 1979	Crazy, Dean, Deep, Double Corral, Double Jack, Haypress, Jackson, Jackson Creek Salvage, Lava, Toggle, West Prairie, Wilson Spring.
1980 - 1989	Aspen, Blue Bull, Buckhorn, Bullpine Salvage, Chamberlin, Connally, Chuckles Dead, Dendro Salvage, Dublin Salvage, EP, Happy Dead, Indian, Jackpine, L.V., Mace, Puzzle, Round Meadows, Shakey, South Prairie, Wilson, Woodrow.
1990 - 1996	DCWR.
1996 - 2011	Deep Salvage, Summit.

Records from the Paulina Ranger District indicate the following amount of past harvest treatments on Forest Service lands since 1978:

Regeneration Harvest Total – 3,371 acres

- Clearcut/Clearcut with Reserve Trees – 2,059 acres
- Shelterwood/Seedtree– 1,312 acres

Overstory Removal/Final Removal – 7,095 acres.

Partial Removal Cutting (thinning, selection cutting) – 4,681 acres

Additional harvest is known to have occurred in the area and they are not recorded in the District GIS records. A variety of old records were examined to gather sale information from 1951 to the 1970s for Table 138. These old records are not complete. More recent records are complete. In general, prior to 1970 the harvest was primarily focused on harvesting individual trees, often removing large diameter, high value trees which were deemed at risk to insect mortality. The Keen's Tree Clarification system was used for this risk rating and ground based logging was most commonly used. In the 1970s and 1980s overstory removal harvests became common. Regeneration harvests began in the late 1970s and were common in the 1980s. This was especially true following mountain pine beetle outbreak of the late 1970s and 1980s. Some skyline logging occurred in the 1970s/1980s on the steeper ground in the planning area.

Timber sale harvest units over the course of 60 plus years have spatial overlap. This is easily noted in the case of a shelterwood harvest that was followed by a final removal of the overstory shelterwood trees.

Table 139. Present and Foreseeable Future Actions within the Jackson project area.

Project/Event Name	General Description of Activities	Status
Deep Vegetation Management Project EIS (2001)	Prescribed fire – 8980 acres Noncommercial thinning- 5,080acres	Implemented
Deep Creek Watershed Vegetation EA (2004)	Project objectives is to improve overall stream and riparian health and integrity within the watershed while improving water quality and associated habitat suitable for use by redband trout and other aquatic life. Activities include headcut repair, culvert replacement, road reconstruction, cutbank revetments, livestock exclosures, large wood placement and channel reconstruction.	Implementation
Activity:	**Planned Number, Miles, or Acres:**	**Accomplished:**
Headcut Stabilization	37 Headcuts	3
Cutbank Revetments	18 Revetments	0
Spring Developments	7 Developments	5
Channel Reconstruction	0.25 miles	0
Pool Habitat Enhancement	6	0
Large Wood Placement	3.6 miles	1.5
Grazing Exclosures (Riparian)	226 acres	85
Riparian Pasture	341 acres	0
Culvert Replacement	35 Culverts	1
Culvert Replaced with Rock Ford	3 Rock Fords	2
Roads Decommissioned	47.1 miles	41 miles
Region 6 Invasive Plant EIS (2005)	Implements Standards and Guidelines and prevention strategies to manage invasive plant species.	Implementation
DES/OCH Travel Management Plan EIS	Prohibits travel off of open designated roads, trails, and areas (using existing open designation road system as a base). Establishes (modifies existing) conditions for motorized access for dispersed camping. Limits vehicles access to approved roads and overnight camping within 300 feet. Designates some areas as open to cross country travel. Changes some motorized mixed-use roads to highway legal vehicles only.	Implementation

Range Management		Implementation

Allotment	Total Acres in project area	Permitted Numbers (Cow/Calf pair)	AUMs
Deep Creek	16,662	200	929
Derr	9,737	150	599
Happy	12,383	230	1,018
Little Summit	16,199	200	886

Ochoco Summit OHV Trail	The project area covers approximately 165,000 acres. The intent is to provide a variety of low to moderate density trails within the project area; the alternatives identify 88-155 miles of motorized trails.	Planning
Invasive Plant Treatments EIS (2011)	Deschutes and Ochoco National Forests, Crooked River National Grasslands to reduce the extent of specific invasive plant infestations at identified sites and to protect areas not yet infested from future introduction and spread of invasive species from these sites.	Planning
Wheeler Aspen Restoration	A total of 19 acres are planned to have commercial and noncommercial conifers removed from aspen stands.	Planning
Forest/ District Firewood Collection		Ongoing
Road Maintenance		Ongoing

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

National Environmental Policy Act

NEPA establishes the format and content requirements of environmental analysis and documentation. The entire process of preparing the environmental impact statement was undertaken to comply with NEPA.

National Historic Preservation Act

A cultural resource survey has been completed for the Jackson project. The project review for cultural resources under the terms of the 2004 Programmatic Agreement between the Region 6 Forest Service,

Oregon State Historic Preservation Office and the Advisory Council for Historic Properties was signed March 28, 2012. Under the terms of that agreement, the Jackson project EIS meets criteria for a Historic Properties Avoided determination. Based on these findings, the project complies with Section 106 of the National Historic Preservation Act.

Endangered Species Act

Biological Evaluations have been prepared to document possible effects of proposed activities on threatened and endangered species in the project area. There are no endangered species known or suspected to occur on the Ochoco National Forest. Threatened species that are known or suspected to occur on the Ochoco National Forest include bull trout, mid-Columbia River steelhead, and Canada lynx.

On May 29, 2001 the Forest received concurrence from the U.S. Fish and Wildlife Service that implementation of any activities contained within the Forest Plan, as amended, is not likely to adversely affect the Canada lynx outside of an existing Lynx Analysis Unit. At the time this consultation took place there was, and continues to be, no Lynx Analysis Units existing on the Ochoco National Forest. The determination for Canada lynx is “May effect, but not likely to adversely affect” for both action alternatives.

There would be no effect to bull trout or mid-Columbia River steelhead trout. Consultation with the U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration is not applicable for the Jackson project area.

Clean Air Act

Both proposed alternatives are designed to be consistent with the Clean Air Act. The Oregon Department of Environmental Quality (DEQ) is responsible for assuring compliance with the Clean Air Act. In 1994, the Forest Service, in cooperation with DEQ, the Oregon Department of Forestry, and the BLM signed a Memorandum of Understanding to establish a framework for implementing an air quality program in Northeast Oregon. The Memorandum of Understanding includes a prescribed fire emission limit of 15,000 tons of PM-10 per year for the Malheur, Ochoco, Umatilla, and Wallowa-Whitman national forests. All prescribed burning on these forests is coordinated with DEQ through the State of Oregon smoke management program. All prescribed fire treatments in the selected alternative would be conducted in compliance with the State of Oregon Smoke Management System and would meet smoke management objectives for total emissions.

Clean Water Act

The actions alternatives would comply with the Clean Water Act, as amended. This Act establishes a non-degradation policy for all federally proposed projects. The selected alternative meets anti-degradation standards through project, application, and monitoring of BMPs. The EPA has certified the Oregon Forest Practices Act and regulations as BMPs. The State of Oregon has compared Forest Service practices with State practices and concluded that the Forest Service practices meet or exceed State requirements. Site-specific BMPs have been designed to protect beneficial uses. Chapter 2 lists the design criteria and resource protection measures that have been developed for all action alternatives.

Chapter 3 documents the effects the proposed alternatives would have on streams listed on the 2002 State 303(d) list of Water Quality Limited Water Bodies for summer water temperature. These streams are Deep, Jackson and Little Summit Prairie Creeks. Implementation of either proposed action alternative should not result in any measurable increase in water temperatures to fish bearing or

non-fish bearing streams in the project area. Commercial timber harvest and noncommercial thinning activities were designed so that they minimize shade reduction. There is a possibility that conifer thinning in aspen stands would cause short-term reductions in shade. However, these slight reductions in shade should not result in any measurable increase in water temperature because the area affects is small. There is a potential to increase water temperature in intermittent non-fish bearing streams (Class IV) when they are flowing, but this should not result in a violation of state water quality standards because these streams go dry before peak water temperature occurs in the project area.

National Forest Management Act

To ensure consistency with the National Forest Management Act, the Ochoco National Forest Land and Resource Management Plan, as amended, was consulted. The Forest Plan contains several standards and guidelines that apply forest-wide or to specific management areas. Both forest-wide and management area specific standards and guidelines were reviewed. All alternatives were designed to be consistent with the Ochoco Forest Plan. All of the action alternatives are consistent with long-term management objectives as discussed in the Forest Plan as amended.

Forest Plan Consistency

Federal regulations (36 CFR 219.10(e)) require that permits, contracts, cooperative agreements, and other activities carried out on the Ochoco National Forest be consistent with the Ochoco National Forest Land and Resource Management Plan, as amended (see FEIS page 260). Accordingly, I have reviewed my decision against Forest Plan direction. I find this decision to be consistent with the long term objectives as discussed in the Forest Plan as amended except as discussed below. The selected alternative is consistent with the seven management requirements listed in 36 CFR 219.27.

Alternative 2 requires a Forest Plan amendment; this amendment is consistent with the Regional Forester's June 11, 2003 letter on guidance for implementing Eastside Screens and the evaluation of significance criteria defined under Forest Service Manual 1926.51 listed below.

1. Actions that do not significantly alter the multiple use goals and objectives for long term land and resource management (Forest Plan Level).
2. Adjustments of management area boundaries or management prescriptions resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple use goals and objectives for long term land and resource management.
3. Minor changes in standards and guidelines.
4. Opportunities for additional projects or activities that will contribute to the achievement of the management prescription.

CHAPTER 4. CONSULTATION AND COORDINATION

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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Glossary

Adverse Effects – INFISH defined adverse effects to fisheries as: Adverse effects include short- or long-term, direct or indirect management related impacts of an individual or cumulative nature, such as mortality, reduced growth, or other adverse physiological changes; harassment of fish; physical disturbance of redds; reduced reproductive success; delayed or premature migration; or other adverse behavioral changes. Adverse effects to designated critical habitat include effects to any of the essential features of critical habitat that would diminish the value of the habitat for the survival of native inland fish.

Alternative - In an EIS, one of a number of possible options for responding to the purpose of and need for action.

Arterial Road - Roads comprising the basic access network for National Forest System administrative and management activities. These roads serve all resource to a substantial extent, and maintenance is not normally determined by the activities of any one element. They provide service to large lands areas and usually connect with public highways or other Forest arterial roads to form an integrated network of primary travel routes. Usually they are developed and operated for long-term land and resource management purposes and constant service.

Basal Area – The area of the cross section of a tree stem including the bark, near its base, generally at breast height, or 4.5 feet above the ground.

Best Management Practices (BMPs) - Practices designed to prevent or reduce water pollution, including sedimentation.

Board Foot (bf) - A unit of wood that is 12 inches by 12 inches by 1 inch thick.

Canopy - In a forest, the branches from the uppermost layer of trees; in a shrub or grassland, the uppermost layer of shrubs; in a riparian area, the layers of vegetation that project over the stream..

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.

Closed Road - Generally local roads that are physically closed (signs, gates, earthen berms) to public use.

Collector Road - Roads that serve smaller lands areas than a Forest arterial road, and usually connected to an arterial road or public highway. These roads collect traffic from local Forest roads and/or terminal facilities. The location and standard are influenced by both long-term multi-resource service needs, as well as travel efficiency. These roads may be operated for either constant or intermittent service, depending on land use and resource management objectives for the area.

Compaction - Packing together soil particles by exerting force at the soil surface and increasing soil density. Making soil hard and dense, decreasing its ability to support vegetation because the soil can hold less water and air and because roots have trouble penetrating the soil.

Connectivity - The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation. The opposite of fragmentation.

Cover - (1) Trees, shrubs, rocks, or other landscape features that allow an animal to partly or fully conceal itself. (2) The area of ground covered by plants, litter, and coarse fragments, including tree crowns and shrubs that are in direct contact with the ground.

Cultural Resources - The remains of sites, structures, or objects used by humans in the past. They may be historic, prehistoric, archaeological, or architectural in nature.

Cumulative Effects **-** Impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Decommissioned Road **-** A road that is no longer needed and is not planned to be used again. It has been closed and generally has been returned to production. For example, a road that has been ripped (tilled) and planted with vegetation.

Density (stand) **-** The number of trees growing in a given area, usually expressed in terms of trees per acre.

Developed Recreation **-** Recreation that requires facilities that in turn result in concentrated use of an area; for example, a campground.

Direct Effects **-** Impacts on the environment that are caused by an action and occur at the same time and place.

Dispersed Recreation **-** Recreation that does not occur in a developed recreation sites; for example, hunting or backpacking.

Eastside Screens (aka Regional Forester's Interim Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales) **-** Originally signed in 1994 and amended in 1995. The objective of this direction was to provide an approach for maintaining future planning options concerning wildlife habitat associated with late and old structural stages, fish habitat, and old forest abundance. The direction was intentionally restrictive, reflecting a conservative interpretation of riparian, wildlife, and ecosystem needs for the short term. The direction applies to timber sales.

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 species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.

Endangered Species Act (ESA) **-** An act, passed by Congress in 1973, that directed all Federal departments and agencies to seek to conserve endangered and threatened species. Actions authorized, funded, or carried out by Federal departments and agencies should not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of their critical habitat. The act also mandates conferencing with the appropriate agencies.

Environment **-** The combination of external physical, biological, social, and cultural conditions affecting the growth and development of organisms and the nature of an individual or community.

Environmental Impact Statement (EIS) **-** A statement of environmental effects of a proposed action and alternatives to it. A Draft EIS is released to the public and other agencies for review and comment. A Final EIS is issued after consideration of public comments. A Record of Decision (ROD) is based on the information and analysis in the Final EIS.

Fire Regime **-** The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire. Fire regimes can be grouped into three severity regimes: Nonlethal, Mixed, and Stand Replacement. Nonlethal fires are of low to moderate intensity, creeping, surface fires that consume primarily understory grasses, forbs, and shrubs, and leave the overstory trees intact. Stand replacement fires are of high intensity and consume most of an existing stand. Mixed fires are of moderate intensity and consume the understory and some of the overstory.

Forest Plan (Land and Resource Management Plan) **-** A document that guides natural resource management and establishes standards and guidelines for a National Forest; required by the National Forest Management Act.

Fragmentation (habitat) - The breakup of a large land area (such as a forest) into smaller patches isolated by areas converted to a different land type. The opposite of connectivity.

GIS (Geographic Information System) - An information processing technology to input, store, manipulate, analyze, and display data; a system of computer maps with corresponding site-specific information that can be combined electronically to provide reports and maps.

Ground Cover - Perennial vegetation plus litter and coarse fragments (greater than 2 mm sizes), including tree crowns and shrubs, that are in direct contact with the ground. Based on the erosion hazard class, ***effective ground cover*** is between 20% and 75% of the ground covered the first year after management activities.

Habitat - A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

Headcut – a characteristic of a stream where bank instability and increased water yields have resulted in an entrenched gully that migrates upstream as the stream abandons its associated floodplain.

Hydrologically Closed Road - A road that has been modified to remove water as soon as possible off the road surface to facilitate infiltration into the soil. Generally, sidecast materials and culverts will be removed; relief drainage will be provided to prevent resource damage if culverts plug or fail; and a closure device (barricade, earthen berm, logs, rocks, gates, etc.) will be installed at the entrance.

Hydrologically Stabilized Road - A road that has been modified to remove water as soon as possible off the road surface to facilitate infiltration into the soil. Generally, sidecast materials and unstable landings will be removed and relief drainage will be provided to prevent resource damage if culverts plug or fail.

Inactivated Road - A road that is managed in a stored or closed category for long-term intermittent use. Generally, a single purpose type road that remains open to motorized off-highway vehicles. An inactivated road can be hydrologically stabilized or hydrologically closed.

Indirect Effects - Impacts on the environment that are caused by an action and are later in time or farther removed in distance.

INFISH - Interim Inland Native Fish Strategy for the Intermountain, Northern, and Pacific Northwest Regions (Forest Service). A strategy intended to provide interim direction to protect habitat and populations of resident fish outside of anadromous fish habitat in eastern Oregon, eastern Washington, Idaho, western Montana, and portions of Nevada. The Decision Notice/Finding of No Significant Impact for this strategy was signed on July 28, 1995.

Interdisciplinary Team (IDT) - A team of people that collectively represent several disciplines and whose duty it is to coordinate and integrate the planning process.

Intermittent Stream - A stream that flows only at certain times of the year when it receives water from other streams or from surface sources such as melting snow.

Irretrievable - A category of impacts that applies to losses of production or commitment of renewable resources. For example, while a linear piece of land is being used as a road, some or all of the timber production there is irretrievably lost. If the road was rehabilitated after use and soil compaction was reduced, timber production could resume; therefore, the loss of timber production during the time the road was in use is irretrievable but not irreversible, because it is possible for timber production to resume if the piece of land is no longer used as a road.

Irreversible - A category of impacts that applies to non-renewable resources, such as minerals and archaeological sites. Losses of these resources cannot be reversed. Irreversible effects can also refer to effects of actions on resources that can be renewed only after a very long period 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 "key" 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 - Vertical fuels are called ladder fuels. These are trees in the forests understory which provide a ladder for fire to move from the forest floor to the forest overstory.

Late and Old Structure (LOS) - Late and old structure forested stands. See Late Successional and Old Structured.

Late Successional - Forest late seral stages wherein shade tolerant species begin to occupy codominant and eventually dominant positions in the canopy. Most standing dead and down material is small to medium sized, but some mature and recently overmature overstory trees have recently died and are developing as snags. Specific definitions are dependent on current and potential vegetation composition and arrangements.

Local Road - Local roads are usually one-lane roads constructed to serve a dominant use or resource. Local roads do not access large land areas since they are more site-specific than arterial and collector roads.

Management Direction - A statement of goals and objectives, management prescriptions, and associated standards and guidelines for attaining them.

Management Indicator Species (MIS) - Vertebrate species whose population changes are believed to best serve as an index of a biological community's response to the effects of land management activities or which are important for fishing, hunting, and trapping.

Multiple Use Management - The management of public lands and their various resource values so they are used in a combination that best meets the present and future needs of the public.

National Environmental Policy Act (NEPA) - An act, passed by Congress in 1969, that declared a national policy to encourage productive harmony between humans and their environment. This act requires the preparation of environmental impact statements for Federal actions that are determined to be of major significance. (See 40 CFR [Code of Federal Regulations] 1500-1508 for implementing regulations. See also FSH [Forest Service Handbook] 1909.15, the FS Environmental Policy and Procedures Handbook.)

National Forest Management Act (NFMA) - An act, passed by Congress in 1976, that amends the Forest and Rangeland Renewable Resources Planning Act. The act requires the preparation of Forest plans and regulations to guide that development. (Implementing regulations are codified at 36 CFR 219.)

No Action Alternative - The most likely condition expected to exist in the future if current management direction were to continue unchanged.

Obliterated Road - see Decommissioned Road.

Old Growth Management Area - Management area or allocation in the Land and Resource Management Plan intended to provide habitat for old growth associated species.

Old Structure - A forest stand dominated by large trees with early to late seral species compositions. There may be multiple or single canopy layers, dependent on the plant association group and site potential.

Overstory - The upper canopy layer.

Perennial - A plant that lives for three or more years.

Perennial Stream - A stream that flows water year round.

Plant Association Group (PAG) - A group of plant associations that share similar productivities, disturbance regimes, and responses to disturbance. Eight major plant association groups have been described on the Ochoco National Forest.

Preferred Alternative - The alternative identified in a draft environmental impact statement which has been initially selected by the agency as the most acceptable resolution to the problems identified in the purpose of and need for action.

Proposed Action - A proposal made by the Forest Service to authorize, recommend, or implement an action on National Forest System lands to meet a specific purpose and need.

Record of Decision (ROD) - A document, based on information disclosed in a final environmental impact statement, that identifies the alternative chosen, mitigation and monitoring measures to be implemented, and other information relative to the decision.

Riparian Area - An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Riparian Habitat Conservation Area (RHCA) - A portion of a watershed where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by (1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, (2) providing root strength for channel stability, (3) shading the stream, and (4) protecting water quality. The following Categories of Riparian Habitat Conservation Area have been established by INFISH:

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 slop 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 floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet, 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 edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or the extent of moderately and highly unstable areas, or to a distance equal to the height of one site potential tree, or 150 feet slope distance from the edges of the maximum pool elevation of constructed ponds and reservoirs from the edge of the wetland, pond or lake, whichever is greatest.

Category 4: Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide-prone areas: This category includes features with high variability in size and site-specific characteristics. At a minimum the interim RHCAs must include:

a. the extent of landslides and landslide-prone areas,

b. the intermittent stream channel and the area to the top to of the inner gorge,

c. the intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation,

d. for Priority Watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest,

e. for watersheds not identified as Priority Watersheds, the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one-half site potential tree, or 50 feet slope distance, whichever is greatest.

Scoping - The early stages of preparation of an environmental assessment or environmental impact statement used to solicit public opinion, receive comments and suggestions, and determine the issues to be considered in the development and analysis of a range of alternatives. Scoping may involve public meetings, telephone conversations, mailings, letters, and other contacts.

Sensitive Species - Species identified by a Regional Forester for which population viability is a concern either (a) because of significant current or predicted downward trends in population numbers or density, or (b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Seral Stage - A stage in the progression of an ecosystem from initial development to maturity; an age, structure, and development classification for a biological community.

Silviculture - The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

Species - A population or series of populations of organisms that can interbreed and reproduce freely with each other but not with members of other species.

Stand - A group of trees in a specific area that are sufficiently alike in composition, age, arrangement, and condition to be distinguishable from the forest in adjoining areas.

Stream Class - A classification system for streams according to their beneficial uses. **Class I** are perennial or intermittent streams containing one or more of the following characteristics: (1) are the direct source of water for domestic use; and/or (2) are used by large numbers of fish for spawning, rearing, or migration. **Class II** are perennial or intermittent streams containing one or more of the following characteristics: (1) are used by moderate numbers of fish for spawning, rearing, or migration; and/or (2) if fish are not present then flow enough water to have a moderate influence on downstream quality of a Class I or II stream. **Class III** are all other perennial streams not meeting Class I or II definitions. These streams are normally spring fed or have a length greater than 1¼ miles. No fish present due to gradient (steep) or physical or biological barriers. **Class IV** are streams with intermittent flow, defined channel and less than 1¼ mile in length. No fish are present or spring fed sources.

Subwatershed - An area mostly bounded by ridges or other similar topographic features contributing water, organic matter, dissolved nutrients, and sediments to a lake or stream.

Succession - A series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax. An example is the development of series of plant communities (called seral stages) following a major disturbance.

Surface fuels - Horizontally arranged fuels are called "surface" fuels. These are trees and other vegetation on the ground surface.

Threatened Species - Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

Understory - Grass, small trees, shrubs, and other plants found beneath the overstory.

Uneven-aged Stand - A stand of trees in which there are considerable differences in the ages of individual trees.

Unroaded Area - An undeveloped area of land where there are no improved roads for travel by means of motorized vehicles intended for highway use.

Viable Ecosystems Management Guide - A system to classify vegetation on a landscape basis. This system compares existing vegetation with site potential. It focuses on relationships between combinations of vegetation structure and species composition, and habitat requirements for animals, insects, and plants. This guide was devised by the Ochoco National Forest Viable Ecosystem Quality Action Team. The Viable Ecosystems Management Guide describes a seral/structural matrix for characterizing forest vegetation by plant association groups (PAGs). Each plant association group is further characterized by seral and structural stages. There are three seral stages: E (early), M (middle), and L (late). There are five structural stages: 1 (grass/forb/shrub), 2 (seedling and sapling, trees less than 4.9 inches dbh), 3 (pole, trees between 5 and 8.9 inches dbh), 4 (small, trees between 9 - 20.9 inches dbh), and 5 (medium and large, trees greater than 21 inches dbh). The seral/structural classification is based on the dominant vegetative features on the site.

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APPENDIX A – DESCRIPTIONS OF ACTIVITIES

Silvicultural Activities

Various silvicultural treatments are being proposed to meet the vegetative objectives for the area and move the landscape towards the desired ranges. They have been proposed to meet stand specific conditions including density, species composition, and stand structure. Often two or more treatments, for example commercial thinning (harvest) followed by non-commercial thinning, is prescribed for the same unit. The major emphasis of the silvicultural treatments will be to:

1. Maintain existing large structure (21”+ dbh trees) and accelerate the development of additional large structure.
2. Reduce stand densities to maintain existing large trees, favor early-seral species, and reduce susceptibility to disturbance agents (insects, disease, and fire).
3. Select for species compositions that are closer to what occurred historically.
4. Increase the amount of acres in single strata stand structure.

Commercial thinning: This prescription would be used in overstocked stands with a surplus of merchantable sized trees between 7 and 20.9 inch DBH. Many stands contain an existing component of large trees (greater than 21 inches DBH). Current stand conditions often include multiple canopies and dense stocking and may include all seral stages. The stands would be thinned on average to recommended stocking levels while retaining variable densities across the unit. Merchantable trees up to 20.9 inch DBH removed in a commercial thinning would be sold and removed from the stand. Following the commercial thinning most stands would be non-commercially thinned and the thinning slash would be treated, in most cases by prescribed fire. All of these treatments work together to attain the desired stand condition where future prescribed burning can safely be used as a forest management tool, that mimics the role that fire historically had in these forests. These treatments can create immediate stand structure and species composition shifts to that of a single-strata stand with early seral species composition because the treated stands will no longer be dominated by a dense understory and trees that are removed tend to be mid and late seral species. Overall, species diversity will be retained after harvest, but the proportion of early seral species will likely increase. Most treated stands would retain some irregular or uneven-aged structure and age distribution, resulting from some clumps of trees remaining un-thinned or small gaps up to ½ acre being created. Existing large trees will become more vigorous following the harvest since the between tree competition will be reduced. The increased growth rates in mid-sized trees will eventually augment the number of large diameter trees, helping to help increase the amount of late and old structure. Post harvest residual basal area per acre would be approximately 30 to 60 square feet on drier sites (pine and Douglas-fir) and 50 to 100 square feet on more mesic sites (grand fir). Residual basal area per acre could exceed 100 square feet if numerous trees larger than 21 inches DBH are already present.

Recommended stocking levels vary depending on site quality, tree size and species. For example, the desired density range for an uneven-aged ponderosa pine stand on a grand fir-pinegrass site is 89 to 133 trees per acre when the average diameter is 10 inches DBH and the corresponding basal area would be between 49 and 73 square feet per acre. If the average diameter were larger, then fewer trees would be retained but the residual basal area would increase. Fewer trees would be retained on drier sites relative to moister sites. Recommended stocking levels are derived from “Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest” (Powell, 1999).

Stands selected for commercial thinning usually contain a mosaic of seral structural stages including a large proportion of pole and small size trees and dense, multi-storied stand conditions. Most stands selected also contain varying amounts of large structure ranging from scattered groups to individual

large trees that were left during previous harvests or have grown to a large size since the past harvest occurred.

No live trees 21 inch DBH or larger would be removed in commercial thinning operations except for those which are safety hazards. Hazardous trees which are within Riparian Habitat Conservation Areas would be felled but not removed.

Commercial thinning prescriptions will also require that ponderosa pine with old tree characteristics be retained, regardless of size or condition. Identification of old ponderosa pine is based on tree characteristics similar to those discussed in *Identifying Old Trees and Forests in Eastern Washington* (Van Pelt 2008). These include bark characteristics, branching structure, and crown form.

Sixteen stands dominated by lodgepole pine are proposed for commercial thinning as part of a post and pole or firewood sale. Typical post and poles are from 3 to 9 inches at DBH. The firewood areas could include live and standing dead lodgepole pine trees, as well as dead and down lodgepole where fuel loadings exceed acceptable levels, and where snag and down wood levels exceed desired levels that are defined by each PAG. These units tend to be located in areas where the mountain pine beetle has been recently active. Firewood units could remove trees up to 20.9 inch DBH with lodgepole pine being the primary species to be removed.

Units scheduled for winter logging shall meet one of the following conditions in order for the operations to proceed: (1) 6 inches of frozen ground conditions, (2) 4 inches of frozen ground conditions with 1 foot of snow, (3) 2 feet of snow.

Noncommercial thinning: The objective of this treatment is to reduce the amount of small non-merchantable trees (generally less than 9 inches DBH). The number of small trees to be left varies by stand conditions, depending on the overall stocking objectives and the amount of existing overstory. Where the objective in the stand is to have single-storied LOS stand and many large diameter trees exist, then few small understory trees would be retained (40 or less per acre). Where few overstory trees exist, such as in young plantations, then the non-commercial thinning could retain 135 or more small trees per acre. Species selection usually retains ponderosa pine and western larch, or removes species infected with or susceptible to insects/disease. Non-commercial thinning can occur either following a commercial entry or as the only treatment. Trees cut during this activity may be left on site and the slash treated by a variety of fuels treatments. In units scheduled for grapple piling the trees may be removed for biomass utilization if a market exists for this material.

Aspen treatments: These treatments are designed to reduce conifer competition in aspen stands by cutting down and/or girdling conifers that encroached into aspen stands. Commercial harvest would occur in some of these stands while in other stands non-commercial thinning may be the only treatment. In the case of non-commercial thinning only areas, conifers up to 15 inch DBH may be felled or girdled. Thinning will take place for an approximate distance of 75 feet from aspen seedlings to allow for sufficient sunlight, water, nutrient and growing space to be available for the struggling aspen stand.

Slash generated from the non-commercial activities would be lopped and scattered, or handpiled. Handpiles within 50 feet of a stream would not be burned; handpiles outside of the 50 foot zone may be burned. Underburning is not prescribed for the aspen clones. To prevent browsing on aspen seedlings and saplings, fencing or individual cages may be installed. In some stands livestock fencing may be installed, in others big game fencing may be required. The type of fence needed will be determined on a site specific basis. Fences could be wire, plastic or wooden. Buck and pole fences could be built in some stands where the conifers are lodgepole pine, and they could be used on site for a fence. Aspen seedlings may be planted on some sites to aid in the restoration. Planted aspen would be protected from animal browsing.

When previously unknown aspen clones are encountered in stands that are planned for commercial harvest or non-commercial thinning, the silvicultural prescription will be modified within and adjacent to the aspen similarly to the above description.

Juniper cutting: This treatment is primarily proposed within the xeric pine PAG and juniper woodland/steppe PAGs to reduce juniper density. Young junipers up to 20.9 inch DBH would be cut using hand tools and the slash would be lopped and scattered. Old juniper would be retained, regardless of size. Concentrations of slash would be burned. Burning is expected to occur in patches as a continuous fuel bed of slash is not expected. The effects of these treatments on the juniper PAGs have not been analyzed using the viable ecosystem model. The net effect however will be to reduce juniper density and increase the amount of area that is dominated by grass and shrub vegetation.

The prescriptions for the juniper cutting will require that junipers with old tree characteristics be retained, regardless of size or condition. Identification of old junipers is based on tree characteristics similar to those discussed in *Biology, Ecology and Management of Western Juniper* (Miller et al. 2005) and summarized in *Western Juniper Management: A Field Guide* (Barrett 2007). These include crown form, branching structure, bark color and bark features.

Fuels Activities

Based on the timelines of previous projects on the Ochoco, natural fuels underburning and thinning with fire in the Jackson project area would occur over the next 10 years, depending on climate, fuels accumulation and understory growth. Activity fuels burning would also occur over the next 10 years, depending on when commercial and noncommercial thinning occurs.

Prescribed Fire: The general objectives of prescribed fire are:

- To lessen the severity, resistance to control and cost of future wildfires by reducing natural fuels (naturally occurring forest debris), activity fuels (thinning slash) and ladder fuels (seedlings and saplings).
- To maintain forest health, reducing seedlings and saplings to maintain open stands, promoting fire tolerant species (ponderosa pine, western larch, Douglas fir), and reducing fire intolerant species (western juniper, grand fir).
- To increase the quantity and vigor of native grasses, forbs and shrubs.

Prescribed fire is the application of fire in pre-determined patterns and conditions in order to produce a desired flame length, rate of spread, and fire effects. The combination of environmental conditions used to determine when to burn is called a “fire prescription”. The most common ignition technique involves igniting strips of fire across a unit on a contour, starting at the uphill end, or on the leeward side of a unit on flat ground, burning into the wind. Flame length and rate of spread is controlled by adjusting the distance between the strips and how fast they are lit. Based on past experience, 40 - 80% of the surface area of prescribed fire units is burned; mineral soil exposure usually occurs on less than 5% of a unit, usually where downed logs are consumed.

Firelines (fuel breaks) are needed to control fire spread. Roads or natural fuel breaks are used where possible. Handline is fireline constructed using handtools, and consists of clearing a 5-10 foot wide path of seedlings, saplings, brush and downed woody debris, and removing ground fuels (litter and duff layer) down to mineral soil, 1-3 feet wide.

Maintenance Underburning would reduce naturally occurring debris on the forest floor, and seedlings and saplings, maintaining low intensity fire conditions in stands that have been previously treated.

Activity Fuels Underburning would reduce the forest debris (slash) from harvest and noncommercial thinning as well as existing fuels.

Natural Fuels Burn: Some of the stands in the Jackson project area are densely forested, dry mixed conifer stands, with heavy fuels on steep slopes and limited road access. Wildfires in these stands are usually either low intensity fires in large downed logs with occasional torching (see photos) or, where wind and slope line up, high intensity crown fires with long duration burning and long distance spotting (over a half-mile), which is what has occurred in similar fires on the Ochoco (Hash Rock Fire 2000, 747 Fire 2002, Maxwell Fire 2006, Black Canyon Fire Use 2008). Prescribed fire in these stands would be a multiple entry process over a period of several years, starting with one or two burns to reduce large fuel concentrations under moist conditions, to protect large old trees.

Slash Piling. Piling slash and burning the piles is proposed where fuel loadings are expected to be too high to underburn without scorching too much of the overstory. Piling and burning is usually followed by a low-intensity underburn 2-3 years after pile burning. Piling can occur immediately after thinning, before the fuels dry out, reducing the duration of the short-term hazard that exists after thinning. Piling usually removes 60-70% of the fuel in any given area. Approximately 5% of the surface area of piled units is covered by piles.

Hand Piling would occur where thinning slash is too heavy to burn without damaging the residual stand. Hand piles are 6-8 feet across and 6-8 feet high.

Grapple Piling would occur on slopes less than 35% where thinning slash is too heavy to burn without damaging the residual stand. Grapple piles consist of forest fuels that are stacked by a grapple piler (an excavator with a grapple on an articulating arm), are 5-10 feet high by 10-15 feet in diameter. Grapple pilers would operate on existing skidtrails, on slopes less than 35%. An average grapple pile unit has 12 piles per acre @ 150 square feet per pile, so grapple piles cover 18,000 square feet of a 10 acre unit.

Landing piles are a product of commercial harvest using whole tree yarding. The footprint of landing piles disturbs considerably less soil than in a grapple pile unit. Harvest units have an average of 1 landing pile per 10 acres, so an average landing pile covers 3000 square feet of a 10-acre unit.

Piles are burned after drying for a year, unless there is a market for the piles and they are sold and removed for biomass. If burned, fire from burning piles could creep around the forest floor between the piles.

Summit Trail Shaded Fuelbreak. This treatment, small diameter thinning, limbing, handpiling and pile burning will occur 300 feet of both sides of Road 2630, the Summit Trail. This would reduce the risk of high-intensity fire along this historic feature. When the Summit Trail has to be used as a control line, a shaded fuelbreak would allow for a low-intensity backfire, and reduce the risk of disturbance from heavy equipment opening the canopy during a suppression operation.

APPENDIX B – UNIT-SPECIFIC SOIL EFFECTS BY ALTERNATIVE

Explanation of Terms and Assumptions Used in Table B1

EXISTING SOIL DISTURBANCE: This column refers to the estimated level of existing detrimental ground disturbance in each individual unit. These units are largely multiple entry units that have varying degrees of detrimental compaction and displacement from prior entries.

POST TREATMENT ESTIMATE: This estimate is from predicted amount of detrimental ground disturbance due to the treatments from this entry which, in this case, are largely thin from below commercial thinning stand prescriptions. Mostly the disturbance from this proposal will be restricted to existing roads, landings and skid trails. When additional access is needed there will be some additional ground disturbance depending on whether the unit can be tilled. If , in some units, specific skid trails need to be relocated due to poor initial placement, then they are re-located and the additional disturbance is documented here.

TILLAGE POTENTIAL: This was based on slope, local on-site knowledge by the Forest Soil Scientist and District Silviculturist, Tillage Suitability Guidelines (J. David), and the Soil Resource Inventory of the Ochoco National Forest(1977, Paulson). Low potential means that there may be too much rock, too much slope or that the soil is too shallow or too clayey (smectitic clay soils will decompact themselves with every annual wet/dry cycle by expanding and contracting.) Besides not benefiting from tillage of the clay they will produce heavy clods which make traffic and planting difficult. (See Overview of Tillage Methods and Objectives and Tillage Suitability Guidelines, J. David, above)

POST TILLAGE ESTIMATES: This is an estimate of what the post tillage detrimental soil condition estimate will be. The tillage (either shallow scarification or deeper sub-soiling or ripping) will help restore soil functions especially in regards to water infiltration and soil aeration.

Recommendations for post-implementation soil restoration activities are derived from the existing condition of soils in each unit (see discussion in Soils section, Chapter 3 of this document). Existing disturbance was quantified to the nearest ten percent bracket (0-10, 10-20, etc.), estimates were made as to tillage potential, and unit specific mitigations identified where needed to ensure compliance with the soil standards.

0 percent (pristine) class: Keep detrimental disturbance to below 20 percent. This includes 120 foot minimum spacing on skid trails, minimum landings and roads.

1 to 9 percent class: Stay on existing disturbance and allow no more than 10 percent additional disturbance.

10 to 19 percent class: Stay on existing disturbance and design activities to stay below the 20 percent level.

20 to 29 percent class: Stay on existing disturbance in unit.

A. If tillable, allow no more than 5% increase over existing, till to keep NET percentage to below pre-existing conditions.

B. If not tillable, stay on existing disturbance in unit, winch line from existing disturbance or winter log under suitable conditions.

30 to 39 percent class: Stay on existing disturbance in unit.

A. If tillable, allow no more than 5% increase over existing, till to keep NET percentage to below pre-existing conditions.

B. If not tillable, stay on existing disturbance in unit, winch line from existing disturbance or winter log under suitable conditions.

40 to 49 percent class: Stay on existing disturbance in unit.

A. If tillable, allow no more than 5% increase over existing, till to keep NET percentage to below pre-existing conditions. Consider broadcast tillage to bring overall detrimental soil conditions down to the 20 percent level.

B. If not tillable, stay on existing disturbance in unit, winch line from existing disturbance or winter log under suitable conditions.

50 to 60 percent class: Stay on existing disturbance in unit.

A. If tillable, allow no more than 5% increase over existing, till to keep NET percentage to below pre-existing conditions. Seriously consider broadcast tillage for these units to get the overall percentage of detrimental soil conditions down to the 20% level.

B. If not tillable, stay on existing disturbance in unit, winch line from existing disturbance or winter log under suitable conditions.

Table B1: Soil Disturbance Effects by Harvest and/or Grapple Piled Units:

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
1	10.7	T	T	10-19	50	0.5	19	Keep disturbance below 20%. Meets standard.
3	124.4	T-GP	T	40-49	50	6	45	Stay on existing trails, no net increase over 50%. Till 6 acres. Meets standard.
4	8.4	T	T	30-39	0	0	30-39	Stay on existing disturbance, no net increase. Meets standard.
37	0.5	T	T	20-29	50	0	20-29	Stay on existing disturbance, no net increase. Meets standard.
38	127.6	T	T	20-29	50	6	25	Limit new disturbance to <5%. No net increase over 30 %. Till 6 acres. Meets standards.
39	100.3	T	T	30-39	75	5	35	Stay on existing trails, no net increase over 40%. Till 5 acres. Meets standard
40	41.6	T	T	30-39	25	0	30-39	Stay on existing disturbance, no net increase. Meets standard.
42	57.5	T	T	50-59	75	3	55	Stay on existing trails, no net increase over 60%. Till 3 acres. Meets standard.
43	18.1	T-GP	T-GP	30-39	50	1	35	Stay on existing disturbance, no net increase.Till 1 acre. Meeds S&Gs.
44	7.0	T-GP	T-GP	20-29	50	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
44a	4.9	T-GP	T-GP	0-9	75	0	17	Skid trail/landing layout will keep unit below20% det. soil conditions and meet standards.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
45	13.3	T-GP	T-GP	30-39	50	1	35	Stay on existing disturbance, no net increase.Till 1 acre. Meeds S&Gs.
46	4.1	T-GP	T-GP	20-29	100	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
50	33.7	T	T	20-29	50	0	20-29	Limit new disturbance to less than 30 percent. Meets S&Gs.
51	35.1	T	T	30-39	100	0	30-39	Limit new disturbance to less than 40 percent. Meets S&Gs.
52	30.6	T	T	20-29	50	1.5	25	Limit new disturbance to <5%, Mitigate effects with tilling 1.5 acres to meet S/Gs.
53	39.0	T	T	20-29	75	2	25	Limit new disturbance to less than 30 percent. Till 2 acres. Meets S&Gs.
57	10.7	T	T	20-29	75	0.6	25	Limit new disturbance to <5%, Mitigate effects with tilling 0.5 to 1 acre to meet S/Gs.
59	6.6	T	T	10-19	0	0	10-19	Stay on existing disturbance, no net increase over 20%. Meeds S&Gs.
60	14.4	T	T	20-29	0	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
69	9.8	T	T	20-29	25	0	20-29	Stay on existing trails, no net increase over 30%. Till 1 acre. Meets standard.
70	2.6	T-GP	T-GP	30-39	0	0	30-39	Stay on existing disturbance, no net increase. Meeds S&Gs.
71	17.8	T-GP	T-GP	20-29	100	1	25	Stay on existing disturbance, no net increase.Till 1 acre. Meeds S&Gs

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
75	41.1	T	T	20-29	75	2	25	Stay on existing trails, no net increase over 30%. Till 2 acres. Meets standard.
76	5.3	T-GP	T-GP	10-19	0	0	10-19	Stay on existing trails, no net increase over 20%. Meets standard.
77	3.6	T	T	20-29	100	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
77b	1.0	T	T	30-39	100	0	0	Stay on existing disturbance, no net increase. Meeds S&Gs.
78a	20.5	T	T	20-29	25	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
78b	5.8	T	T	20-29	75	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
78c	17.0	T	T	20-29	50	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
79	7.4	T	T	0-9	100	0	10-17	Stay on existing trails, no net increase over 20%. Meets standard.
80	6.0	T	T	0-9	100	0	10-17	Stay on existing trails, no net increase over 20%. Meets standard.
81	26.3	T-GP	T-GP	0-9	75	0	10-17	Stay on existing trails, no net increase over 20%. Meets standard.
82	17.0	T-GP	T-GP	20-29	100	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
83	4.6	T-GP	T-GP	20-29	100	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.
84	2.9	T-GP	T-GP	20-29	50	0	20-29	Stay on existing disturbance, no net increase. Meeds S&Gs.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
85	18.1	T-GP	T-GP	20-29	75	1.5	25	Stay on existing trails. Till 1 to 2 acres. No net increase. Meets standard..
86	9.0	T-GP	T-GP	20-29	50	0	20-29	Stay on existing trails. No net increase. . Meets standard.
107	29.7	T	T	20-29	25	0	20-29	Stay on existing trails. No net increase. . Meets standard.
114	29.1	T	T	20-29	25	0	20-29	Stay on existing trails. No net increase. . Meets standard.
115	12.3	T	T	20-29	50	0.5	20-29	Stay on existing trails. No net increase. Meets standard.
116	24.7	T	T	10-19	25	0	10-19	Skid trail/landing layout will keep unit below20% det. soil conditions and meet standards.
120	7.2	T	T	10-19	0	0	10-19	Skid trail/landing layout will keep unit below20% det. soil conditions and meet standards.
123	34.1	T	T	0-9	50	0	15	Stay on existing trails, no net increase over 20%. Meets standard.
124	29.5	T	T	0-9	25	0	17	Skid trail/landing layout will keep unit below20% det. soil conditions and meet standards.
125	14.2	T	T	0-9	100	0	10-17	Skid trail/landing layout will keep unit below20% det. Soil conditions and meet S&Gs.
126	23.9	T-GP	T-GP	10-19	75	0	15-19	Stay on existing trails. No net increase over 20 %. Meets standard..
127	35.6	T	T	20-29	50	2	25	Stay on existing trails. No net increase over 30%. Till 2 acres. Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
128	12.1	T	T	10-19	75	0.6	12-19	Keep disturbance below 20%. Meets standard.
129	35.8	T	T	30-39	25	0	30-39	Stay on existing trails. No net increase. Meets standard.
130	35.9	T		40-49	25	0	40-49	Stay on existing trails. No net increase. Meets standard.
131	29.5	T-GP	T-GP	0-9	50	0	10-19	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
132	2.9	T	T	20-29	25	0	20-29	Keep disturbance below 29%. Meets standard.
133	28.0	T	T	0-9	50	0	15-18	Stay on existing trails. No net increase over 20% . Meets standard.
134	67.6	T	T	20-29	75	3.5	25	Stay on existing trails. No net increase over 25%. Till 3.5 acres. Meets standard.
140	32.0	T-GP	T-GP	20-29	50	2	25	Stay on existing trails. No net increase over 25%. Till 2 acres. Meets standard.
141	10.0	T-GP	T-GP	10-19	50	0	10-19	Stay on existing trails. No net increase over 20%. Meets standard.
142	99.8	T-GP	T-GP	40-49	50	5	45	Limit new disturbance to <5%. No ne t increase over 45%. Till 5 acres. Meets standard.
143	22.9	T-GP	T-GP	40-49	75	2	45	Limit new disturbance to <5%. No ne t increase over 45%. Till 5 acres. Meets standard.
144	23.6	T-GP	T-GP	10-19	75	1	18	Stay on existing trails. No net increase over 20%. Meets standard.
145	49.9	T	T	10-19	25	0	18	Stay on existing trails. No net increase over 20% . Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
146	53.3	T-GP	T-GP	20-29	50	3	25	Stay on existing trails. No net increase over 25%. Till 3 acres . Meets standard.
149	24.9	T-GP	T-GP	30-39	50	1.2	35	Stay on existing trails. No net increase over 35%. Till 1.5 acres. Meets standard.
150	18.0	T	T	20-29	75	0	20-29	Stay on existing disturbance. Till one acre. No net increase over 25%. Meets S&Gs.
151a	11.7	T-GP	T-GP	30-39	75	0.7	35	Stay on existing trails. Till 1 acre. No net increase over 35%. . Meets standard
156	20.3	T	T	20-29	50	1	25	Stay on existing trails. Till 1 acre. No net increase over 25%. . Meets standard
156a	1.4	T	T	20-29	75	0	20-29	Stay on existing trails. No net increase. . Meets standard.
157	17.5	T	T	20-29	50	1	25	Stay on existing trails.Till 1 acre. No net increase over 25 %. . Meets standard
159	36.8	T	T	30-39	25	0	30-39	Stay on existing trails. No net increase. Meets standard
161	26.6	T	T	0-9	50	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
162	25.8	T	T	0-9	50	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
166	25	T	T	20-29	50	1.2	25	Stay on existing trails. Till 1.2 acres. No net increase over 25%. Meets standard.
167	23.6	T	T	20-29	75	1.3	25	Stay on existing trails.Till 1.3 acres. No net increase over 25%. Meets standard.
167a	24.1	T	T	20-29	75	1.3	25	Stay on existing trails. Till 1.3 acres. No net increase over 25%. Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
168	43.8	T	T	0-9	50	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
169	55.7	T	T	0-9	50	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
170	30.7	T	T	10-19	0	0	10-19	Stay on existing trails. No net increase over 20%. Meets standard
173	7.4	T	T	20-29	75	0	20-29	Stay on existing trails. No net increase. Meets standard
175	26.2	T	T	30-39	0	0	30-39	Stay on existing trails. No net increase. Meets standard
176	30.6	T	T	20-29	50	2	25	Stay on existing trails. Till 2 acres. No net increase over 25% . Meets standard.
178	24.7	T	T	10-19	0	0	10-19	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
179	6.9	T	T	20-29	50	0	20-29	Stay on existing trails. No net increase. Meets standard
180	16.0	T	T	20-29	50	0	20-29	Stay on existing trails. No net increase. Meets standard
190	17.6	T	T	10-19	0	0	10-19	Stay on existing trails. No net increase over 20% . Meets standard
202	41.4	T	T	30-39	75	2	35	Limit new disturbance to <5%. No ne t increase over 35%. Till 2 acres. Meets standard.
203	7.4	T	T	20-29	75	0	20-29	Stay on existing trails. No net increase. Meets standard.
205	12.6	T	T	10-19	50	0	10-19	Stay on existing trails. No net increase over 20%. Meets standard

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
206	9.0	T	T	10	100	1	18	Stay on existing trails. No net increase over 20%. Till 1 acre. Meets standard.
207	14.8	T	T	0-9	25	0	15-18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
208	25.4	T	T	10	100	1	18	Stay on existing trails. No net increase over 20 %. Till 1 acre. Meets standard
210	40.9	T	T	20-29	100	2	20-29	Stay on existing trails. No net increase. Till 2 acres. Meets standard.
211	28.8	T	T	20-29	75	1	20-29	Stay on existing trails. No net increase. Till 1 acre. Meets standard.
212	11.3	T	T	10	50	0.5	18	Stay on existing trails. No net increase over 20 %.. Till 0.5 acre. Meets standard
213	16.8	T	T	0-9	50	0	17	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
213a	10.4	T	T	0-9	0	0	17	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
214	24.5	T	T	0-9	25	0	17	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
215	24.3	T	T	0-9	25	0	17	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
221	10.9	T	T	10	50	0	18	Stay on existing trails. No net increase over 20%. Meets standard

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
223 b	47.1	T	T	10	50	0	18	Stay on existing trails. No net increase over 20 %. Meets standard.
224	21.6	T	T	10-19	25	0	10-19	Stay on existing trails. No net increase over 20 %. Meets standard.
224 b	3.2	T	T	20-29	25	0	20-29	Stay on existing trails. No net increase. Meets standard
224c	11.8	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard
224 d	4.2	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard
226	46.4	T	T	30-39	50	0	30-39	Stay on existing trails. No net increase . Meets standard.
229	4.6	T	T	10	25	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet S&Gs.
230	64.9	T	T	30-39	0	0	30-39	Stay on existing trails. No net increase . Meets standard.
233	18.1	T	T	10-19	50	1	10-19	Stay on existing trails. No net increase over 20 %. Meets standard.
234	10.3	T	T	20-29	75	0	20-29	Stay on existing trails. No net increase . Meets standard.
235a	41.2	T	T	0-9	50	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
235 b	6.2	T	T	0-9	50	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
237 b	8.3	T	T	30-39	25	0	30-39	Stay on existing trails. No net increase . Meets standard.
245	17.5	T	T	20-29	75	1	25	Stay on existing trails. Till 1 acre. No net increase . Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
246	18.8	T	T	30-39	0	0	30-39	Stay on existing trails. No net increase . Meets standard.
252	19.8	T	T	10-19	100	1	10-19	Stay on existing trails. Till one acre. No net increase over 20% . Meets standard.
253	63.8	T	T	10-19	75	2.5	10-19	Stay on existing trails. Till 2.5 acres. No net increase over 20 %. Meets standard.
254	33.6	T	T	20-29	75	1.5	20-29	Stay on existing trails. Till 1.5 acres. No net increase . Meets standard.
255	35.2	T	T	20-29	50	2	20-29	Stay on existing trails. Till 2 acres. No net increase . Meets standard.
257	48.8	T	T	20-29	25	0	20-29	Stay on existing trails. No net increase . Meets standard.
258	20.7	T	T	30-39	50	1	30-39	Stay on existing trails. Till one acre. No net increase. Meets standard.
261	20.0	T-GP	T-GP	20-29	100	1	25	Stay on existing trails. No net increase over 25 %. Meets standard.
299	9.1	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
300	32.0	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
302	31.6	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
302a	1.7	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
304	6.9	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
305	6.6	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
306	2.8	T	NH	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
310a	76.9	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
313	78.7	T	T	20-29	25	0	20-29	Stay on existing trails. No net increase. Meets standard.
314	27.5	T/WL	T/WL	20-29	25	0	20-29	Stay on existing trails. No net increase . Meets standard.
317	23.6	T	T	30-39	0	0	31-39	Stay on existing trails. No net increase . Meets standard.
318	45.0	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
326	35.5	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
326a	51.4	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
327	12.9	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
334	27.5	T	T	10-19	0	0	10-19	Stay on existing trails. No net increase over 20 %. Meets standard.
334a	22.4	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
334 b	8.6	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
334c	23.6	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
335	18.0	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
335a	6.2	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
336	6.8	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
351	24.4	T/WL	T/WL	30-39	50	2	33	Stay on existing trails. Till 2 acres. No net increase. Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
352	18.7	T	T	20-29	100	2	21	Stay on existing trails. Till 2 acres. No net increase. Meets standard.
353	113.3	T	T	30-39	75	10	31	Stay on existing trails. Till 10 acres. No net increase. Meets standard.
354	69.1	T	T	20-29	75	4	25	Stay on existing trails. Till 4 acres. No net increase. Meets standard.
355	48.7	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Contains ca. 30 % meadows, log when dry. Meets standard.
356	18.1	T	T	20-29	100	1.5	25	Stay on existing trails. Till 1.5 acres. No net increase. Meets standard.
357	30.1	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
357a	3.1	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
358	21.0	T	T	30-39	25	0	30-39	Stay on existing trails. No net increase. Meets standard.
360	32.5	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
371	59.3	T	T	0-9	50	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
372	19.8	T	T	0-9	75	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
377	11.4	T	T	10-19	25	0	10-19	Stay on existing trails. No net increase over 20 %. Meets standard.
378	11.1	T	T	10-19	100	0.6	10-19	Stay on existing trails. Till 0.6 acres. No net increase over 20 %. Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
381	27.2	T	T	10-19	100	1.5	10-19	Stay on existing trails. Till 1.5 acres. No net increase over 20 %. Meets standard.
388	103.6	T	T	30-39	75	5	35	Stay on existing trails. Till 5 acres. No net increase. Meets standard.
393a	3.0	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
397	32.1	T	T	0-9	75	0	18	Stay on existing trails. No net increase over 20 %. Meets standard.
400	12.1	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase . Meets standard.
401	23.8	T	T	10-19	0	0	10-19	Stay on existing trails. No net increase over 20 %. Meets standard.
415	46.9	T/GP	T/GP	30-39	100	3	35	Stay on existing trails. Till 3 acres. No net increase. Meets standard.
416	14.4	T	T	20-29	100	1	25	Stay on existing trails. Till 1 acre. No net increase. Meets standard.
417	17.4	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
418	5.8	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
420	17.3	T	T	0-9	75	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
420c	1.0	T	T	20-29	100	0	20-29	Stay on existing trails. No net increase. Meets standard.
420 d	1.0	T	T	20-29	100	0	20-29	Stay on existing trails. No net increase. Meets standard.
422	2.8	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
423	4.4	T/WL	T/WL	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
425	12.3	T/GP	T/GP	0-9	50	0	18	Skid trail/landing layout will keep unit below 20% det. soil conditions and meet standards.
426	18.4	T/GP	T/GP	0-9	0	0	18	Skid trail/landing layout will keep unit below 20% det. soil conditions and meet standards.
435	20.3	T	T	30-39	50	1	35	Stay on existing trails. Till 1 acre. No net increase. Meets standard.
436	19.7	T	T	10-19	75	3	10-19	Stay on existing trails. No net increase over 20 %. Meets standard.
436 b	6.3	T	T	20-29	100	0	20-29	Stay on existing trails. No net increase. Meets standard.
442	9.6	T/GP	T/GP	20-29	100	0	20-29	Stay on existing trails. No net increase. Meets standard.
443	15.1	T	T	0-9	75	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
443a	9.2	T	T	20-29	50	0	20-29	Stay on existing trails. No net increase. Meets standard.
445	24.1	T/GP	T/GP	10-19	100	0	10-19	Stay on existing trails. No net increase over 20 %. Meets standard.
446	33.7	T	T	0-9	75	0	18	Stay on existing trails. No net increase over 20 %. Meets standard.
447	41.4	T	T	0-9	25	0	18	Stay on existing trails. No net increase over 20 %. Meets standard.
454	29.0	T	T	30-39	0	0	30-39	Stay on existing trails. No net increase . Meets standard.
454a	45.8	T	T	30-39	25	0	30-39	Stay on existing trails. No net increase . Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
455	52.6	T	T	0-9	50	0	18	Stay on existing trails. No net increase over 20 %. Meets standard.
456	15.8	T	T	0-9	0	0	18	Stay on existing trails. No net increase over 20 %. Meets standard.
465	55.9	T/WL	T/WL	30-39	75	0	30-39	Stay on existing trails. No net increase . Meets standard.
472	40.3	T	T	40-49	75	3	42	Stay on existing trails. Till 3 acres. No net increase. Meets standard.
477	20.1	T	T	0-9	100	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
478	8.2	T	T	0-9	100	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
482	47.6	T-GP	T-GP	30-39	50	2.5	35	Stay on existing trails. Till 2.5 acres. No net increase. Meets standard.
484	22.6	T	T	30-39	50	1.5	35	Stay on existing trails. Till 1.5 acres. No net increase. Meets standard.
485	14.8	T/WL	T/WL	40-49	0	0	40-49	Stay on existing trails. No net increase. . Reuse existing landings. Meets standard,
488	75.7	T/WL	T/WL	30-39	50	0	30-39	Stay on existing trails. No net increase. Reuse existing landings. Meets standard.
491	20.2	T-GP	T-GP	30-39	50	0	30-39	Stay on existing trails. No net increase. Meets standard.
494	23.0	T-GP	T-GP	10-19	100	2	10-19	Stay on existing trails. Till 2 acres. No net increase over 20%. Meets standard.
495	28.8	T	T	30-39	100	2	35	Stay on existing trails. Till 2 acres. No net increase. Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
496	36.0	T	T	30-39	100	3	32	Stay on existing trails. Till 3 acres. No net increase. Meets standard.
496a	2.5	T	T	30-39	100	0	30-39	Stay on existing trails. No net increase. Meets standard.
499	65.6	T/GP	T/GP	20-29	50	3	25	Stay on existing trails. Till 3 acres. No net increase. Meets standard.
500	14.5	T	T	10-19	100	1	10-19	Stay on existing trails. Till 1 acres. No net increase over 20%. Meets standard.
501	10.2	T/WL	T/WL	20-29	25	0	20-29	Stay on existing trails. No net increase. Meets standard.
501a	5.7	T/WL	T/WL	20-29	25	0	20-29	Stay on existing trails. No net increase. Meets standard.
502	52.4	T/WL	T/WL	20-29	75	3	25	Stay on existing trails. Till 3 acres. No net increase. Meets standard.
505	12.5	T	T	20-29	50	0	20-29	Stay on existing trails. No net increase. Meets standard.
506	29.8	T/GP	T/GP	10-19	75	1.5	15	Stay on existing trails. Till 1.5 acres. No net increase over 20%. Meets standard.
506a	12.3	T	T	0-9	0	0	18	Skid trail/landing layout will keep unit below 20% Det. Soil conditions and meet standards.
507	20.1	T	T	10-19	75	2	10-15	Stay on existing trails. Till 2 acres. No net increase over 20%. Meets standard.
508	11.5	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.
509	40.7	T/WL	T/WL	40-49	25	3.5	45	Stay on existing trails. Till 3.5 acres. No net increase. Meets standard.
513	28.3	T	T	40-49	100	2.3	45	Stay on existing trails. Till 2. 3 acres. No net increase. Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
516	15.3	T	T	30-39	100	1.2	33	Stay on existing trails. Till 1.2 acres. No net increase. Meets standard.
518	12.0	T	T	10-19	100	1	15	Stay on existing trails. Till 1 acre. No net increase over 20%. Meets standard.
520	7.5	T	T	30-39	75	0.5	35	Stay on existing trails. Till 2 acre. No net increase. Meets standard.
524	46.6	T	T	40-49	75	4	43	Stay on existing trails. Till 4 acres. No net increase. Meets standard.
526	35.9	T-GP	T-GP	30-39	50	3.4	31	Stay on existing trails. Till 3.4 acres. No net increase. Meets standard.
528	30	T	T	20-29	75	2.5	25	Stay on existing trails. Till 2.5 acres. No net increase. Meets standard.
529	9.7	T	T	30-39	0	0	30-39	Stay on existing trails. No net increase. Meets standard.
534	44.9	T-GP	T-GP	40-49	25	3.3	45	Stay on existing trails. Till 3.3 acres. No net increase. Meets standard.
537	13.3	T	T	10-19	100	0	10-19	Stay on existing trails. No net increase over 20%. Meets standard.
600	12.6	T	T	10-19	50	1	15	Stay on existing trails. Till 1 acre. No net increase over 20%. Meets standard.
603	2.5	T/WL	T/WL	10-19	0	0	10-19	Stay on existing trails. No net increase over 20%. Meets standard.
604	8	T	T	20-29	25	0	20-29	Stay on existing trails. No net increase. Meets standard.
605	5.5	T	T	20-29	50	0	20-29	Stay on existing trails. No net increase. Meets standard.
636	5.2	T	T	20-29	0	0	20-29	Stay on existing trails. No net increase. Meets standard.

Unit	Size (acres) Alt2 PA	Alt. 2 Logging System	Alt. 3 Logging System	Existing Soil Disturbance (%)	Tillage Potential In %	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
						Tillage Total= ca. 161 acres		

T/WL: Tractor/Winter Logging
T: Tractor yarding
T-GP: Tractor/Grapple Pile
NH: No Harvest

Tillage Potential
25%– Low (not good candidate for tillage because soil and physical features)
50% – Moderate
75-100% – High

APPENDIX C – UNIT-BY-UNIT PROJECT DESIGN

Table C1. Unit-specific project design information.

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
1	2 and 3	10.7	HIM	PCT	Activities	T										
2	2 and 3	57.5		PCT	Activities											
3	2	124.4	HIM	PCT	GP	T				1.4				X		
3	3	123.0	HIM	PCT	GP	T										
4	2 and 3	8.4	HTH	PCT	Activities	T										
5	2	11.8			Activities			5.1								
5	3	6.7			Activities											
6	2	19.3		PCT	Activities			2.8								
6	3	16.5		PCT	Activities											
7	2	23.3		PCT	Activities					0.6						
7	3	22.7		PCT	Activities											
8	2 and 3	10.7		PCT	Activities											
9	2	19.0		PCT	Activities				1.4							
9	3	17.6		PCT	Activities											
9a	2 and 3	9.1		PCT	Activities											
10	2 and 3	9.2		PCT	Activities											
11	2 and 3	37.5		PCT	Activities											
12	2 and 3	65.7		PCT	Activities											
13	2 and 3	22.6		PCT/HWD	Activities							X				
14	2	109.8			Activities					4.2		X		X		X
14	3	105.5			Activities							X		X		X
15	2 and 3	26.3		JUT	Activities											
16	2	166.6		JUT	Activities			0.1		3.1						
16	3	163.4		JUT	Activities											
17	2	187.3		JUT	Activities					3.9						
17	3	183.4		JUT	Activities											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
18	2	21.8		PCT	Activities			6.8		3.0						
18	3	12.0		PCT	Activities											
18a	2	5.2		PCT	Activities			4.4								
18a	3	0.8		PCT	Activities											
19	2	43.4		JUT	Activities		6.4			3.8						
19	3	33.2		JUT	Activities											
20	2	92.2		JUT	Activities					3.8						
20	3	88.4		JUT	Activities											
21	2	135.5			Activities		35.9			2.8				X		X
21	3	96.8			Activities											
22	2 and 3	11.9		JUT	Activities											X
23	2	177.0		JUT	Activities			1.9		4.0						
23	3	171.2		JUT	Activities											
24	2 and 3	6.1		JUT	Activities											
25	2 and 3	60.0		JUT	Activities											
26	2	11.9		JUT	Activities					1.0						
26	3	10.9		JUT	Activities											
28	2	759.9			Nat Fuels				1.8	22.1						X
28	3	736.0			Nat Fuels											X
28a	2	221.1			Activities		1.7	5.5	24.8	5.1						
28a	3	184.1			Activities											
29	2	18.3		PCT	Activities					3.4						
29	3	14.9		PCT	Activities											
30	2	85.9		PCT/HWD	Activities				0.8							X
30	3	85.1		PCT/HWD	Activities											X
34	2 and 3	29.2		PCT/HWD	Activities											
36	2 and 3	6.9		PCT	Activities							X				
37	2 and 3	0.5	HIM	PCT	Activities	T						X				
38	2 and 3	127.6	HIM	PCT	Activities	T										
39	2 and 3	100.3	HIM	PCT	Activities	T								X		
40	2	41.6	HIM	PCT	Activities	T	0.9									
40	3	40.7	HIM	PCT	Activities	T										
41	2	3.6		PCT	Activities			1.8				X				
42	2	57.5	HIM	PCT	Activities	T		0.1		3.0						
42	3	54.3	HIM	PCT	Activities	T										
43	2	18.1	Firewood/PP	PCT	GP	T		1.1								
43	3	17.0	Firewood/PP	PCT	GP	T										

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
44	2	7.0	Firewood/PP	PCT	GP	T		0.1								
44	3	7.0	Firewood/PP	PCT	GP	T										
44a	2	4.9	Firewood/PP	PCT	GP	T		2.1								
44a	3	2.8	Firewood/PP	PCT	GP	T										
45	2 and 3	13.3	Firewood/PP	PCT	GP	T										
46	2 and 3	4.1	Firewood/PP	PCT	GP	T										
47	2 and 3	4.5		PCT	Activities											
48	2 and 3	22.0		PCT	Activities											
49	2	26.2			Activities					3.2						
49	3	23.1			Activities											
50	2 and 3	33.7	HIM	PCT	Activities	T										
50a	2 and 3	13.5		PCT	Activities											
51	2 and 3	35.1	HIM	PCT	Activities	T										
51a	2 and 3	11.8		PCT	Activities											
52	2 and 3	30.6	HIM	PCT	Activities	T										
52a	2	14.9		PCT	Activities		0.01									
52a	3	14.9		PCT	Activities											
53	2	39.0	HIM	PCT	Activities	T	0.02									
53	3	38.9	HIM	PCT	Activities	T										
54	2 and 3	22.8		PCT	Activities											
55	2 and 3	11.0		PCT	Activities											
56	2 and 3	23.4		PCT	Activities											
57	2 and 3	10.7	HIM	PCT	Activities	T										
59	2 and 3	6.6	HIM	PCT	Activities	T										
59a	2 and 3	36.1	HIM	PCT	GP	T			3.1							
60	2 and 3	14.4	HTH	PCT	Activities	T										
62	2	17.6		PCT	Activities					1.2						
62	3	16.4		PCT	Activities											
63	2	3.3		PCT	Activities					0.7						
64	2 and 3	9.3		PCT	Activities											
66	2 and 3	32.0		PCT	Activities									X		
67	2	102.4			Activities					2.3						
67	3	100.1			Activities											
69	2	9.8	HIM	PCT	Activities	T				0.01						
69	3	9.8	HIM	PCT	Activities	T								X		
70	2	2.6	Firewood/PP	PCT	GP	T			1.0					X		

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
70	3	1.6	Firewood/PP	PCT	GP	T										
71	2	17.8	Firewood/PP	PCT	GP	T			4.9					X		
71	3	13.0	Firewood/PP	PCT	GP	T										
72	2 and 3	16.8		PCT	Activities											
73	2	56.7		PCT	Activities			1.6		6.6						
73	3	48.4		PCT	Activities											
74	2	21.2		PCT	Activities				0.6							
74	3	20.6		PCT	Activities											
75	2 and 3	41.1	HIM	PCT	Activities	T										
76	2 and 3	5.3	HIM	PCT	GP	T										
76a	2 and 3	2.9	HWD	PCT	Activities	T										
77	2 and 3	3.6	HIM	PCT	Activities	T								X		
77a	2 and 3	3.5		PCT	Activities											
77b	2 and 3	1.0	HWD	PCT	Activities	T								X		X
78	2	20.8		PCT	Activities				0.3							
78	3	20.5		PCT	Activities											
78	3	20.5		PCT	Activities											
78a	2 and 3	20.5	HIM	PCT	Activities	T								X		
78b	2 and 3	5.8	HIM	PCT	Activities	T										X
78c	2 and 3	17.0	HIM	PCT	Activities	T								X		
78d	2 and 3	2.9		PCT	Activities											
79	2 and 3	7.4	HIM	PCT	Activities	T										
80	2 and 3	6.0	HIM	PCT	Activities	T										X
81	2 and 3	26.3	HIM	PCT	GP	T								X		
82	2 and 3	17.0	Firewood/PP	PCT	GP	T										
83	2 and 3	4.6	Firewood/PP	PCT	GP	T										
84	2	2.9	Firewood/PP	PCT	GP	T				0.05						
84	3	2.9	Firewood/PP	PCT	GP	T										
85	2 and 3	18.1	HIM	PCT	GP	T										
86	2 and 3	9.0	HIM	PCT	GP	T										
87	2 and 3	48.1		PCT	Activities							X				
88	2 and 3	27.1		PCT	Activities							X				
89	2 and 3	37.3		PCT	Activities											
107	2	29.7	HIM	PCT	Activities	T								X		
107	3	29.7	HIM	PCT	Activities	T								X		
108	2	7.2			Nat Fuels			4.6								

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
108	3	2.6			Nat Fuels											
109	2	14.7			Nat Fuels					2.4						
109	3	12.3			Nat Fuels							X				
110	2 and 3	25.1			Nat Fuels											
111	2	23.5		PCT	Activities			0.01								
111	3	23.5		PCT	Activities											
112	2 and 3	25.9		PCT	Activities											
113	2 and 3	1.7		PCT	Activities											
114	2 and 3	29.1	HTH	PCT	Activities	T										
115	2 and 3	12.3	HIM	PCT	Activities	T										
116	2 and 3	24.7	HIM	PCT	Activities	T										
117	2 and 3	9.5		PCT	Activities											
118	2	26.9		PCT	Activities			0.02				X				
118	3	26.9		PCT	Activities							X				
119	2	140.2		PCT	HP		11.7			6.9		X				
119	3	121.7		PCT	HP							X				
120	2 and 3	7.2	HIM	PCT	Activities	T						X				
121	2 and 3	29.3			Activities											
122	2	45.4		PCT	Activities			1.0								
122	3	44.3		PCT	Activities											
123	2	34.1	HIM	PCT	Activities	T				0.01						
123	3	34.1	HIM	PCT	Activities	T										
123a	2	45.4		PCT	Activities					5.5						
123a	3	39.8		PCT	Activities											
124	2	29.5	HIM	PCT	Activities	T								X		
124	3	29.5	HIM	PCT	Activities	T										
125	2	14.2	HIM	PCT	Activities	T										
125	3	14.2	HIM	PCT	Activities	T										
126	2 and 3	23.9	HIM	PCT	GP	T										
127	2 and 3	35.6	HIM	PCT	Activities	T										
128	2 and 3	12.1	HIM	PCT	Activities	T										
128a	2 and 3	17.5		PCT	Activities											
129	2 and 3	35.8	HTH	PCT	Activities	T										
130	2 and 3	35.9	HIM	PCT	Activities	T								X		
130a	2	18.2		PCT	Activities			2.6								
130a	3	15.6		PCT	Activities											
131	2 and 3	29.5	HIM	PCT	GP											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
132	2 and 3	2.9	HTH	PCT	Activities	T										
133	2 and 3	28.0	HIM	PCT	Activities	T										
134	2	67.6	HIM	PCT	Activities	T				4.7					X	
134	3	62.9	HIM	PCT	Activities	T									X	
135	2	31.3			Activities			0.3								
135	3	31.1			Activities											
136	2	15.7		PCT	Activities			4.3		0.6						
136	3	10.9		PCT	Activities											
137	2 and 3	24.6		PCT	Activities											
138	2 and 3	60.9			Activities											
139	2	22.7			Activities			8.2								
139	3	14.4			Activities											
140	2	32.0	HIM	PCT	GP	T			0.1					X		
140	3	31.8	HIM	PCT	GP	T								X		
141	2 and 3	10.0	HIM	PCT	GP	T										
142	2 and 3	99.8	HIM	PCT	GP	T										X
143	2 and 3	22.9	HIM	PCT	GP	T								X		
143a	2 and 3	17.6		PCT	Activities											
144	2 and 3	23.6	HIM	PCT	GP	T										
145	2 and 3	49.9	HIM	PCT	Activities	T										X
146	2	53.3	HIM	PCT	GP	T			5.2			X				
146	3	48.1	HIM	PCT	GP	T						X				
147	2	7.3			Nat Fuels		0.03			1.4		X				
147	3	5.9			Nat Fuels							X				
148	2 and 3	13.6			Nat Fuels											
149	2 and 3	24.9	HIM	PCT	GP	T						X		X		
150	2 and 3	18.0	HIM	PCT	Activities	T						X				
151a	2 and 3	11.7														
152	2	10.3			Nat Fuels					0.3					X	
152	3	10.0			Nat Fuels										X	
153	2	10.0			Nat Fuels					0.01						
153	3	10.0			Nat Fuels											
154	2	26.9			Nat Fuels					0.2						
154	3	26.7			Nat Fuels											
155	2 and 3	46.2		PCT	Activities											
156	2 and 3	20.3	HIM	PCT	Activities	T										
156a	2	1.4	HWD	PCT	Activities	T										

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
156a	3	1.4	HWD	PCT	Activities	T										
157	2 and 3	17.5	HIM	PCT	Activities	T										
159	2 and 3	36.8	HIM	PCT	Activities	T										
160	2	112.8		PCT	Activities					0.9						
160	3	111.9		PCT	Activities											
161	2 and 3	26.6	HIM	PCT	Activities	T										
162	2	25.8	HIM	PCT	Activities	T				0.01		X				
162	3	25.8	HIM	PCT	Activities	T						X				
162a	2	13.0		PCT	Activities					5.8		X				
162a	3	7.2		PCT	Activities							X				
162b	2	30.5	HIM	PCT	Activities	T				0.01		X				X
162b	3	30.5	HIM	PCT	Activities	T						X				X
163	2 and 3	60.4		PCT	Activities											X
164	2	31.1		PCT	Activities					0.2						
164	3	30.9		PCT	Activities											
166	2	25.0	HIM	PCT	Activities	T				0.01						
166	3	25.0	HIM	PCT	Activities	T										
167	2 and 3	23.6	HTH	PCT	Activities	T										
167a	2 and 3	24.1	HIM	PCT	Activities	T										
168	2 and 3	43.8	HIM	PCT	Activities	T										
169	2	55.7	HIM	PCT	Activities	T		0.01								
169	3	55.7	HIM	PCT	Activities	T										
170	2 and 3	30.7	HIM	PCT	Activities	T										
171	2 and 3	27.1		PCT	Activities											
172	2 and 3	16.2		PCT	Activities											X
173	2 and 3	7.4	HTH	PCT	Activities	T										
174	2 and 3	32.8		PCT	Activities											
175	2 and 3	26.2	HIM	PCT	Activities	T										
176	2 and 3	30.6	HIM	PCT	Activities	T										X
177	2 and 3	29.0		PCT	Activities											
178	2	24.7	HIM	PCT	Activities	T		0.00						X		
178	3	24.7	HIM	PCT	Activities	T										
179	2 and 3	6.9	HTH	PCT	Activities	T										
180	2	16.0	HTH	PCT	Activities	T				1.2						
180	3	14.8	HTH	PCT	Activities	T										
181	2 and 3	9.1		PCT	Activities											
182	2	506.4			Activities					3.1						

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
182	3	503.3			Activities											
183	2	24.4		PCT	Activities					4.3						
183	3	20.1		PCT	Activities											
183a	2	47.5		JUT	Activities					0.9						
183a	3	46.7		JUT	Activities											
184a	2	167.0		PCT/HWD	Activities		19.9			3.4					X	
184a	3	143.7		PCT/HWD	Activities										X	
185	2	119.3			Activities		25.7			2.8					X	X
185	3	90.8			Activities											
186	2	8.9		PCT	Activities					2.3						
186	3	6.6		PCT	Activities											
187	2 and 3	5.7		PCT	Activities											
188	2 and 3	36.8		JUT	Activities											
189	2	79.7		PCT	Activities					18.0						
189	3	61.7		PCT	Activities											
190	2	17.6	HTH	PCT	Activities	T		0.01								
190	3	17.5	HTH	PCT	Activities	T										
190a	2	12.3		PCT	Activities			0.02								
190a	3	12.3		PCT	Activities											
191	2	16.6		PCT	Activities					2.4						
191	3	14.2		PCT	Activities											
192	2	5.6		PCT	Activities					1.5						
192	3	4.1		PCT	Activities											
193	2 and 3	3.9		PCT	Activities											
194	2	53.5		PCT	Activities					10.2						
194	3	43.2		PCT	Activities											
195	2 and 3	11.6		PCT	Activities											
196	2	10.8		PCT	Activities					0.03						
196	3	10.8		PCT	Activities											
197	2	15.3		PCT	Activities				5.1							
197	3	10.2		PCT	Activities											
198	2 and 3	4.2		PCT	Activities											
199	2 and 3	6.0		PCT	Activities											
200	2 and 3	1.6		PCT	Activities											
201	2	25.8		PCT	Activities					7.3						
201	3	18.4		PCT	Activities											
202	2	41.4	HTH	PCT	Activities	T				0.9						

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
202	3	40.4	HTH	PCT	Activities	T										
202a	2	13.6		PCT	Activities			2.2								
202a	3	11.4		PCT	Activities											
202b	2	8.3		PCT	Activities					2.4						
202b	3	5.9		PCT	Activities											
202c	2	4.8	HWD	PCT	Activities	T				1.3						
202c	3	3.5		PCT	Activities	T										
202d	3	1.3	HWD	HP												
203	2	7.4	HTH	PCT	Activities	T				0.3						X
203	3	7.2	HTH	PCT	Activities	T										X
203a	2	7.3		PCT	Activities					2.1						
203a	3	5.2		PCT	Activities											
204	2	23.6		PCT	Activities					2.7						
205	2 and 3	12.6	HTH	PCT	Activities	T										
205a	2	9.9		PCT	Activities					1.8						
205a	3	8.1		PCT	Activities											
205b	2	12.4		PCT	Activities					2.5						
205b	3	9.9		PCT	Activities											
206	3	9.0	HIM	PCT	Activities	T										
206a	2	10.4						0.00		1.2						
206a	3	9.2														
207	2	14.8	HIM	PCT	Activities	T										
207	3	15.6	HIM	PCT	Activities	T										X
208	2	25.4	HIM	PCT	Activities	T		0.3								
208	3	25.1	HIM	PCT	Activities	T										
209	2	86.3		PCT	Activities					0.2						
209	3	86.1		PCT	Activities											
210	2	40.9	HIM	PCT	Activities	T				2.0						
210	3	39.0	HIM	PCT	Activities	T										
211	2 and 3	28.8	HIM	PCT	Activities	T										
212	2	11.3	HIM	PCT	Activities	T			0.7							
212	3	10.6	HIM	PCT	Activities	T										
213	2	16.8	HIM	PCT	Activities	T				2.4						X
213	3	13.6	HIM	PCT	Activities	T										
213a	2	10.2	HIM	PCT	Activities	T				0.2						
213a	3	10.0	HIM	PCT	Activities	T										
214	2	24.5	HIM	PCT	Activities	T				2.4					X	

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
214	3	22.1	HIM	PCT	Activities	T									X	
214a	2	72.0	HWD	PCT	Activities	T				8.1						
214a	3	63.8			Activities											
214b	2	3.0		PCT	Activities					0.4						
214b	3	2.6	HNT	PCT	Activities											
214c	2	3.6	HWD	PCT	Activities	T				0.9					X	
214c	3	2.7	HWD	PCT	Activities	T									X	
214d	3	0.9		HWD	HP											
215	2	24.3	HIM	PCT	Activities	T				1.1					X	
215	3	23.2	HIM	PCT	Activities	T									X	
215a	2 and 3	8.1	HIM	PCT	Activities	T									X	
215b	2	31.1		PCT	Activities					1.9						
215b	3	29.2		PCT	Activities											
216	2 and 3	16.5		PCT	Activities											
217	2	7.0		PCT	Activities					1.7						
217	3	5.3		PCT	Activities											
218	2 and 3	44.4		HWD	HP				39.0	0.2				X		X
219	2 and 3	2.9		PCT	Activities											
220	2	65.6		PCT	Activities			1.7		2.2		X			X	
220	3	61.7		PCT	Activities							X			X	
221	2 and 3	10.9	HIM	PCT	Activities	T						X				
222	2 and 3	37.8		PCT	Activities											
223b	2 and 3	47.1	HIM	PCT	Activities	T						X		X		
224	2 and 3	21.6	HIM	PCT	Activities	T						X				
224a	2	21.5		PCT	Activities					0.3		X				
224a	3	21.2		PCT	Activities							X				
224b	2	3.2	HIM	PCT	Activities	T				0.7						
224b	3	2.5	HIM	PCT	Activities	T										
224c	2	11.8	HIM	PCT	Activities	T				3.0						
224c	3	8.8	HIM	PCT	Activities	T										
224d	2	4.2	HWD	PCT	Activities	T				0.6						
224d	2	3.6	HWD	PCT	Activities	T										
224e	3	0.6		HWD	HP											
225	2	18.6		PCT	Activities					3.5						
225	3	15.1		PCT	Activities											
226	2	46.4	HIM	PCT	Activities	T			1.2							

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
226	3	45.2	HIM	PCT	Activities	T										
226a	2 and 3	14.3		PCT	Activities											
227	2 and 3	12.4		PCT	Activities							X				
228	2	10.1		PCT	Activities					0.01		X				
228	3	10.1		PCT	Activities							X				
229	2 and 3	4.6	HIM	PCT	Activities	T										
230	2 and 3	64.9	HIM	PCT	Activities	T										
231	2	41.4		PCT	Activities				1.3							
232	Alt 2	13.5		PCT	Activities					1.6						
232	Alt 3	11.9		PCT	Activities											
233	2	18.1	HIM	PCT	Activities	T				0.4						
233	3	17.7	HIM	PCT	Activities	T										
234	2	10.3	HIM	PCT	Activities	T			0.02							
234	3	10.3	HIM	PCT	Activities	T										
235a	2	41.2	HIM	PCT	Activities	T			0.2							
235a	3	41.0	HIM	PCT	Activities	T										
235b	2 and 3	6.2	HIM	PCT	Activities	T										
235c	2 and 3	2.8		PCT	Activities											
236	2	12.9		PCT	Activities				8.2					X		
236	3	4.7		PCT	Activities									X		
237	2	10.4		PCT	Activities					0.2		X				
237	3	10.2		PCT	Activities							X				
237a	2 and 3	3.1		HWD	HP			1.3		1.0		X				
237b	2	8.3	HWD	PCT	Activities	T		2.0				X				
237b	3	6.4	HWD	PCT	Activities	T						X				
237c	3	2.0		HWD	HP							X				
239	2	15.1			Activities					0.6						
239	3	14.6			Activities											
240	2	28.9			Activities			3.2		4.5					X	
240	3	21.2			Activities											
241	2	18.1		PCT/HWD	Activities			0.2								
241	3	17.9		PCT/HWD	Activities											
242	2	56.3			Activities			26.4	1.7	1.5						X
242	3	26.7			Activities											X
243	2	34.9			Activities					5.5						
243	3	29.4			Activities											
244	2	9.2		PCT	Activities					1.5						

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
244	3	7.7		PCT	Activities											
245	2 and 3	17.5	HIM	PCT	Activities	T						X				
246	2 and 3	18.8	HIM	PCT	Activities	T										
247	2	19.7		PCT	Activities			5.8				X				
247	3	13.9		PCT	Activities							X				
248	2	20.6		PCT	Activities			1.0				X				
248	3	19.6		PCT	Activities							X				
249	2 and 3	6.9			Activities											
250	2 and 3	11.8			Activities											
251	2 and 3	26.9		PCT	Activities							X				
252	2 and 3	19.8	HIM	PCT	Activities	T						X				
253	2 and 3	63.8	HIM	PCT	Activities	T						X		X		
254	2 and 3	33.6	HIM	PCT	Activities	T										
255	2 and 3	35.2	HIM	PCT	Activities	T										
256	2 and 3	24.0		PCT	Activities											
257	2 and 3	48.8	HIM	PCT	Activities	T										X
257a	2	3.5		PCT	Activities											
257a	3	3.5		PCT	Activities											
258	2 and 3	20.7	HIM	PCT	Activities	T										
259	2	31.6		PCT	Activities					4.5						
259	3	27.0		PCT	Activities											
260	2 and 3	36.3			Nat Fuels											
261	2	20.0	HIM	PCT	GP	T	0.02			0.00						
261	3	20.0	HIM	PCT	GP	T										
262	2	24.5		PCT	Activities					4.8					X	
262	3	19.6		PCT	Activities										X	
263	2	30.6		PCT/HWD	Activities			18.9	0.01	1.2					X	
263	3	10.4		PCT/HWD	Activities											
264	2	15.8		PCT	Activities			6.4	0.01	1.0						
264	3	8.5		PCT	Activities											
265	2	69.2		PCT	Activities				0.01	0.7						
265	3	68.4		PCT	Activities											
265a	2	12.5		PCT	Activities				0.01							
265a	3	12.5		PCT	Activities											
266	2	60.8		PCT	Activities				0.01	5.6						

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
266	3	55.2		PCT	Activities											
267	2	48.7		PCT	Activities				3.6							
267	3	45.1		PCT	Activities											
268	2	27.8		PCT	Activities				0.3							
268	3	27.5		PCT	Activities											
269	2	7.3		PCT	Activities					2.1		X				
269	3	5.2		PCT	Activities							X				
270	2 and 3	39.9			Activities							X				X
271	2 and 3	35.4			Activities							X				
272	2 and 3	4.3			Activities											
273	2 and 3	23.3			Activities											
274	2	24.2			Activities					1.1						
274	3	23.0			Activities											
275	2	26.5			Activities				4.7							
275	3	21.8			Activities											
276	2	7.7			Activities				0.1							
276	3	7.6			Activities											
277	2 and 3	8.1			Activities											
278	2 and 3	5.8			Activities											
281	2	29.0			Activities			0.6		1.2						
281	3	27.1			Activities											
282	2	6.6			Activities		1.7	0.7								
282	3	4.2			Activities											
283	2 and 3	33.1			Activities											
284	2 and 3	11.4			Activities											
285	2 and 3	6.0			Activities											
286	2	218.6			Nat Fuels					2.2						
286	3	216.4			Nat Fuels											
287	2	96.0			Nat Fuels					1.1		X				
287	3	94.9			Nat Fuels							X				
288	2	47.3			Nat Fuels		7.3			2.5		X		X		
289	2	22.5			Nat Fuels				5.4							
289	3	22.5			Nat Fuels											
290	2	21.5			Activities					4.5						
290	3	16.9			Activities											
291	2	31.6			Activities			8.7							X	
291	3	22.9			Activities											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
292	2	16.9			Activities			6.3								
292	3	10.7			Activities											
293	2 and 3	26.7			Activities											
294	2 and 3	11.4			Activities											
295	2	51.5			Activities					5.6						
295	3	45.8			Activities											
296	2 and 3	1.8			Activities											
297	2	10.1			Nat Fuels				7.7							
297	3	2.4			Nat Fuels											
298	2	45.0			Activities		3.7			3.0						
298	3	38.3			Activities											
299	2	9.1	HTH	PCT	Activities	T/WL			4.4					X		
299	3	4.5	HTH	PCT	Activities	T/WL								X		
299a	2	3.5	HWD	PCT	Activities	T/WL			3.5					X		
299a	3	7.1		HWD	HP				3.5					X		
300	2	32.0	HTH	PCT	Activities	T/WL			9.4					X		
300	3	22.5	HTH	PCT	Activities	T/WL								X		
301	2	26.3		PCT	Activities				10.5							
301	3	15.8		PCT	Activities											
302	2	31.6	HTH	PCT	Activities	T			0.02					X		
302	3	31.6	HTH	PCT	Activities	T								X		
302a	2	3.3	HWD	PCT	Activities	T/WL			1.7					X		
302a	3	3.3		HWD	HP				1.7					X		
302b	2	14.7		PCT	Activities				13.0							
302b	3	1.7		PCT	Activities											
303	2	32.1		PCT	Activities				20.6							
303	3	11.6		PCT	Activities											
304	2	6.9	HTH	PCT	Activities	T/WL				0.9				X		
304	3	6.0	HTH	PCT	Activities	T/WL								X		
305	2	6.6	HTH	PCT	Activities	T			0.1					X		
305	3	6.4	HTH	PCT	Activities	T								X		
306	2	2.8	HTH	PCT	Activities	T			2.5					X		
306a	2	1.9		PCT	Activities				1.9							
307	2	2.1		PCT	Activities				1.1							
308	2 and 3	2.8		PCT	Activities											
309	2 and 3	1.6		PCT	Activities											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
310	2 and 3	80.1		PCT	Activities	T/WL								X		
310a	2	65.0	HIM	PCT	Activities	T/WL				11.9				X		
310a	3	53.1	HIM	PCT	Activities	T/WL								X		
311	2 and 3	4.5		PCT	Activities											
312	2	30.2			Activities				10.0							
312	3	20.2			Activities											
313	2	78.7	HTH	PCT	Activities	T				3.4						
313	3	75.3	HTH	PCT	Activities	T										
314	2	27.3	HTH	PCT	Activities	T/WL				0.1						
314	3	27.2	HTH	PCT	Activities	T/WL										
314a	2	21.7		PCT	Activities					7.4						
314a	3	14.3		PCT	Activities											
315	2	89.1		PCT	Activities		2.6		16.7	4.1						X
315	3	65.7		PCT	Activities											
316	2	30.6		PCT	Activities		0.01			0.01						
316	3	30.5		PCT	Activities											
317	2	23.6	HTH	PCT	Activities	T				0.7						
317	3	22.9	HTH	PCT	Activities	T										
318	2	45.0	HIM	PCT	Activities	T				2.1						
318	3	42.9	HIM	PCT	Activities	T										
318a	2	34.7		PCT	Activities					3.7						
318a	3	31.0		PCT	Activities											
319	2	50.0		PCT	Activities		6.2									
319	3	43.7		PCT	Activities											
320	2	56.5		PCT	Activities		8.9			5.1				X		
320	3	42.4		PCT	Activities									X		
321	2	28.5		PCT	Activities		3.6									
321	3	24.9		PCT	Activities											
322	2	55.7			Activities				16.9						X	
322	3	38.8			Activities										X	
323	2 and 3	12.2		PCT/HWD	Activities											X
324	2	135.1			Nat Fuels			1.2	14.7	4.7					X	X
324	3	114.6			Nat Fuels										X	X
325	2 and 3	23.4		PCT	Activities											
326	2	35.5	HIM	PCT	Activities	T				2.4						
326	3	31.4	HIM	PCT	Activities	T										
326a	2	51.4	HIM	PCT	Activities	T				0.02				X		

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
326a	3	53.1	HIM	PCT	Activities	T								X		
327	2	12.9	HIM	PCT	Activities	T/WL			1.6					X		
327	3	11.3	HIM	PCT	Activities	T/WL										
328	2	90.1		PCT	Activities					2.5						
328	3	87.6		PCT	Activities											
329	2	20.3		PCT	Activities			4.2								
329	3	16.1		PCT	Activities											
330	2 and 3	20.7		PCT	Activities											
331	2 and 3	105.0		PCT	Activities							X				
332	2 and 3	56.4			Activities											
333	2	7.7		PCT	Activities					3.3						
333	3	4.3		PCT	Activities											
334	2	27.5	HIM	PCT	Activities	T				0.6						
334	3	26.9	HIM	PCT	Activities	T										
334a	2	22.4	HWD	PCT	Activities	T				3.9				X		
334a	3	18.2	HWD	PCT	Activities	T								X		
334b	2 and 3	8.6	HWD	PCT	Activities	T										
334c	2	23.6	HIM	PCT	Activities	T				4.6				X		
334c	3	19.0	HIM	PCT	Activities	T								X		
334d	3	3.9		HWD	HP											
335	2 and 3	18.0	HTH	PCT	Activities	T										
336	2 and 3	6.8	HTH	PCT	Activities	T								X		
337	2 and 3	26.8		PCT	Activities											
338	2 and 3	37.2		PCT	Activities											
341	2	14.0		PCT	Activities					3.1						
341	3	10.8		PCT	Activities											
342	2	69.8		PCT/HWD	Activities		6.6									
342	3	63.2		PCT/HWD	Activities											
343	2	109.2		PCT	Activities		0.01									
343	3	109.1		PCT	Activities											
344	2 and 3	65.1		PCT	Activities											
345	2 and 3	12.7		PCT	Activities											
346	2 and 3	43.2		PCT	Activities											
347	2	10.2		PCT	Activities				2.4							
347	3	7.8		PCT	Activities											
348	2	15.9		PCT	Activities				5.7							
348	3	10.2		PCT	Activities											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
349	2 and 3	3.9		PCT	Activities											
350	2 and 3	54.3		PCT	Activities										X	
351	2 and 3	24.4	HIM	PCT	Activities	T/WL									X	
352	2	18.7	HIM	PCT	Activities	T				1.6				X		
352	3	17.1	HIM	PCT	Activities	T								X		
353	2	113.3	HIM	PCT	Activities	T				0.4					X	X
353	3	112.9	HIM	PCT	Activities	T									X	X
354	2 and 3	69.1	HIM	PCT	Activities	T									X	
354a	2	12.7		PCT	Activities											
354a	3	12.7		PCT	Activities											
355	2	48.7	HIM	PCT	HP	T			2.9	2.3				X	X	X
355	3	38.3	HIM	PCT	HP	T								X	X	X
335a	2 and 3	6.2	HWD	PCT	Activities	T										
356	2 and 3	18.1	HIM	PCT	Activities	T									X	
356a	2 and 3	14.5		PCT	Activities											
357	2	30.1	HIM	PCT	Activities	T/WL				5.2					X	X
357	3	24.8	HIM	PCT	Activities	T/WL									X	X
357a	2	4.2	HWD	PCT	Activities	T/WL				1.1						
357a	3	3.1	HWD	PCT	Activities	T/WL										
357b	3	1.1		HWD	HP											X
358	2	21.0	HTH	PCT	Activities	T				0.8				X		
358	3	20.2	HTH	PCT	Activities	T								X		
359	2 and 3	15.2		PCT	Activities											
360	2	32.5	HIM	PCT	Activities	T/WL				3.5						
360	3	29.1	HIM	PCT	Activities	T/WL										
361	2 and 3	19.7			Activities											
371	2 and 3	59.3	HIM	PCT	Activities	T								X		
372	2 and 3	19.8	HIM	PCT	Activities	T										
373	2	46.5		PCT	Activities		0.02									
373	3	46.5		PCT	Activities											
374	2	87.5		PCT	Activities					1.8						
374	3	85.7		PCT	Activities											
375	2	166.1		PCT	Activities			2.1		14.7						
376	2 and 3	30.1		PCT	Activities											
377	2 and 3	11.4	HIM	PCT	Activities	T										
378	2 and 3	11.1	HIM	PCT	Activities	T										
379	2 and 3	22.1		PCT	Activities		0.01									

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
380	2 and 3	31.6		PCT	Activities											
381	2 and 3	27.2	HIM	PCT	Activities	T										
382	2 and 3	11.6		PCT	Activities											
383	2 and 3	104.3		PCT	Activities											
384	2 and 3	147.9		PCT	Activities											
385	2 and 3	17.9		PCT	Activities											
386	2	68.0		PCT	Activities					4.3		X				
386	3	63.7		PCT	Activities							X				
387	2	87.7		PCT	Activities					4.0		X				
387	3	83.8		PCT	Activities							X				
388	2	103.6	HIM	PCT	Activities	T				3.5		X		X		X
388	3	100.2	HIM	PCT	Activities	T						X				X
388a	2	150.2		PCT	Activities				17.2	2.7		X				
388a	3	130.2		PCT	Activities							X				
389	2 and 3	25.7			Activities							X				
390	2 and 3	58.6			Activities									X		
391	2	54.2			Activities					3.1						
391	3	51.1			Activities											
392	2 and 3	55.9			Nat Fuels											
392a	2 and 3	29.6			Activities											
393	2	85.7			Activities					6.8						
393	3	78.9			Activities											
393a	2	3.0	HWD	PCT	Activities	T/WL				0.9				X		
393a	3	2.1	HWD	PCT	Activities	T/WL								X		
393b	3	0.9		HWD	HP									X		
394	2	241.6			Activities		15.2		1.3	12.9		X				
394	3	47.1			Activities							X				
395	2	8.8		PCT	Activities					3.0						
395	3	5.8		PCT	Activities											
396	2	184.5		PCT/HWD	Activities		8.8	3.5		6.8		X			X	
396	3	165.5		PCT/HWD	Activities							X				
396a	2 and 3	16.5		PCT	Activities											
397	2	32.1	HIM	PCT	Activities	T	0.05					X				
397	3	32.1	HIM	PCT	Activities	T						X				
397a	2	25.0		PCT	Activities				1.7			X		X		
397a	3	23.3		PCT	Activities							X				

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
398	2	5.7		PCT/HWD	Activities					2.7		X				
398	3	3.0		PCT/HWD	Activities							X				
399	2	13.8		PCT/HWD	Activities					5.8						
399	3	8.0		PCT/HWD	Activities											
399a	2	71.1		PCT/HWD	Activities					3.1						
399a	3	68.0		PCT/HWD	Activities											
400	2	12.1	HIM	PCT	Activities	T	3.4									
400	3	8.7	HIM	PCT	Activities	T										
401	2 and 3	23.8	HIM	PCT	Activities	T								X		
402	2	54.7		PCT/HWD	Activities		7.3								X	
402	3	47.4		PCT/HWD	Activities											
403	2 and 3	26.6			Activities											
404	2 and 3	34.9			Activities											
405	2 and 3	24.3			Activities											
406	2	30.7			Activities				0.03	0.3						
406	3	30.4			Activities											
407	2 and 3	14.5			Activities											
408	2	306.2			Activities			1.2		8.0						
408	3	297.1			Activities											
409	2 and 3	2.8			Activities											
413	2	21.1			Activities					3.5						
413	3	17.6			Activities											
414	2 and 3	18.6		PCT	Activities											
415	2	46.9	Firewood/PP	PCT	GP	T				2.2				X		X
415	3	44.7	Firewood/PP	PCT	GP	T								X		X
416	2 and 3	14.4	HIM	PCT	Activities	T								X		
417	2	17.4	HTH	PCT	Activities	T		4.2						X	X	
417	3	13.2	HTH	PCT	Activities	T								X	X	
418	2 and 3	5.8	HTH	PCT	Activities	T/WL								X		
419	2	11.4		JUT	Activities				0.8							
419	3	10.6		JUT	Activities											
420	2 and 3	17.3	HIM	PCT	Activities	T								X		
420a	2 and 3	15.8		PCT	Activities											
420b	2	13.0		PCT	Activities			0.1								
420b	3	12.9		PCT	Activities											
420c	2 and 3	1.0	HWD	PCT	Activities	T										

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
420d	2 and 3	1.0	HWD	PCT	Activities	T								X		
421	2	2.3		PCT	Activities			0.2								
421	3	2.1		PCT	Activities											
422	2 and 3	2.8	HTH	PCT	Activities	T										
423	2	4.4	HTH	PCT	Activities	T/WL			0.3					X		
423	3	4.2	HTH	PCT	Activities	T/WL										
424	2	70.3		PCT	Activities					2.5						
424	3	67.8		PCT	Activities											
425	2 and 3	12.3	Firewood/PP	PCT	GP	T										
426	2	18.4	Firewood/PP	PCT	GP	T				0.2						
426	3	18.2	Firewood/PP	PCT	GP	T										
427	2	15.6		PCT	Activities			4.3								
427	3	11.3		PCT	Activities											
428	2	179.4		PCT/HWD	Activities					3.0						
428	3	176.4		PCT/HWD	Activities											
429	2 and 3	39.4			Activities											
430	2	54.5			Activities					3.8						X
430	3	50.7			Activities											X
431	2 and 3	2.4			Activities											
432	2	19.1			Activities			0.8								
433	2 and 3	8.5			Activities											
434	2 and 3	30.6			Activities										X	
435	2 and 3	20.3	HIM	PCT	Activities	T										
436	2 and 3	19.7	HIM	PCT	Activities	T										
436a	2	46.2		PCT	Activities					0.9						
436a	3	45.3		PCT	Activities											
436b	2 and 3	6.3	HWD	PCT	Activities	T										
437	2	76.4		PCT/HWD	Activities					3.8						
437	3	72.6		PCT/HWD	Activities											
438	2 and 3	34.9			Activities											X
439	2	810.2			Activities			18.2	8.9	17.9		X			X	
439	3	765.3			Activities							X			X	
439a	2	170.3			Activities							X				
439a	3	169.4			Activities					0.9		X				
441	2 and 3	6.0			Activities											
442	2	9.6	Firewood/PP	PCT	GP	T		0.1	0.02							

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
442	3	9.4	Firewood/PP	PCT	GP	T										
443	2	15.1	HIM	PCT	Activities	T/WL		0.01								
443	3	15.1	HIM	PCT	Activities	T/WL										
443a	2	9.2	HIM	PCT	Activities	T				2.4				X		
443a	3	6.8	HIM	PCT	Activities	T								X		
444	2	20.9		PCT/HWD	Activities			20.0								
444	3	0.9		PCT/HWD	Activities											
445	2 and 3	24.1	Firewood/PP	PCT	GP	T										
446	2 and 3	33.7	HIM	PCT	Activities	T								X		
447	2	41.4	HIM	PCT	Activities	T		0.01								
447	3	41.4	HIM	PCT	Activities	T										
448	2 and 3	29.3			Activities											
449	2	245.9			Activities			0.1		0.4		X				
449	3	245.5			Activities							X				
452	2	218.9			Activities		14.2	2.4							X	
452	3	202.4			Activities											
453	2 and 3	36.6		PCT	Activities											
454	2 and 3	29.0	HTH	PCT	Activities	T										
454a	2	45.8	HTH	PCT	Activities	T				0.1				X		
454a	3	45.7	HTH	PCT	Activities	T								X		
455	2	52.6	HIM	PCT	Activities	T				0.01				X		
455	3	52.6	HIM	PCT	Activities	T								X		
456	2 and 3	15.8	HIM	PCT	Activities	T										
457	2 and 3	15.2		PCT	Activities											
458	2	113.8			Activities		4.7			2.4						
458	3	106.7			Activities											
459	2 and 3	22.4			Activities											
460	2 and 3	34.9		PCT	Activities											
462	2 and 3	25.1			Activities											
463	2 and 3	4.9			Activities											
464	2 and 3	35.8			Activities							X				
465	2	55.9	HIM	PCT	Activities	T/WL			9.3	1.3				X		
465	3	27.6	HIM	PCT	Activities	T/WL										
466	2 and 3	10.9		PCT	Activities											
467	2	53.7		PCT/HWD	Activities				7.8							
467	3	45.9		PCT/HWD	Activities											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
468	2	73.1			Activities			41.5		3.1					X	
468	3	28.5			Activities											
469	2 and 3	8.0			Activities											
470	2	422.7			Nat Fuels		37.8	3.9		5.9					X	
470	3	375.2			Nat Fuels										X	
471	2 and 3	44.8			Activities										X	
472	2	40.3	HTH	PCT	Activities	T				1.8		X				
472	3	38.5	HTH	PCT	Activities	T						X				
473	2	103.4		PCT	Activities			65.2						X		
473	3	38.2		PCT	Activities											
474	2 and 3	7.0			Activities											
475	2	40.9			Activities				8.7						X	
475	3	32.2			Activities										X	
477	2 and 3	20.1	HIM	PCT	Activities	T										
478	2 and 3	8.2	HIM	PCT	Activities	T										
478a	2	33.9		PCT	Activities					6.1						
478a	3	27.7		PCT	Activities											
479	2	6.1			Activities					0.5						
479	3	5.6			Activities											
480	2	50.4			Activities				0.4	0.2						
480	3	49.8			Activities											
481	2	48.9		PCT	Activities					0.5						
481	3	48.4		PCT	Activities											
482	2 and 3	47.6	HIM	PCT	GP	T										
483	2 and 3	13.5			Activities											
484	2 and 3	22.6	HIM	PCT	Activities	T										
485	2 and 3	14.8	HIM	PCT	Activities	T/WL										
486	2	72.9			Activities					6.4						
486	3	66.5			Activities											
487	2	110.1			Activities					7.4						
487	3	102.8			Activities											
488	2	75.7	HIM	PCT	Activities	T/WL				2.6						
488	3	73.0	HIM	PCT	Activities	T/WL										
488a	2	66.7		PCT	Activities					0.3						
488a	3	66.5		PCT	Activities											
489	2 and 3	21.4			Activities											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
490	2	22.8		PCT	HP					0.02						X
490	3	22.8		PCT	HP											X
491	2	20.3	Firewood/PP	PCT	GP	T				0.01				X		
491	3	20.2	Firewood/PP	PCT	GP	T								X		
492	2	22.4		PCT	HP					0.03				X		X
492	3	22.3		PCT	HP									X		X
493	2 and 3	8.3		PCT	HP											
494	2	21.3	HIM	PCT	GP	T		0.1		1.6		X				
494	3	21.2	HIM	PCT	GP	T						X				
495	2 and 3	28.8	HIM	PCT	Activities	T						X				
496	2 and 3	36.0	HTH	PCT	Activities	T								X		
496a	2 and 3	2.5	HWD	PCT	Activities	T								X		
498	2 and 3	4.7		PCT	HP											
499	2 and 3	65.6	HIM	PCT	GP	T										
500	2 and 3	14.5	HIM	PCT	Activities	T										
501	2	10.2	HIM	PCT	Activities	T/WL				2.7				X		
501	3	7.5	HIM	PCT	Activities	T/WL								X		
501a	2	5.7	HWD	PCT	Activities	T/WL				1.7				X		
501a	3	3.9	HWD	PCT	Activities	T/WL								X		
501b	3	1.7		HWD	HP									X		
502	2	52.4	HIM	PCT	Activities	T/WL				4.1				X		
502	3	48.5	HIM	PCT	Activities	T/WL								X		
503	2 and 3	27.3		PCT	Activities											
504	2 and 3	7.4		PCT	Activities											
505	2 and 3	12.5	HIM	PCT	Activities	T										
506	2 and 3	29.8	HIM	PCT	Activities	T										
506a	2 and 3	12.3	HIM	PCT	GP	T										X
507	2 and 3	20.1	HIM	PCT	Activities	T								X	X	
508	2 and 3	11.5	HIM	PCT	Activities	T										
509	2 and 3	40.7	HIM	PCT	Activities	T/WL								X		
509a	2 and 3	13.9		PCT	Activities											
510	2	107.2		PCT	Activities					11.2						
510	3	96.1		PCT	Activities											
511	2	15.2		PCT	Activities				1.0							
511	3	14.3		PCT	Activities											
512	2 and 3	11.1		PCT	Activities											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
513	2 and 3	28.3	HIM	PCT	Activities	T										
514	2	40.8			Activities					1.7						
514	3	39.1			Activities											
515	2 and 3	39.1		PCT	Activities											
516	2	15.3	HIM	PCT	Activities	T				1.0						
516	3	14.3	HIM	PCT	Activities	T										
517	2 and 3	11.2		PCT	Activities											
518	2	12.0	HIM	PCT	Activities	T				0.1						
518	3	11.9	HIM	PCT	Activities	T										
519	2 and 3	24.3		PCT	HP											X
520	2 and 3	7.5	HIM	PCT	Activities	T										
521	2 and 3	20.7		PCT	HP									X	X	
522	2 and 3	3.8		PCT	HP											
523	2	61.5		PCT	HP											X
523	3	61.5		PCT	HP											X
524	2 and 3	46.6	HIM	PCT	Activities	T										
526	2	34.4	HTH	PCT	GP	T				1.5				X		
526	3	32.9	HTH	PCT	GP	T										
527	2 and 3	20.4		PCT	HP							X				
528	2	30	HIM	PCT	Activities	T				3.0						
528	3	27	HIM	PCT	Activities	T										
529	2 and 3	9.7	HIM	PCT	Activities	T										
530	2 and 3	16.5		PCT	HP											
531	2 and 3	5.9		PCT	HP											
533	2 and 3	20.6		PCT	Activities											
534	2 and 3	44.9	HIM	PCT	GP	T										X
535	2	9.4		PCT	Activities					2.1						
535	3	7.3		PCT	Activities											
536	2 and 3	26.2		PCT	Activities											X
537	2	13.3	HWD	PCT	Activities	T/WL				4.1				X		X
537	3	9.1	HWD	PCT	Activities	T/WL								X		X
537a	3	4.1		HWD	HP									X		X
600	2	12.6	HIM	PCT	Activities	T				0.04						
600	3	12.6	HIM	PCT	Activities	T										
602	2	58.1		PCT	Activities					0.04						
602	3	58.1		PCT	Activities											

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
603	2 and 3	2.5	HWD	PCT	Activities	T/WL										
604	2	8.0	HWD	PCT	Activities	T				2.7		X				
604	3	5.3	HWD	PCT	Activities	T						X				
604a	3	5.4		HWD	HP					2.7		X				
605	2	5.5	HWD	PCT	Activities	T/WL			3.1	1.4				X		
605	3	0.9	HWD	PCT	Activities	T/WL								X		
605b	3	2.7		HWD	HP					1.4				X		
633	2 and 3	14.6		JUT												
634	2 and 3	2.4		HWD	HP			1.2								
635	2 and 3	1.5		HWD	HP					0.7				X		
636	2	5.2	HWD	PCT	Activities	T				1.9						
636	3	3.3	HWD	PCT	Activities	T										
636a	3	3.8		HWD	HP					1.9						
637	2 and 3	1.0		HWD	HP					0.5						
638	2 and 3	1.7		HWD	HP											
639	2 and 3	1.0		HWD	HP				0.9							
640	2 and 3	1.0		HWD	HP			0.3	0.3					X		
641	2 and 3	4.7		HWD	HP			1.0	3.3					X		
642	2 and 3	3.8		HWD	HP			1.9						X		
643	2 and 3	1.0		HWD	HP			0.05							X	
644	2 and 3	1.0		HWD	HP			0.8		0.1		X				
645	2 and 3	2.0		HWD	HP			1.0						X		
649	2 and 3	1.0		HWD	HP					0.5						
650	2 and 3	1.0		HWD	HP					0.5				X		
651	2 and 3	1.0		HWD	HP			1.0								
652	2 and 3	1.0		HWD	HP					0.03						
653	2 and 3	1.0		HWD	HP											
654	2 and 3	1.0		HWD	HP					0.2						
655	2 and 3	1.0		HWD	HP					0.5				X		
656	2 and 3	1.0		HWD	HP					0.1				X		
657	2 and 3	1.0		HWD	HP					0.4				X		
658	2 and 3	1.0		HWD	HP			0.9								
659	2 and 3	2.0		HWD	HP			1.7								
660	2 and 3	1.0		HWD	HP					0.5				X		
661	2 and 3	1.0		HWD	HP											
662	2 and 3	9.1		HWD	HP					3.5				X		

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements		
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Recreation Sites
663	2 and 3	1.0		HWD	HP					0.5						
664	2 and 3	1.0		HWD	HP											
665	2 and 3	1.0		HWD	HP					0.1				X		
666	2 and 3	1.0		HWD	HP							X				
667	2 and 3	1.0		HWD	HP					0.5						
668	2 and 3	1.0		HWD	HP							X				
669	2 and 3	1.0		HWD	HP					0.3		X				
670	2 and 3	1.0		HWD	HP					0.5		X		X		
671	2	0.9		HWD	HP					0.5				X		
672	2 and 3	1.0		HWD	HP		0.2									
673	2 and 3	1.0		HWD	HP											
674	2 and 3	1.0		HWD	HP											
675	2 and 3	2.0		HWD	HP			1.0								
676	2 and 3	1.0		HWD	HP					0.4						
677	2 and 3	1.0		HWD	HP											
678	2 and 3	2.0		HWD	HP			1.0								
679	2 and 3	2.0		HWD	HP		1.0									
680	2 and 3	0.7		HWD	HP											
681	2 and 3	1.0		HWD	HP					0.5						
682	2 and 3	2.0		HWD	HP		1.0									
683	2 and 3	2.0		HWD	HP		1.0									
684	2 and 3	2.0		HWD	HP		1.0							X		
685	2 and 3	2.0		HWD	HP		1.0								X	X
686	2 and 3	4.5		HWD	HP		1.9								X	
687	2 and 3	2.6		HWD	HP					0.8				X		
688	2 and 3	1.8		HWD	HP											
689	2 and 3	1.9		HWD	HP											
690	2 and 3	0.6		HWD	HP							X				
691	2 and 3	1.0		HWD	HP					0.5						
692	2 and 3	1.0		HWD	HP					0.5						
693	2 and 3	1.0		HWD	HP											
694	2 and 3	1.0		HWD	HP											
695	2 and 3	1.0		HWD	HP											
696	2 and 3	1.0		HWD	HP											
697	2 and 3	1.0		HWD	HP							X				
698	2 and 3	1.0		HWD	HP							X				

Unit	Alternative (s)	Acres	Commercial Treatment	Non-commercial Treatment	Fuels Treatment	Logging System	Acres in RHCA				Seasonal Restrictions			Other Elements			
							Class 1	Class 2	Class 3	Class 4	Big Game	Goshawk	Other Raptors	Sensitive Plants/Habitats	Noxious Weeds	Cultural Resources	Recreation Sites
699	2 and 3	1.0		HWD	HP												
700	2 and 3	1.0		HWD	HP												
701	2 and 3	2.0		HWD	HP				1.0								
702	2	1.0		HWD	HP				0.2								
703	2 and 3	1.0		HWD	HP												
704	2 and 3	1.0		HWD	HP												
705	2 and 3	1.0		HWD	HP												
706	2 and 3	1.0		HWD	HP												
707	2 and 3	13.1		HWD	HP												
708	2 and 3	1.0		HWD	HP												
709	2 and 3	1.0		HWD	HP												
710	2 and 3	1.0		HWD	HP												
711	2 and 3	2.3		HWD	HP												
712	2 and 3	2.0		HWD	HP			1.0									
713	2 and 3	1.0		HWD	HP					0.5							
714	2 and 3	1.0		HWD	HP					0.3		X					
715	2 and 3	1.0		HWD	HP							X					
716	2 and 3	1.0		HWD	HP												
717	2 and 3	1.0		HWD	HP					0.2							
718	2 and 3	6.0		HWD	HP		3.0										
719	2	77.7		PCT			77.6		0.1								
720	2	17.6		PCT					17.5								
721	2	50.6		PCT					50.6								
726	2	21.9		PCT			21.9					X					
733	2	138.7		PCT				138.6				X		X			
737	2	41.2		PCT			41.2										
738	2	10.6		PCT			10.6										
739	2	42.6		PCT			42.6										
742	2	37.8		PCT			19.2										
743	2	12.1		PCT			10.6	1.6									
745	2	37.8		PCT			35.4										
768	2	17.5		PCT						17.4		X					
769	2	71.9		PCT			0.01	71.8									

HTH/HIM: Commercial thin
HDW: Hardwood treatment
JUT: Juniper treatment
Nat Fuels: Natural Fuels treatment

UB: Underburn
Activities: Activities Fuels treatment
PCT: Noncommercial thin
HP: Hand pile/ GP: Grapple pile

Application of Water Quality BMPs, INFISH, and LRMP Standards and Guidelines

A number of the design elements described in Chapter 2 of the DEIS, and procedural steps done in development of these projects, are identified as Best Management Practices (BMPs). BMPs also include requirements such as Forest Service manual direction, timber sale contract provisions, environmental documents, and Forest Plan standards and guidelines. The Forest Plan was amended by the Inland Native Fish (INFISH) Strategy in July 1995. Applicable INFISH standards are also identified.

The Forest Plan, as amended, guides natural resource management activities and establishes management standards and guidelines for the Ochoco National Forest. The Forest Plan requires compliance with State requirements in accordance with the Clean Water Act through the application of BMPs.

The following table describes design elements and other aspects of the project development process and identifies those design elements which are applied as site-specific BMPs and INFISH standards.

Table C2. Application of BMPS, INFISH and LRMP

Jackson Project - Design Element or Procedural Requirement	BMP/INFISH Reference
Analysis and scheduling timber sale activities to avoid potential effects on water quality. The Deep Creek Watershed Analysis was completed in 2010. The roads analysis was accomplished in 2002. Water quality and stream channel condition are analyzed in Chapter 3 of the FEIS.	**T-1**: Timber Sale Planning Process Objective: To introduce water quality and hydrologic considerations into the timber sale planning process. **INFISH RF-2a**: Roads Management Completing watershed analysis prior to construction of new roads or landings in RHCAs within priority watersheds.
Timber harvest units and other activities were evaluated to estimate the response of the watershed. The IDT reviewed each treatment unit including factors influencing potential for impacts to water quality such as EHA, soil erosion hazard, slope, distance to stream, logging method, and effects to forest vegetation. Adjustments were made to silvicultural prescriptions and fuel treatments.	**T-2**: Timber Harvest Unit Design Objective: To ensure that timber harvest unit design will secure favorable conditions of water flow, water quality, and fish habitat.
The potential for erosion and mass wasting for the area was evaluated by examining the soil, topography, rock type, drainage patterns, water conditions, and plant community. Reference Hydrology Resource Report, Geology Report, and Soils Resource Report. Areas with high erosion potential were identified and used to design treatments which reduced erosion potential.	**T-3**: Use of Erosion Potential Assessment for Timber Harvest Design. Objective: To prevent downstream water quality degradation by the timely identification of areas with high erosion potential and adjustment of harvest unit design.

Jackson Project - Design Element or Procedural Requirement	BMP/INFISH Reference
Based on data collected during the planning process and sale layout, the location of stream courses, springs, wet meadows, and RHCAs are delineated on the sale area map. In addition, sites identified during implementation will be reviewed by applicable IDT members for protection needs.	**T-4:** Use of the Sale Area Map for designating Water Quality Protection Needs Objective: To delineate the location of protection areas and available water sources as a guide for both the purchaser and the sale administrator, and to ensure their recognition and proper consideration and protection on the ground.
The timber sale contract specifies normal operating season for timber harvest operations, during which, operations may generally proceed without resource damage. Design elements (Jackson FEIS chapter 2) also describe road conditions that would restrict timber hauling.	**T-5**: Limiting the Operating Period of Timber Sale Activities Objective: To ensure that purchasers conduct operations in a timely manner and conduct operations within the time period specified in the timber sale contract. **INFISH RM-2 c5:** Regulate traffic during wet periods to minimize erosion and sediment delivery and accomplish other objectives.
Unstable lands that are unsuitable for timber management were identified through satellite imagery, aerial photos, and field reconnaissance. Geology Report, Hydrology Report.	**T-6**: Protection of Unstable Lands Objective: To provide for identification and appropriate management prescriptions for unstable lands.
Skid trails, landings, and other timber harvesting facilities would be kept at a prescribed distance from designated stream courses. Exceptions for landings would be approved by the Forest Hydrologist and/or Forest Fisheries Biologist. INFISH RHCAs have been identified for all streams within the Deep Creek Watershed. Proposed treatments within RHCAs are intended to meet INFISH RMOs. Reference FEIS, Chapter 2, Design Elements Common to all Action Alternatives, Hydrology Report, and Fisheries Report.	**T-7**: Streamside Management Unit (SMU) Designation Objective: To designate a riparian area or zone along streams and wetlands where prescriptions are made that will minimize potential adverse effects of nearby logging and related land disturbance activities on water quality and beneficial uses. **INFISH:** RHCA Designation **INFISH TM-1b:** Apply silvicultural practices for RHCAs to acquire desired vegetation characteristics where needed to attain RMOs. Apply silvicultural practices in a manner that does not retard attainment of RMOs and that avoids adverse effects on inland native fish.

Jackson Project - Design Element or Procedural Requirement	BMP/INFISH Reference
FEIS Design Elements - Water Quality/Fisheries The road system to access sale units was designed to minimize new stream crossings. There are identified crossings on temporary roads and skids trails in both Alt2 & 3. Design Elements describe temporary road construction and crossings criteria to prevent sediment from entering stream and to maintain integrity of the streambanks. FEIS Design Elements (Jackson FEIS Chapter 2) – Soils, Transportation, Hydrology Skid trails would be designated and approved prior to logging and would be located on already disturbed areas where possible. Logs would be yarded away from streams.	**T-8**: Streamcourse Protection a. Location, method, and timing of streamcourse crossings must be agreed to prior to construction Objective: (1) To protect the natural flow of streams, (2) to provide unobstructed passage of streamflow, and (3) to prevent sediment and other pollutants from entering streams.
FEIS Design Elements – Water Quality/Fisheries	**T-8**: Streamcourse Protection b. Purchaser shall repair all unavoidable damage to a stream course, including damages to banks and channel, to the extent practicable. Objective: (1) To protect the natural flow of streams, (2) to provide unobstructed passage of streamflow, and (3) to prevent sediment and other pollutants from entering streams.
FEIS Design Elements - RHCAs Ground-based machinery for logging and slash piling operations would not be used within RHCAs except on existing roads. Other exceptions would be evaluated on a case-by case basis by the hydrologist or fish biologist.	**T-8**: Streamcourse Protection d. Equipment shall not operate within SMUs (RHCAs) or protected streamcourses, as identified on the sale area map. Objective: (1) To protect the natural flow of streams, (2) to provide unobstructed passage of streamflow, and (3) to prevent sediment and other pollutants from entering streams. LRMP S&G: No more than 10% of an activity area (Riparian MA-F15) can be compacted or displaced to a degree which degrades vegetative productivity.

Jackson Project - Design Element or Procedural Requirement	BMP/INFISH Reference
FEIS Design Elements - Water Quality/Fisheries/Transportation/Soils Adequate drainage would be established on roads. Filter strips below drainage structures would be of sufficient size to catch sediment before runoff enters streams. Reconstructed and temporary roads would be designed with relief drainage (drivable dips, outslope, no berms). Drainage would be maintained during operations and be fully functional going into the winter and when roads are decommissioned or inactivated.	**T-8**: Streamcourse Protection f. Water bars and other erosion control structures will be located so as to prevent water and sediment from being channeled into streamcourses, and to dissipate concentrated flows. Objective: (1) To protect the natural flow of streams, (2) to provide unobstructed passage of streamflow, and (3) to prevent sediment and other pollutants from entering streams.
FEIS Design Elements – Soils On slopes exceeding 35%, end lining would be required to minimize soil impacts. Proposed units were evaluated by the IDT during planning for suitability for tractor logging based on slope, soil erosivity, geologic stability, and distance from streams.	**T-9**: Delineating Tractor Loggable Ground Objective: To protect water quality from degradation caused by tractor logging ground disturbance
FEIS Design Elements - RHCAs No new landings would be placed in RHCAs. Existing landings may be reused in the outer margins of Class I-IV RHCAs.	**T10**: Log Landing Location Objective: To locate landings in such a way as to minimize creation of hazardous watershed condition.
FEIS Design Elements - Soils Skid trails would be designated and approved prior to logging and would be located on already disturbed areas where possible. Skid trails, landings, and roads would be designed to minimize the aerial extent of the activity. Objective is 20% or less of activity area in a detrimental soil condition. Skid trails may be tilled if greater than 20% of the area.	**T-11**: Tractor Skid Trail Location and Design Objective: To minimize the area compacted, erosion, and runoff water.
FEIS Design Elements - Soils For tractor yarding units, the leading end of logs would be suspended above the ground during skidding operations to limit soil displacement. If slopes should exceed 35%, end lining would be required to minimize detrimental soil impacts.	**T-12**: Suspended Log Yarding in Timber Harvesting Objective: 1. To protect soils from excessive disturbance, and 2. to maintain the integrity of SMU (RHCA) and other sensitive watershed areas.
FEIS Design Elements - Noxious Weeds Effective ground cover would be established decommissioned roads within RHCAs to minimize sedimentation. An erosion control plan would be developed that incorporates applicable erosion control actions for all action alternatives and made part of the timber sale contract.	**T-13**: Erosion Prevention and Control Measures During Timber Sale Operations Objective: To ensure that the purchaser's operations shall be conducted to minimize soil erosion.

Jackson Project - Design Element or Procedural Requirement	BMP/INFISH Reference
FEIS Design Elements Noxious Weeds - Effective ground cover would be established on landings, primary skid trails, and decommissioned system & temporary roads as soon as possible to reduce the potential for weed establishment and soil erosion.	**T-14**: Revegetation of Areas Disturbed by Harvest Activities Objective: To establish a vegetative cover on disturbed sites to prevent erosion and sedimentation.
FEIS Design Elements - Water Quality/Fisheries, RHCAs & Weeds Landings, primary skid tails and temporary roads would be scarified, water barred, and seeded as needed to prevent and control erosion and prevent the spread of weeds.	**T-15**: Log Landing Erosion Prevention and Control Objective: To reduce the impacts of erosion and subsequent sedimentation, on log landings, by use of mitigation measures. **T-16**: Erosion Control on Skid Trails Objective: To protect water quality by minimizing erosion and sedimentation derived from skid trails.
Meadows, seeps, and springs have been identified through satellite imagery, aerial photos, and field verification. Wet meadows are afforded protection by the application of INFISH RHCAs & Executive Order 11990. Dry meadows are protected from impacts from harvest and road activities. See contract provision BT5.61. Aspen and cottonwood management is proposed to improve stand vigor.	**T-17**: Meadow Protection During Timber Harvesting Objective: To avoid locating roads, landings, and skid trails in meadows.
FEIS Monitoring Common to All Action Alternatives Timber sale administration would include monitoring for implementation of activities as planned including: harvest operations, road work, erosion control, and fuels treatment.	**T-18**: Erosion Control Structure Maintenance Objective: To ensure that constructed erosion control structures are stabilized and working. **INFISH RF-2 c4:** Requirements for pre-, during, and post-storm inspections and maintenance.
These BMPs are included in the action alternatives for TS activity. T-19 and T-21 are considered normal operating procedures and are included in timber sale contract language. T-20 is required per Forest Service Manual requirements. T-22 is provided for through monitoring and evaluation of conditions throughout the life of the timber sale contract.	**T-19:** Acceptance of TS Erosion Control Measures Before Sale Closure **T-20:** Reforestation **T-21:** Servicing and Refueling of Equipment **T-22:** Modification of TSC **INFISH RA-4:** General Riparian Area Management Prohibit storage of fuels and other toxicants within RHCAs.

Jackson Project - Design Element or Procedural Requirement	BMP/INFISH Reference
FEIS, Chapter 2, Alternatives Both Alt 2 & 3 propose building 15 miles of temporary roads on existing disturbance; 10 miles of temporary road and reconstructing .3 miles of existing road system.	**R-1**: General Guidelines for the Location and Design of Roads a. Basic requirement for transportation facility development which best meets management objectives with least effect on environmental values.
Road management activities including: reconstruction, inactivation, decommission, temporary roads, and use are identified as key factors affecting water quality and fish habitat. During development of the FEIS the design and location of existing and proposed roads was evaluated by the IDT.	**R-1**: General Guidelines for the Location and Design of Roads b. Interdisciplinary team evaluates effects of transportation system design and road location. **INFISH RF-2 c1:** Road design criteria, elements, and standards that govern construction and reconstruction are identified.
FEIS Design Elements - Water Quality/Fisheries An erosion control plan is required.	**R-2**: Erosion Control Plan Objective: To limit and mitigate erosion and sedimentation through effective planning to initiation of road construction activities and through effective contract administration during construction.
Dormant and active landslide areas were identified by the Forest Geologist during planning and road locations were modified to avoid activating slope failures.	**R-4**: Road Slope Stabilization Objective: To reduce sedimentation by minimizing erosion from road slopes and minimizing the chances for slope failures along roads.
FEIS Design Elements - Water Quality/Fisheries Road associated sediment is identified as a key factor affecting stream sedimentation. The alternatives include several design elements aimed at reducing the potential for sediment delivery from roads.	**R-7**: Control of Surface Road Drainage Associated with Roads Objective: 1. To minimize the erosive effects of water concentrated by road drainage features, 2. to disperse runoff from or through the road, and 3. to minimize the sediment generated from the road. **INFISH RF-2d:** avoiding sediment delivery to streams from the road surface.
FEIS Design Elements - Water Quality/Fisheries A water conservation plan was developed for the forest to maintain base flows. This plan would be followed under the action alternatives.	**R-17**: Water Source Development Consistent with Water Quality Protection Objective: To supply water for roads and fire protection while maintaining existing water quality.

Jackson Project - Design Element or Procedural Requirement	BMP/INFISH Reference
FEIS Design Elements - Water Quality/Fisheries Decommissioning of temporary roads, primary skid trails, and landings is included in Alternatives 2 and 3.	**R-23**: Obliteration of Temporary Roads and Landings Objective: To reduce sediment and restore productivity of the land at the completion of intended use.
FEIS Design Elements - Water Quality/Fisheries Temporary and reconstructed roads with stream crossings would have adequate relief drainage installed prior to runoff reaching the stream channel.	**INFISH RF-3a:** reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, or do not protect the watershed from increased sedimentation.
Fire severity regimes are described for the area in the Deep Creek Watershed Analysis and in the Fire/Fuels Resource Report. The effects of the alternatives are described for fire, fuels, and fire ecology in the FEIS, Chapter 3.	**F-1**: Fire and Fuels Management Objective: An objective of fire management activities is to reduce the potential public and private losses which could result from wildfire and/or subsequent flooding and erosion, by reducing the intensity and destructiveness of wildfire.
FEIS Design Elements - Water Quality/Fisheries Alternatives 2 and 3 include design elements which reduce the effects of prescribed fire and fire line on water quality.	**F-2**: Consideration of Water Quality in Formulating Prescribed Fire Prescriptions Objective: To provide for water quality protection while achieving the management objectives through the use of prescribed fire.
Cumulative effects of proposed actions, past actions, and reasonably foreseeable future actions are included in the analysis. Reference Hydrology Report, Fisheries Report, and FEIS Chapter 3.	**W-5**: Cumulative Watershed Effects Objective: To protect the beneficial uses of water and streams from the cumulative effects of multiple management activities which may result in adverse (degraded) water quality or stream habitat conditions.
FEIS Design Elements - Soils If slopes should exceed 35 percent on portions of tractor units, winch lining would be required to minimize detrimental soil impacts.	**VM-1**: Slope Limitations for Tractor Operations Objective: To reduce gully and sheet erosion and associated sediment production by limiting tractor use.
FEIS Design Elements - Water Quality/Fisheries Wetlands and meadows are delineated within the project area. Springs, seeps, streams, and wet meadows have associated RHCAs applied. No off road ground-based harvest operations are proposed within RHCAs.	**VM-2**: Tractor Operation Excluded from Wetlands and Meadows Objective: To limit turbidity and sediment production resulting from compaction, rutting, runoff concentration, and subsequent erosion.
FEIS Design Elements - RHCAs - Effective ground cover would be established on landings, skid trails, and temporary roads in RHCAs. Noxious Weeds - Roads, landings, and other disturbed areas would be regenerated as soon as possible to reduce the potential for weed establishment and soil erosion.	**VM-3**: Revegetation of Surface Disturbed Areas Objective: To protect water quality by minimizing soil erosion through the stabilizing influence of vegetation.

Jackson Project - Design Element or Procedural Requirement	BMP/INFISH Reference
FEIS Monitoring Common to All Action Alternatives Implementation monitoring and Water Quality monitoring to evaluate the effectiveness of BMPs and INFISH standards and guidelines is included for all the action alternatives.	**W-7:** Water Quality Monitoring Objective: To determine effects of land management activities on the beneficial uses of water; to monitor baseline watershed conditions for comparison with State Water Quality standards, Forest Plan standards, and estimation of long-term trends; to ensure the health and safety of water users; to evaluate BMP effectiveness; and to determine the adequacy of data, assumptions, and coefficients in the Forest Plan. **INFISH Monitoring**: Monitoring is an important component of the proposed interim direction. The primary focus is to verify that the standards and guidelines were applied during project implementation.
Deep Creek Watershed Analysis A watershed analysis was completed for the Deep Creek Watershed in 2010. Stream channel condition and water quality receive emphasis in the report.	**INFISH Watershed Analysis** Watershed analysis is a systematic procedure for determining how a watershed functions in relation to its physical and biological components. This is accomplished through consideration of history, processes, landform, and condition.
FEIS, Alternative Description, Chapter 2 Alternatives 2 and 3 include riparian restoration actions: Aspen Treatment in Class I-IV RHCAs: Alternative 2 and 3: 113 acres	**INFISH Watershed Restoration** Watershed restoration comprises actions taken to improve the current conditions of watersheds to restore degraded habitat, and to provide long-term protection to natural resources, including riparian and aquatic resources. **INFISH WR-1:** Watershed and Habitat Restoration Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserves genetic integrity of native species, and contributes to attainment of RMOs.

Table C3. PDC for Columbia Spotted Frogs in the Jackson Project.

Project Design Criteria
A. Do not fragment or convert wetland habitat to upland habitat through management activities including, but not limited to, water diversions, road construction, maintenance, or recreational facilities expansion. Where possible restore wetlands.
B. Do not degrade wetland habitat or water quality. 1. In channel, lake, or shoreline digging would be for restoration only. 2. Comply with the following Bull Trout, Steelhead Trout, and Chinook Salmon EFH PDC: (c) Sediment and Substrate 1, 2, 3, 6, 7, 8, 9, and 10. (d) Bank Stability 1 and 2.
C. Changes in hydrology of a stream, spring, lake, or wetland should be for restoration purposes only. 1. In reservoir situations, where possible, allow maintenance or development of shallow water habitat with emergent vegetation through July to provide egg laying and development. 2. When removing or modifying stream barriers to allow for fish passage, do not risk the introduction of non-native species.
D. Limit activities within the channel migration zone or 100-year floodplain to those that have either a neutral or beneficial effect on floodplain functions. Timing of those activities will be outside egg laying/hatching for. If not known, restrict activities from March 1 to May 31.
E. Connectivity will be maintained through properly functioning streams, marsh, in stream, and floodplain vegetation. Restore native sedges, rushes, and willows where possible and appropriate.
F. Use of pesticides, herbicides, and similar potential contaminants are prohibited in and immediately adjacent to wetland habitat. Applications of these chemicals should be conservative when estimating drift to avoid any contamination.

APPENDIX D- RESPONSE TO COMMENTS

The opportunity to comment on the Jackson Vegetation Management project was provided in accordance with 36 CFR 215.5. The comment period began when the Notice of Availability of the draft EIS was published in the *Federal Register* on January 13, 2012. Also, *The Bulletin*, Bend, Oregon, published a legal notice of the opportunity to comment on May 4th, 2012. During the public comment period, responses were received from the following individuals, organizations and agencies.

Letter Code	Comment Date	Name	Organization
#1	1/26/2012	Dick Artley	
#2	2/2/2012	Christine Reichgott	EPA Region 10, Environmental Review and Sediment Management Unit
#3	2/18/2012	Lydia Garvey	
#4	2/22/2012	Chuck Burley	Interfor
#5	2/25/2012	Irene Jerome	American Forest Resources Council
#6	2/27/2012	Doug Heiken	Oregon Wild!
#7	2/27/2012	Glen Ardt	Oregon Department of Fish and Wildlife
#8	2/27/2012	Karen Coulter	Blue Mountains Biodiversity Project

The following documents ID team consideration of and response to comments. In some cases, comments were summarized or combined. The Jackson project file includes more information on consideration of public comment.

Purpose and Need, Range of Alternatives, other aspects of the NEPA Process

Comment: *The Responsible Official dispensed with ALL alternatives suggested by the owners of the Ochoco National Forest in a few sentences without even analyzing the alternatives. Please analyze the 2 citizens' alternatives in detail shown below and disclose the results of the detailed analysis in the final EIS. (Comment 1.11)*

An alternative friendly to the recreating public should be analyzed in detail that implements all activities described in the Proposed Action except: 1) temporary and /or system road construction 2) commercial timber harvest 3) application of herbicides containing glyphosate. I expect that all alternatives submitted by the public to be analyzed in detail and be given serious consideration for selection. (Comment 1.18)

Where is the "Restoration only" alternative? (Comment 3.7)

...the only other action alternative offered, #3…eliminates commercial logging in RHCAs, which we support, and lessens non-commercial thinning in RHCAs to 113 acres, it is otherwise virtually indistinguishable from Alt. 2…The Forest Service has thus offered an inadequate range of alternatives (eg. no "restoration only" alternative, and no alternatives to eliminate any of the other impacts--to Management Indicator Species, soils, federally listed species, climate change, recreation, etc.)...so why was no analysis of a "no commercial harvest" or "restoration only" alt done for the Jackson project specifically and included in the DEIS? (Comment 8.7)

The artificially narrow purpose and need and inadequate range of alternatives preclude assessment of other options for reaching such a goal, such as only thinning those trees that have obviously grown in since the last logging (generally only up to 8-10" dbh) and only in areas that are dry ponderosa

pine sites where competition is a legitimate issue (if natural density is really being exceeded). (Comment 8.42)

Response: Forest Service NEPA regulations state that an EIS shall document the examination of reasonable alternatives to the proposed action and that an alternative should meet the purpose and need and address one or more significant issues related to the proposed action (36 CFR 220.5(e)).

Alternatives are developed in response to significant issues identified during the scoping period of the project. Significant issues are developed, in part, based on substantive comments. Substantive comments that were received for the Jackson project related to the effects of proposed commercial harvesting in RHCAs; therefore, Alternative 3 was developed to minimize disturbance in the RHCAs by eliminating all commercial harvest (DEIS p. 10). The Comparison of Alternatives (Table 4) provides a summary of the effects of implementing each alternative and demonstrates their qualitative and quantitative differences in effect and output.

A "restoration only" alternative was considered but was eliminated from detailed study due to the fact that such an alternative would do little to increase the amount of LOS or accelerate the restoration of seral structures toward HRV in the project area, and would limit management options for restoring aspen and riparian hardwoods, and therefore would not meet the purpose and need of the project (DEIS p. 30). Additional discussion of a "restoration only" alternative is included in the final EIS (Chapter 2).

There was an alternative considered but eliminated from detailed study that included no temporary road construction. The alternative did not meet the purpose and need for the project area (DEIS p. 30).

Because the Proposed Action does not include treatments with glyphosate or any other herbicide, an alternative eliminating such treatment was not necessary.

The impacts to MIS, soils, federally listed species and recreation are disclosed and discussed in the DEIS. The Jackson project meets all relevant Forest Plan standards and guidelines for each of the resources referenced by the commenter (Comment 8.7).

Comment: *The Responsible Official should not propose a timber sale in order to eliminate or reduce natural disturbance events that benefit the forest's natural resources. The Responsible Official must never disrupt the natural functioning of the natural resources in the forest by attempting to stop natural disturbance events from occurring. Of course natural disturbance events such as insect activity, fire and disease kills trees. So what? The vast majority of trees in the national forests should be left in place to serve their ecologic function. The Responsible Official should not attempt to take action that negates the proper functioning of the forest's natural resources to generate corporate profit. (Comment 1.13)*

Response: The need for action presented in the draft EIS does not include elimination of natural disturbance events, disruption of natural functioning or stopping natural disturbance events from occurring (DEIS p. 1-11). Implementation of either action alternative would not eradicate fire, insects and disease from the forest; rather the objective of the project is to improve forest health in treated stands so that they are more resilient to natural levels of fire, insects and disease. In addition, the Forest Plan (p. 4-12, 4-3) identifies a goal of maintaining forest health for present and future uses as well as to maintain or enhance ecosystem functions to provide long term productivity of forest resources and biological communities (DEIS p. 4).

Comment: *I strongly urge you to nix the "Jackson" sale. (Comment 3.1)*

Response: The "No Action" alternative (Alternative 1) was fully analyzed in the draft and final EIS for the Jackson project.

Comment: *The multi-faceted purpose and need described in this DEIS is dishonest, illegal and consciously attempts to deceive the public. The real reason for this timber sale is to spend all the earmarked timber funding allocated to the Forest and achieve the Regional volume expectations that were attached to the funding. In the final EIS please present a modified P&N that describes why the timber sale is being proposed. (Comment 1.14)*

The Forest Service has artificially narrowed the "purpose and need" to logging, totally ignoring public concern or ecological damage (Comment 3.8; 8.8).

Response: The Forest Service has the discretion to determining the underlying purpose and need for project proposals. For the Jackson project, the Forest Service developed the purpose and need by evaluating planning direction identified in the Forest Plan, identifying desired future conditions, and comparing them to the existing condition in the Jackson planning area. The 2010 Deep Creek Watershed Analysis was used as a basis for the existing condition (DEIS p. 2). The Forest Service considered all public comment that was received during the scoping period for the Jackson project; documentation of this consideration is included in the Jackson project file at the Paulina Ranger District. Using these public comments, as well as comments generated internally, the interdisciplinary team developed a list of issues to address. Based on public response during the scoping period, The Forest Service objectively considered three alternatives to the proposed action, two of which were dismissed from detailed consideration for reasons expressed on DEIS p. 30. An additional two alternatives were considered based on comments received during public review of the DEIS; these are discussed in the FEIS (p. 33-34).

Comment: *The DEIS fails to consider other projects' cumulative damage (Comment 3.10).*

Response: Cumulative effects are disclosed throughout Chapter 3 of the draft EIS. The section titled "Cumulative Effects," (DEIS p. 255-258) discloses how cumulative effects have been considered and which past, present, and reasonably foreseeable projects were considered in the cumulative effects analysis.

Comment: *We certainly agree with the stated Purpose and Need for Action and wish to point out that despite the fact providing wood products is number 7 in a list of 8, we feel this is the primary purpose and need for action. (Comment 4.1)*

Response: There are eight purposes of the Jackson project listed on p. 2 of the DEIS. These are not arranged in order of importance.

Comment: *We don't believe you are proposing to treat enough. Your data says that historically between 78% and 81% of the LOS were single-strata whereas today it's only 27%. You should be treating more of the multi-strata, particularly in the DGF PAG to move the landscape more towards the HRV. (Comment 4.30)*

Response: Both action alternatives propose to treat multi-strata LOS in the Dry Grand Fir PAG to move them towards single-strata conditions (DEIS p. 60). Both action alternatives result in the amount of Dry Grand Fir multi-strata LOS dropping slightly below the historic range for that condition (DEIS p. 61 – 63). A Forest Plan amendment is included in the Jackson project because of this (DEIS p. 13 – 14). Based on public comment, an alternative that would have maximized commercial thinning throughout the project area was considered, but was eliminated from detailed analysis for reasons described in the FEIS (p. 34).

Comment: *The Deep sale is not even mentioned in the DEIS. (Comment 8.1)*

[Failure to disclose information about the Deep project] is a violation of public trust and failure to adequately disclose significant information under NEPA -- especially as the prior "Deep" sale was controversial, sparking both an appeal and litigation, as well as serious critique by other government agency officials. (Comment 8.29)

> **Response:** The history of the Deep Creek Vegetation Management project has been added to the Background section of Chapter 1 (FEIS p. 1). This section includes a summary of the NEPA process, the litigation history and its outcomes, the Deep Restoration EA and the updated Deep Creek Watershed Analysis. The update is also noted in the "Changes between Draft and Final Section" (FEIS p. xvii).

Comment: *In general, this analysis fails to specifically address the impacts of logging--both past logging and the logging proposed. (Comment 8.36)*

> **Response:** The DEIS addressed the impacts of past and proposed timber harvest. But, in regards to addressing past harvest, the CEQ regulations (36 CFR 220.4 (f), July 24, 2008) do not require the consideration of the individual effects of all past actions to determine the present effects of past actions and a CEQ interpretative memoranda dated June 24, 2005 regarding past action states "agencies can conduct an adequate cumulative effects analysis by focusing on current aggregate effects of past actions without delving into the historical details of individual past actions" (DEIS p. 255). However, within multiple sections of the DEIS, the agency did consider the effects of past logging where it was considered useful and relevant. The effects of past logging are disclosed and discussed on DEIS p. 91, 107, 113, 119, 157, 168-169, 182-183, 189-190, 194-195, 201, 235, 244-245, and 246-247. The potential impacts of proposed timber harvest are disclosed on DEIS p. 56-68, 74, 76, 90, 97, 98-99, 103-107, 110-113, 129-132, 134-139, 140-152, 155-169, 175-176, 180-182, 185, 186, 188, 189, 193, 198, 199, 207-212, 221-223, 230, 234-238, and 248.

Comment: *The action alternatives have been limited by an artificial narrowing of the purpose and need and an overly broad generalization of forest tree species composition/fire regime/forest structural density and historical range of variability across the project area. Surely many alternatives could address even the stated purpose and need, including an alternative that recognizes the differences between plant association groups that call for differing management, including leaving naturally denser forest areas alone to recover from past logging. (Comment 8.37)*

> **Response:** The purpose and need for the Jackson project was developed by comparing desired vegetative conditions identified in the Ochoco National Forest Land and Resource Management Plan and to the existing condition of the project area (DEIS p. iv, 2). We disagree that the condition of the project area was an "overly broad generalization." To meet the requirements of the Regional Foresters Plan Amendment #2 a landscape analysis of the Jackson project considered seven different biophysical environments (plant association groups) and up to 25 different seral/structural stages within each of them. Existing conditions were determined and compared to historical ranges of variability for each stage (DEIS p. 43 – 49). Summaries of these comparisons at a landscape level are provided (DEIS p. 2 – 6, 42 – 43, 51, 56, 58 – 59). A variety of activities are proposed to move existing vegetative conditions to the desired conditions; these include commercial harvest, noncommercial treatments, and prescribed use of fire (DEIS p. 12 – 14, 30 – 31). Silvicultural treatments recognize that differences exist between the plant association groups and prescriptions will be adjusted appropriately (DEIS p. 65 – 66, 279 – 280).

Comment: *There is no analysis of the negative effects--in this case, to forest health and large tree growth--of planned commercial thinning, non-commercial thinning, burning, and road-building or re-opening, including disruption or destruction of mycorrhizal communities in the soil and hydrologic effects of removing substantial forest cover. There is inadequate disclosure and analysis of foreseeable effects...There is no analysis of how planned logging is likely to degrade forest health...we feel that the project area is already a beautiful healthy flourishing diverse forest throughout most sale units that would be seriously impaired in ecological functions and long-term productivity from commercial logging. (Comment 8.43)*

> **Response:** The purpose and need of Jackson project was developed, in part, to meet the direction identified in the Forest Plan. The Forest Plan (p.4-12) identifies a goal of maintaining forest health for present and future uses. The Forest Plan (p.4-3) also has the goal to "maintain or enhance ecosystem functions to provide long-term productivity of forest resources and biological communities." The Equivalent Harvest Area (EHA) model (DEIS p. 101) was used to determine the relative effects of timber harvest activities on runoff and/or overland flow within the watershed. The EHA values for both action alternatives are below the established threshold of 25% specified in the Forest Plan. Implementation of the proposed action would comply with regional soil standards and would have little effect on fungal associations in treated units because live trees would be retained in all activity units (DEIS p. 97). Also see responses to Comments 3.10 and 8.36.

Comment: *There is little difference between the two action alternatives in general, including acreage of juniper reduction, commercial logging, prescribed burning, and management activities in LOS and RHCAs. All the same activities are proposed with the exception of commercial thinning in RHCAs. (Comment 8.47)*

> **Response:** Alternatives are developed in response to significant issues identified during the scoping period of the project. Significant issues are developed, in part, based on substantive comments. Substantive comments that were received for the Jackson project related to the effects of proposed commercial harvesting in RHCAs; therefore, Alternative 3 was developed to minimize disturbance in the RHCAs by eliminating all commercial harvest (DEIS p. 10). The Comparison of Alternatives (Table 4) provides a summary of the effects of implementing each alternative and demonstrates their qualitative and quantitative differences in effect and output.

Comment: *We don't support any new road construction. (Comment 8.67)*

"No temp road" alternative should have been analyzed as an alt. in the DEIS. (Comment 8.76)

> **Response:** Based on public comments received, a "no temporary road construction" alternative was considered for the Jackson project. The DEIS (p. 30) discloses the rationale why a "no temporary road construction" alternative was not fully developed; such an alternative would not meet the purpose and need of the Jackson project. Additional information can be found in the Jackson project file at the Paulina Ranger District. The Jackson project does not propose construction of any new permanent roads.

Comment: *There could also have been an alternative allowing commercial thinning in less- or non-controversial areas such as unnaturally dense dry ponderosa pine dominant, low-elevation units without LOS and in aspen restoration areas. (Comment 8.77)*

> **Response:** The dry ponderosa pine plant association group encompasses only about 5.5% of the Jackson planning area. Commercial thinning only in dry ponderosa pine would not reduce wildfire hazard, reduce insect and disease susceptibility, or move towards historic stand structures or species composition in Late and Old Structure, or other stands throughout the project area. The same is true for commercial aspen restoration units-these units make up

only about 295 acres in the project area. The Jackson project area is within HRV for multi-strata mesic and xeric ponderosa pine and outside of HRV for single-strata mesic and xeric ponderosa pine. The project proposes to thin within some low-elevation LOS stands in order to move multi-strata ponderosa pine to towards singe-strata ponderosa pine. As a result, the proposed action would move nearly 100 acres of ponderosa pine, multi-strata stands to single-strata LOS. Increasing the abundance of single-strata LOS is part of the purpose and need of the project.

Comment: *Why are these [Analysis Issues] not considered significant issues? As it is, the 2 alternatives leave little choice but to impair soils, risk losing wildlife habitat and potentially degrading water quality and fish habitat, as well as recreational values – these issues should have been used to develop alternatives and design elements.*

Response: Significant issues are developed, in part, based on substantive comments. Substantive comments that were received for the Jackson project related to the effects of proposed commercial harvesting in RHCAs; therefore, Alternative 3 was developed to minimize disturbance in the RHCAs by eliminating all commercial harvest (DEIS p. 10). Substantive comments (including reference to cause-effect relationships and supporting rationale) regarding effects to other resources were not received during the scoping period for the Jackson project or were addressed through the development of Alternative 3. However, effects to soil, water quality, wildlife habitat, recreational values, and may other resources are considered very important by the Responsible Official and are therefore tracked through the analysis; may of these effects are used as comparison points to determine differences between the alternatives (see FEIS Table 4). Design elements were developed to address effects to soils, water quality, aquatic habitats, recreational values, wildlife habitat, and a variety of other resources (see FEIS Chapter 2).

Roads and Road Density

Comment: *No amount of timber harvest justifies the long term damage caused by constructing forest roads. This applies to temporary roads that are not fully obliterated and seeded with native grasses.*

The map of the Jackson Vegetation Management sale area shows a road density that's so high that it will be impossible for the aquatic resources in the vicinity of the proposed timber sale to function properly.

The new road construction planned for the Jackson Vegetation Management project will have compacted road surfaces which will generate overland flow containing sediment during precipitation events. Much of this sediment often enters the stream channel system, locally increasing peak flows and increasing aquatic resource-harming turbidity. No mitigation or BMP application will remove all the sediment laden water before it reaches the stream.

The new road construction planned for the Jackson Vegetation Management project will fragment wildlife habitat and alter animal behavior by causing changes in home ranges, movement, and reproductive success, and will divide large landscapes into smaller patches which will convert interior habitat into edge habitat.

The Responsible Official could eliminate the resource harm in the opposing views Attachment #4 by not constructing any new road as part of this project. (Comment 1.4)

Response: The impacts of roads are described for both wildlife and soils. No new system road construction is proposed in any of the alternatives. The duration of effects of temporary road impacts on soils is described in the DEIS, p. 93: temporary roads will be blocked to eliminate motor vehicle access, hydrologically stabilized and subsoiled or otherwise de-compacted to facilitate their return to proper hydrologic function and vegetative productivity

at the completion of harvest and post harvest activities (DEIS p. 28). Thus, the effects to soils are generally short term, five years or less (DEIS p. 93). Best management practices based on research recommendations are described for project implementation (DEIS p. 15-30).

Within the general forest management area the existing road density is 2.3 miles per square mile which is less than the Forest Plan goal of 3 miles per square mile (DEIS p. 187). The effects and cumulative effects to wildlife are discussed in chapter 3, p. 152-202 of the DEIS.

DEIS, p. 110, discloses that the primary activities that affect sediment delivery within this project area is from harvest and road building activities. Through the combination of BMPs and project design criteria, the potential for sediment from commercially harvested area is reduced to non-existent or negligible quantities (DEIS p. 111).

There was an alternative considered but eliminated from detailed study that included no temporary road construction. The alternative did not meet the purpose and need for the project area (DEIS, p. 30).

Comment: *Temporary roads increase corridors for livestock/ORV damage/wildlife disturbance/illegal resource stealing/invasive weed dispersal/stream killing sediment (Comment 3.6).*

Temporary roads have significant impacts because they are not really temporary, as evidenced by the fact 15 miles of such temp roads are being reused for the project. (Comment 6.8)

"Temporary" roads still cause forest fragmentation, soil compaction, and open pathways for invasive plant introduction and dispersal, ATV damage, poachers, illegal firewood cutters, and wildlife disturbance. (Comment 8.30)

Response: Temporary roads by definition are used temporarily for harvest operations. Most temporary roads are needed for log truck access to avoid long skidding distances. The impacts associated with temporary roads are disclosed in the DEIS on p. 38, 92, 98 and p. 106-107. The impacts associated with temporary road construction will be minimized through the application of design criteria and construction that is in accordance with the provisions of the timber sale contract.

Temporary roads by definition are used temporarily for harvest operations. Most temporary roads are needed for log truck access to avoid long skidding distances. The impacts associated with temporary roads, identified by the commenter, are disclosed in the DEIS on p. 38, 92, 98, 106-107, 178, 190, and 223.

At the completion of harvest and post-harvest activities, all temporary roads would be barricaded to eliminate motor vehicle access and would be subsoiled depending on soil type as part of post-harvest soil remediation activities to facilitate their return to vegetative productivity (DEIS p. 36).

Comment: *Road density already exceeds standards in this project area. Multiple resource benefits can be achieved by coordinating between the need to limit road construction and the need to retain untreated areas. (Comment 6.7)*

Response: The open road density in the Jackson project area is 2.3 mi/sq mi, which is below the LRMP open road density standard of 3.0 mi/sq. mi. for the Deep Creek watershed (HEI Tables-Pin #11 September 13, 1990). The action alternatives do not propose to add any new permanent roads. Therefore, the open road density within the Jackson project area will remain unchanged (DEIS p. 189).

Comment: *The Forest Service can't maintain the existing road system and has an active road closure and decommissioning program which creating new roads and re-opening closed roads contradicts, blocking progress toward identified goals of the programs. (Comment 8.31)*

Response: Alternatives 2 and 3 in the Jackson Draft Environmental Impact Statement propose constructing 25 miles of temporary roads and opening 63.9 miles and 53.8 miles, respectively, of Maintenance Level 1 roads to be used for harvest and post-harvest activities. As noted on p. 36 of the DEIS, temporary roads are not intended to remain as identifiable facilities after administrative need for their use has ended. Therefore as identified on DEIS p. 13-14, 28, 36, 106, and 189, temporary roads constructed for implementation of vegetative management activities would be decommissioned and decompacted after use and would not be added to the existing road system. The closed roads that would be opened for the same purpose are considered as long-term closed roads that are to be opened for a short duration then closed when those vegetative management activities have concluded as described on DEIS p. 28. They would not be added to the open road system, but would instead be managed after this administrative use as Maintenance Level 1 (closed) roads in accordance with the management strategy for such roads described in Forest Service Handbook 7709.59 chapter 62.32. These roads, which are not now displayed on the Motor Vehicle Use Map (MVUM) for the Ochoco National Forest, would not be added to the MVUM; therefore motor vehicle use would be prohibited in accordance with Title 36, Code of Federal Regulations, Section 261.13.

Forested Vegetation, Old Growth, Late and Old Structure, Aspen, Hardwoods, HRV

Comment: *Healthy forests are continually in a state of change. There is no best historic forest condition as the Responsible official infers. This timber sale will reduce the diversity of the sale area to that of a tree farm. Clearly there is no need to create park like conditions, more large trees, reduced stand densities and conditions for more vigorous trees.*

Shade tolerant conifer tree species in crowded conditions provide primary, unique habitat for many species of wildlife and birds. Most shade tolerant conifer tree species have a low lumber value. The Responsible Official wants to manipulate the forest to historic conditions in order to change the stand to something valued by the timber industry.

Selecting the forest's conifer species and size class that existed at some point in the past and attempting to recreate this historic condition must be accompanied by a detailed explanation indicating why the historic condition is so important to achieve the Responsible Official feels justified spending the taxpayer's dollars to pull off. Please explain why the historic condition chosen by the Responsible Official is more important than other historic forest conditions.

Please explain why the historic condition chosen by the Responsible Official creates conditions that favor healthy and thriving aquatic resources, wildlife habitat, fisheries habitat and recreation.

Any manipulation of the vegetation should be based on best science. In the final EIS, cite the references that describe how creating the historical condition preferred by the Responsible Official benefits most natural resources in the forest. Explain how historic species mix was determined and include the date. (Comment 1.8)

Response: Historic Ranges of Variability (HRVs) describe a range of conditions, not a single condition as the commenter suggests. The Ochoco National Forest uses the Viable Ecosystem Management Guide (VEMG) to describe several biophysical environments (Plant Association Groups or PAGs) and multiple vegetative conditions that could exist within each PAG. Comparisons are then made between the existing abundance and the HRV for each

condition (DEIS p. 2-3, 40 – 49). The VEMG provides the framework to perform landscape level analysis in compliance with the Interim Ecosystem Standard contained in the Regional Forester's Forest Plan Amendment #2 (June 1995). The Standard requires the characterization of watersheds for patterns of stand structure and comparison to the HRV. The standard also provides guidance that the HRV "should be based on conditions in the pre-settlement era."

As described in the VEMG, HRVs were developed for the 1820 – 1900 time period. They are based on fire history, land survey notes from the 1870's, USDA publications circa 1900, and anecdotal information from various sources. A review of the Ochoco National Forest's implementation of the Regional Forester's Forest Plan Amendment #2 was conducted by the Regional Office in 1997. This review found that; "The Viable Ecosystem Management Guide (VEMG) is a sound, reasonable, and good guide for ecosystem management. It is especially good in identifying the Historical Range of Variability (HRV) for watersheds on the Ochoco National Forest." (August 1, 1997 Regional Forester Letter, on file at Ochoco National Forest).

The Jackson project analyzes over 140 different seral/structural stages in seven different biophysical environments. Moving towards the HRV for these conditions will not, as the commenter suggests, "reduce the diversity of the sale area to that of a tree farm". Analysis of the Jackson project area indicates that, relative to HRV, the area is deficient in stands dominated by large trees, open park like stand conditions are less abundant, and dense stand conditions are more common (DEIS p. 42 – 43). "Open park like" stand conditions are a characteristic specifically mentioned within the Regional Foresters Amendment #2. Historically these stand conditions were abundant in the Jackson project area. Currently, these stand conditions are relatively scarce and below their historic levels (DEIS p. 43).

Acres dominated by shade tolerant conifers and dense stand conditions are predicted to increase over time under all alternatives as described in the DEIS (p. 50 – 53). Both action alternatives reduce the amount of these conditions but they remain within their relative ranges of historic abundance.

Comment: *[The Jackson project risks] destroying Old-Growth trees (habitat and all species within) (Comment 3.4).*

Response: The Jackson project area contains 1,267 acres of designated Old Growth areas (DEIS p. 6). No vegetation management activities are proposed within Old Growth management areas. Effects to Late and old structure (LOS) stands are disclosed in the draft EIS (p. 58 – 65). Effects to wildlife that occupy LOS habitats are disclosed in the draft EIS (p. 152-202).

Comment: *The increase in Douglas-fir and grand fir is limiting an increase in early seral species through increased competition. Limiting the removal of late seral species to less than 21" dbh is not allowing the removal of late seral trees that are the fiercest competitors with the early seral species. (Comment 4.2)*

It is unclear to me why trees in excess of 21" dbh are not being removed in areas where appropriate, such as grand fir that are crowding old and large western larch or ponderosa pine. (Comment 5.1)

Response: The Jackson project has multiple purposes related to the proposed activities. These purposes include maintaining and increasing the abundance of early-seral, fire tolerant species composition (DEIS p. 2). They also include maintaining and increasing the abundance of late and old structure and increasing riparian vegetation and large tree structure in RHCAs (DEIS p. 2). To respond to these purposes the project has multiple design features, one of which includes retaining all large live (21 inch dbh and larger) trees that currently

exist except for safety hazards (DEIS p. v, vi, 13, 14, 18, 50, 60, 64, 65, 177, 178). This criterion is also included so that the project will be consistent with the Ochoco National Forest Land and Resource Management Plan as amended in 1995 by the Regional Forester's Forest Plan Amendment #2 (DEIS p. 7). The Amendment requires that (for the Jackson project) all live trees 21 inch dbh or larger that currently exist be maintained (DEIS p. 60).

Retaining all live trees 21 inches and larger will result in species compositions that include late seral species such as Douglas-fir and grand fir as the commenter has noted and as discussed in the DEIS (p. 51 – 52). The abundance of these species will, however, be reduced and the abundance of early seral species will be maintained and enhanced (DEIS p. v, 51, 279). Acres dominated by early seral species will increase, while acres dominated by Douglas-fir and grand fir will decrease (DEIS p. 52 – 53).

Proposed commercial harvest would remove merchantable trees less than 21 inches dbh (DEIS p. 3, 18, 279). This project does not propose to change the diameter limit for harvest.

Comment: *Having the arbitrary 21" diameter limit makes meeting needs nearly impossible. This is primarily due to the fact that smaller diameter trees are not the sole source of competition within these stands. The larger trees are also fierce competitors. In the end, removing trees of all sizes and ages will best meet the desired outcome. (Comment 4.4)*

Response: The Regional Forester's Plan Amendment #2 requires that all live trees 21 inch dbh or larger that currently exist be maintained. Retaining all live trees 21 inches and larger will result in stand densities that are above recommended stocking levels in some stands if there are currently an abundance of large trees present (DEIS p.279). Although these stands may be above the recommended levels, the removal of trees less than 21 inches dbh would still meet the needs of the project because density related competition between trees would be reduced, wildfire hazard and susceptibility to insects and disease would be reduced, and removal of shade tolerant understory trees would increase early seral species composition (DEIS p. 3 - 4, 51 – 53, 57). Proposed commercial harvest would remove merchantable trees less than 21 inches dbh (DEIS p. 3, 18, 279).

Comment*: The DEIS states that removing trees less than 21" dbh through commercial and noncommercial thinning "would reduce stand densities to recommended stocking levels." Have you analyzed the ability to meet recommended stocking levels with and without the arbitrary diameter limit? (Comment 4.5)*

Response: The DEIS recognizes that in some stands post treatment stocking will be above the recommended levels (DEIS p. 279). The Jackson project does not propose changing the 21 inch diameter limit that is required by the Regional Forester's Plan Amendment #2.

Comment: *The DEIS states that removing trees less than 21" dbh will also increase early-seral species composition. Again, limiting yourself to an arbitrary diameter may prevent you from removing late-seral fire intolerant trees e.g. Douglas fir and grand fir thus inhibiting your ability to achieve this desired outcome. (Comment 4.6)*

Response: Maintaining and increasing the abundance of early-seral species composition is one of the purposes of the proposed activities (DEIS p. 2). Removing late seral species is not one or the purposes of the Jackson project.

Comment: *Alternatives 1 and 3 would not meet the purpose and need to restore and enhance aspen stands as well as alternative 2 would. (Comment 4.17)*

Response: Alternative 1 (no action) would not restore any aspen stands. Alternative 2 would treat the most acres of aspen at 295 acres being treated (DEIS, p.31). Of the 295 acres, 126

acres would receive a commercial treatment (DEIS, p.68). Alternative 3 would treat 293 acres of aspen (DEIS, p. 31), with 94 of those acres being treated commercially (DEIS, p. 68).

Comment: *Restricting the removal of conifers to under 21" dbh does not allow the removal of the trees which provide the most competition for aspens. (Comment 4.18)*

Alternatives 1 and 3 would not meet the purpose and need to restore and enhance aspen stands as well as alternative 2 would. Restricting the removal of conifers to under 21" dbh does not allow the removal of the trees which provide the most competition for aspens. (Comment 5.4)

Response: In most aspen stands in the Jackson project area, the majority of the conifers present are less than 21 inch dbh. Consequently, the smaller sized trees provide most of the competition to the aspen trees. Additional description of the existing condition of aspen stands has been included in the FEIS. Many of the conifers greater than 21 inch dbh within aspen stands are part of the historic stand structure and need to be retained to meet the Ochoco National Forest Land and Resource Management Plan as amended in 1995 by the Regional Forester's Forest Plan Amendment #2 (DEIS p. 7). The amendment requires that (for the Jackson project) all live trees 21 inch dbh or larger that currently exist be maintained (DEIS p. 60). On p. 2 of the DEIS, purpose and need statement number 4 addresses the need to reduce (not eliminate) conifer competition within aspen stands. This project does not propose to change the diameter limit for harvest for aspen restoration.

Comment*: The reader sees in Table 23 (DEIS p. 50) that approximately 18-20 thousand acres are proposed for management (commercial and noncommercial) but there is no indication of what PAGs these treatments are in. (Comment 4.24)*

Response: Two new tables (Tables 24 and 25 on FEIS p. 50) have been incorporated into the FEIS, showing silvicultural treatments by PAG by alternative.

Comment: *We also believe that you are not proposing to treat enough acres to make a measurable impact over time. If you look at Figure 3 (DEIS p. 52) you see that the Dense Structural Stages for both Alternatives 2 and 3 at year-0 are nowhere near the lower bound of the HRV and that for both action alternatives after 20 years the dense structural stages exceed the high end of HRV. Unless you intend to re-enter these stands in the next 20 years, this is inadequate treatment today. We suggest that you increase the acres treated, remove the arbitrary diameter limit, and treat the acres such that after 20 years the dense structural stages shown in Figure 3 still don't exceed the HRV high values. (Comment 4.25)*

Response: There are currently about 10,000 acres of dense structural stages within the Jackson project area. Alternative 2 reduces this amount by over 2,000 acres while Alternative 3 reduces it by about 1,900 acres (DEIS p. 51 – 52). After 20 years, as noted, the amount of dense stages is above HRV for both action alternatives, but not as far above as the no action alternative (DEIS p. 51 – 52). There is no proposal to re-enter stands treated under the Jackson project within the next 20 years, however, there is no preclusion that additional stands within the Jackson project area could not be treated within the next 20 years. Future vegetation management projects within the Jackson area would be proposed under the management direction that exists at that time and be based on the vegetative conditions that exist in the future.

Comment: *Alternative 2 will reduce the high-risk stages [to insect/disease outbreak] by 2,078 acres which is the most of all the alternatives. (DEIS p. 57) This is only 20% of the high risk acres identified. This would hardly seem like it meets the intent of the Purpose and Need. Again, we see in Figure 6 (DEIS p. 58) that even at year-0, the action alternatives do not reduce high-risk acres to the HRV low values. Again, in Figure 6 we see that after 20 years, the action alternatives leave the landscape far worse than it is today. We suggest that you increase the acres treated and the treatment*

methods be more aggressive (though we don't see in the DEIS just what you propose to do) so that at year-0 the high-risk acres are below the HRV low and remain below the HRV high at year 20. (Comment 4.26)

The actual number of acres being treated in comparison to the total acres in the Jackson Vegetation Project area is so small that I question the effectiveness of the project with regard to reducing "the susceptibility of the landscape to large-scale infestation by insects and disease". (Comment 5.3)

> **Response:** As discussed on p. 2 of the DEIS, one purpose of the Jackson project is to "Reduce the susceptibility of the landscape to large scale infestation by insects and disease." There are currently over 10,000 acres classified as being in a high risk condition. Alternative 2 would reduce this amount by almost 2,100 acres and bring the amount of high risk acres to just below the midpoint of the historic range for that condition (DEIS, p. 57). The 20 year projections do not include any future management activities (DEIS p. 58). Thus the acres of high risk increase with time as stand succession and growth continue. After 20 years both action alternatives are projected to result in fewer acres of high risk than the no action alternative (DEIS p. 57 – 58).

***Comment**: On DEIS p. 60, the first paragraph under Direct and Indirect Effects—LOS Stands, it appears you have an inconsistency with your data. You refer to the acres of LOS stands, for instance a total 4,191 acres of which 2,663 is in the DGF PAG. But these figures do not reconcile with those in Table 29 on DEIS p. 59. (Comment 4.26)*

> **Response:** The discussion on DEIS p. 59 indicates that in order to be considered as a "stand," LOS must occur in blocks of at least 5 acres. While the acres in DEIS Table 29 reflect all mapped LOS, including scattered patches that are smaller than 5 acres, the acres described on DEIS p. 60 include only LOS stands of 5 acres and larger. Text has been added to the FEIS (p. 59) to clarify this distinction.

***Comment:** We strongly urge the FS to protect "small old trees." That is trees that may not be 21" dbh but do have old growth characteristics like large bark plates, colored bark, flat top, relatively large branches, asymmetric crowns, etc. (Comment 6.1)*

> **Response:** All live trees 21" dbh or larger will be retained in harvest prescriptions. In addition, prescriptions require that old character ponderosa pine be retained, regardless of size or condition. Identification of old pine is based on tree characteristics similar to those discussed in the reference cited by the commenter (*Van Pelt, R. 2008. Identifying Old Trees and Forests in Eastern Washington. Washington State Department of Natural Resources).* These do include bark characteristics, branching structure, and crown forms as recommended. This requirement is included in the Final Environmental Impact Statement (p. 315).

***Comment:** We urge the FS to develop prescriptions that achieve a great degree of variability also referred to as "gappy-patchy-clumpy." This may be attained by using "skips and gaps" within each stands, retaining and protecting "living room" sized clumps of 3-15 trees; heavily thinning small portions of each stand, etc. (Comment 6.2)*

> **Response:** Variable density prescriptions will be utilized for commercial thinning treatments with an objective of reducing densities, on average, to recommended stocking levels (DEIS p. 279). The prescriptions currently in use on the Ochoco National Forest have been developed over the last few years to retain "clump, patchy, gappy" vegetation patterns and maintain a diversity of trees as suggested. Example units from past projects have been reviewed by the commenter's organization and concurrence was reached that these concepts have been incorporated (Tim Lillebo review of 12/2/2009 on file at the Lookout Mountain Ranger District).

Comment: *Finding the right mix of treated and untreated areas within each stand is important, but also between stands and across the landscape – some stands should be treated and others left untreated, and this should be a subject of rational analysis and quantification. (Comment 6.3)*

Response: The Jackson project will maintain a large mosaic of stands conditions through the landscape. For example, there are no treatments in Old Growth Management Areas (OGMA) and of the 4,190 acres of mapped LOS, approximately 2,500 acres are not being treated (DEIS p. 59-60). Also, within the 1,225 acres of connective corridors, approximately 600 acres will not be treated (DEIS p. 65-66). In the 5,661 acres of mapped RHCAs, Alternative 2 proposes to treat only 1,825 acres or 28%.

Comment: *The non-commercial treatments appear to affect a large amount of acreage. We urge the FS minimize the effects of heavy equipment, and to include plenty of untreated "skips," so that patches of dense forest, undisturbed soil, and dead wood recruitment are retained at various scales within and between stands. (Comment 6.6)*

Response: Heavy equipment is only proposed in commercial treatment units. In areas identified for noncommercial treatment only, no heavy equipment will be used (DEIS p. 12-13). In noncommercial treatment units, variable density prescriptions will be utilized to ensure that patches of dense forest, undisturbed soils and wood recruitment are retained.

Comment: *The DEIS does not provide enough analysis to show that adequate numbers of trees are being retained to ensure sufficient recruitment of snags, dead wood, and instream wood over time and across the landscape. (Comment 6.9)*

The DEIS (p 176) says that thinned stands have fewer trees available for future recruitment and that thinned stands would have fewer but larger snags in the future. This is an important trade-off, maybe one of the most important effects of this whole project, but the issue gets just a few sentences. The FEIS should explore this trade-off quantitatively and compare to the snag needs of key wildlife as described in DecAID (while noting all its caveats). The FS cannot conclude that the project will not adversely affect the viability of primary cavity excavators unless this trade-off is more fully described. (Comment 6.12)

Response: In areas where we are treating, we are retaining a more that adequate number of trees per acre. These un-thinned patches represent trees of all size classes and will be available for the future recruitment of snags, dead wood and instream wood. Stand density objectives are based on the recommended stocking levels from Powell (DEIS p. 279). Recommended stocking levels define the range of stand densities which are high enough to utilize a substantial portion of the site resources yet low enough to reduce risk of competition-related tree mortality. Snag recruitment on approximately 8,085 acres which are left at a stage of high risk of insect and disease in Alternative 2 (8,233 acres in Alternative 3) would continue to produce snag recruitment at the current trend (DEIS p. 57). These acres left in high risk of insect and disease represent approximately 20% of the forested PAGS in the project area (refer to Tables 13 and 28). Thus, these acres are likely to contribute substantially to the provisions of snag habitat, dead wood and instream over time and across the landscape.

Comment: *The VEMG snag standards are not consistent with the current science. Many more snags are needed to support viable populations of diverse wildlife associated with dead wood. In order to have optimal levels of snags over time, many more green trees typically need to be retained. (Comment 6.10)*

Response: The Jackson snag analysis represents the best available science and draws on information from the Forest-wide Viable Ecosystem Management Guide (VEMG) (Simpson et al. 1994), the Landscape Ecology, Modeling and Analysis team's Gradient Nearest Neighbor (GNN), and DecAid (Mellen-McLean et al. 2009) with the objective of evaluating

the existing condition and HRV for snags in two DecAid habitat types: Eastside Mixed Conifer (EMC) and Ponderosa Pine/Douglas-fir (PPDF). EMC is associated with species such as the pileated woodpecker, red-naped sapsucker and Williamson's sapsucker, while PPDF is associated with species such as white-headed woodpecker and Lewis' woodpecker. The commenter does not provide any substantive information that would alter our snag management policy and objectives.

Comment: *Does "HRV Max" as referred to in the snag analysis (DEIS pp 173-175) really encompass the full historic range, such as the abundant snags that follow insect outbreaks and fires? Which species suffer when we fail to manage for the full range? (Comment 6.11)*

Response: As explained in the snag analysis (DEIS p. 191-202) and response to comments 6.10 and 6.12, we are managing for the full historic range of possible snag recruitment. Insect and disease risk will remain unchanged on a large percentage of the project area; therefore we are not precluding the possibility of large areas of contiguous snag recruitment.

Comment: *Any tree >21" dbh that must be cut for safety reasons should be retained on site (not just those in RHCAs). To do otherwise would create an undesirable motive to over-identify hazard trees. (Comment 6.15)*

Response: The Forest Service follows Federal and State OSHA regulations regarding safety standards and guidelines as well as Agency regulations and requirements regarding the identification of dangers to employees and nonemployees.

Comment: *When logging is intended to restore hardwoods by removing conifers, we encourage the FS to retain many large conifers and girdle and leave others to enhance snag habitat. (Comment 6.18)*

Response: In the case of aspen treatments, as in other commercial treatment, the Jackson project does not propose cutting trees larger than 21 inches. In regards to noncommercial thinning, the Jackson project proposes to girdle trees only up to 15" (DEIS, Appendix A, p. 280).

Comment: *The Forest Service plans to convert this naturally diverse forest into primarily early seral species (ponderosa pine and western larch, the timber industry preferred species) and reduce fir also in the name of fire risk reduction (even though this is higher elevation back country with no local communities) and theoretically to reduce insects and disease (though the bulk of the forest looks healthy, with no insect or disease epidemics in the area). (Comment 8.9)*

Response: The Jackson project proposes to move upland vegetative conditions towards the range of conditions that existed historically and provide for a mixture of all seral conditions (DEIS p. 2). To accomplish this objective in part, the proposed treatments will favor species compositions which were more abundant historically (DEIS p. 4). The DEIS discloses that historically the amount of area dominated by ponderosa pine and western larch was much more common than areas dominated by late seral species (grand fir and Douglas-fir). In many stands, there is relatively more western juniper, Douglas-fir, and grand fir and less ponderosa pine and western larch than what occurred historically (DEIS p. 3, 42). Currently, the overall abundance of acres dominated by grand and/or Douglas-fir is within its historic range (DEIS p.52). Both action alternatives propose to reduce the amount of area dominated by these species, yet keep it within its historic range. Correspondingly, the area dominated by ponderosa pine and western larch would be increased, but would also remain within the historic range (DEIS p. 51 – 53). The DEIS also recognizes that although the abundance of late seral species would be reduced, they would not be eliminated from stands where they are currently present (DEIS p. 51).

One purpose of the Jackson project is to reduce the potential for high-intensity wildfires and maintain conditions that currently support low-intensity fires (DEIS p. 2). High-intensity wildfires increase the potential for unwanted loss of trees, water quality, soil productivity, wildlife habitat, and other forest resources. High-intensity wildfires also limit suppression options available to firefighters and decrease the safety, efficiency, and economy of fire suppression (DEIS p. 5, 74). The Jackson project does not propose to reduce risk of high intensity fires simply due to its proximity to local communities as suggested. Currently about 29 percent of the Jackson project area has fuel conditions that would support a moderate or high fire hazard and 28 percent that indicate high burn probability. Under the no action alternative these conditions would increase over time (DEIS p. 75). Both action alternatives reduce the amount of moderate or high hazard and the amount of high burn probability (DEIS p. 76).

Another purpose of the Jackson project is to reduce the susceptibility of the landscape to large-scale infestation to insects and disease (DEIS p. 2). The DEIS does not suggest that there is currently an ongoing insect epidemic. The DEIS does, however, recognize that currently there are over 10,000 acres of high risk stages in the area and that within 20 years the amount of high risk area will increase to over 17,000 acres and exceed the historic abundance for that condition (DEIS p. 57). One other purpose of the Jackson project is to maintain and increase the abundance of late and old structural stands (DEIS p. 2). Maintaining the resiliency of the existing large trees is among the objectives of the proposed treatments as is increasing the growth rates of smaller trees so that they can become large trees faster (DEIS p. 3). Thinning is proposed to reduce competition, maintain resiliency, lessen risk of loss due to wildfire, and increase growth rates. This is supported by numerous references cited in the DEIS (DEIS p. 3, 49 – 50, 54 – 56).

Comment: *The Forest Service is also claiming to increase large tree structure in the RHCAs by removing existing smaller and mature trees (and thus removing trees that would become large over time) and to be generally increasing the amount of Late and Old Structure forest the same way, though they would be actually setting back such development by removing thousands of acres of mature trees next in line to become old growth. (Comment 8.10)*

Response: Increasing large tree structure within RHCAs and increasing the abundance of Late and Old Structure (LOS) are two of the stated purposes of the Jackson project (DEIS p. 2). Two types of LOS are defined in the Regional Forests Forest Plan Amendment #2, multi-stratum with large trees and single stratum with large trees. In both of these structural stages large trees are common (DEIS p. 58). It is not defined as a condition in which trees are mature nor is it defined as old growth as the commenter suggests.

Historically, the most abundant type of LOS in the Jackson project area was the single stratum condition. Currently this structural stage is well below the historic range of abundance while the multi-stratum stage is within the historic range for all plant association groups except Douglas-fir (DEIS p. 59). Compared to the no action alternative the proposed activities will result in an increase of large trees over time as they reduce stand density and associated inter-tree competition for water, light, and growing space. The DEIS cites numerous references supporting the science demonstrating tree response to density reduction treatments. These responses include increased growth and vigor, reduced susceptibility to insects and disease, and moderated fire hazard (DEIS p. 3, 49, 50, 54, 55, 56). Increasing the vigor and reducing susceptibility of the existing large trees will help maintain them over time while increasing the growth rates of smaller trees will allow them to grow to large stature quicker. Alternatives 2 and 3 result in a conversion of some existing multi-strata LOS to single stratum LOS as smaller understory trees are removed. Over time, alternatives 2 and 3 also result in more single stratum LOS than the no action alternative (DEIS p. 61 – 64).

Comment: *While we are not opposed to thinning the truly small trees (generally only up to 8" dbh, sometimes up to 10" dbh) where appropriate due to unnatural density from past logging and fire suppression in drier ponderosa pine-dominant areas, mature tree logging (esp. 15" dbh and greater) needs to be greatly scaled back or curtailed in order to allow for restoration of missing historic old growth forest over time, restoration of large wood structure missing due to past logging (including snags and large down wood), and provision of existing mature forest for wildlife needs, nutrient cycling, recreational uses, and carbon storage, as well as to provide the next generation of old growth trees. (Comment 8.11)*

> **Response:** An alternative such as this was considered but was eliminated from further study as described on p. 30 of the DEIS. Thinning of only smaller trees would severely limit attainment of many of the purposes of the Jackson project. These include maintaining and increasing the abundance of LOS (especially single stratum), increasing large tree structure, aspen restoration, and providing wood products.

Comment: *Much of the project area is naturally and historically a mixed conifer forest, not low elevation, and dry ponderosa pine-dominant forest. Therefore, it's not appropriate to move seral and structural conditions of these forest stands through logging and burning in most cases since they are already within historic ranges of variability, with a lot of evidence on the ground of past logging-out of old growth and mature grand fir and Douglas-fir. (Comment 8.27)*

> **Response:** Approximately 43 percent of the Jackson project area is mapped as the Dry grand fir plant association group (PAG) (DEIS p. 40). Within this PAG, 25 different seral/structural stages are defined. Fifteen of the stages are outside of the historic range of abundance while ten are within (DEIS p. 44 – 45). Dry grand fir single strata LOS was historically the single most abundant type of LOS within the project area. It is now well below the historic range as are all other types of single strata LOS (DEIS p.59). The DEIS recognizes that this deficiency on the landscape is largely due to past timber harvest, which removed large trees from the landscape (DEIS p. 3, 60). Without density reduction, the replacement of these large trees will be hampered by overly dense conditions that slow tree growth, increase risk of tree mortality to insects and disease, and increase potential loss of large trees to high intensity fire (DEIS p. 3 – 4, 57, 60, 63).

Comment: *The findings of the Watershed Analysis simply don't apply equally or uniformly across the whole sale area and don't take into account the effects of past logging--specifically the removal of much greater numbers of old growth and mature fir than exist now on site as mature or old growth fir trees. Higher elevation mixed conifer and moister mixed conifer naturally burns at high or mixed severity and should not be logged to artificially create low intensity fire conditions--which arguably can't be created that way since the area will come back in young grand fir and lodgepole pine, both of which are typical of higher severity fire regimes and create greater fire hazard than mature or old grand fir and lodgepole pine. (Comment 8.28)*

> **Response:** The analysis performed for the Jackson project area recognizes that the area has a diverse mix of biophysical environments and uses plant association groups to classify the landscape. Plant association groups vary in productivity and support variable mixtures of forest vegetation (DEIS p. 39 – 40, 65 - 66, Map 4). The DEIS also discloses that past timber harvest, which removed large trees from the landscape, is an important reason why large trees are now deficit in the project area (DEIS p. 3, 41 - 43, 60). Commercial thinning is not proposed to create low intensity fire conditions in the Jackson project.

Comment: *Where is your proof that the rate of increase in LOS large tree characteristics would be "hampered" by "overstocked" conditions with no action? Hampered how much? How many scientific studies for what specific geographic areas were used to determine which stands were "overstocked" in the Jackson/Deep project area? How is the concept of "over-stocking" relevant to naturally denser*

moister and cold mixed conifer forest found in the project area, compared to the more naturally open, drier ponderosa pine-dominant forest to which the stocking study refers? We think that this is not the accurate science or the best professional judgment required by NEPA. (Comment 8.32)

Response: The DEIS cites multiple scientific studies that demonstrate that reductions in stand density result in increased vigor and growth of the remaining trees, reduced susceptibility to insects and disease, and moderated fire hazard and lowered crown fire potential due to thinning and fuel treatment (DEIS p. 49, 50, 54 – 56). Overstocking is determined by comparing the current stand density to the recommended stocking levels derived from "Suggested Stocking levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest" (DEIS p. 67, 279). The stocking levels contained in this Guide were developed for the ecological province (Blue-Ochoco) that includes the Ochoco National Forest and is based on earlier published research (Cochran and others, 1994). Stocking levels vary depending on site productivity, tree size and species. For example, recommended stocking levels are higher on more productive sites compared to drier sites and also increase as tree size increases (DEIS p. 279).

Comment: *This paragraph [DEIS p. v, first paragraph] pretty much admits that the stocking/large tree vs. smaller tree competition issue is mostly relevant to "drier sites" yet applies this rationale for planned commercial logging, non-commercial thinning, and burning for the entire Jackson project as a general "prescription" regardless of highly variable site-specific conditions from one part of the sale area to the next. (Comment 8.33)*

Response: The cited paragraph lists several summarized outcomes of what it would mean to not meet the stated need of the Jackson project. The sentence referring to drier sites is just one of the examples given in this summary section of the DEIS.

Comment: *How does LOS increase with logging? This is a fallacious argument. At best, LOS areas would remain structurally LOS but not increase. The promise of encouraging the development of an accelerated rate of large structure is disingenuous when it is considered that the Forest Service will be back to cut down those trees or any growing up close to but under 21" dbh within 20 to 30 years at most. Single strata forest is probably not the natural condition of most of the project area. It is disingenuous to suggest that there would be no future management activities other than continued fire suppression. (Comment 8.40)*

Response: The DEIS makes no claim that the amount of Late and Old Structure (LOS) will immediately increase due to logging. We agree that, as the commenter points out, areas that are currently LOS would remain LOS post treatment since no large live trees (apart from hazards) would be removed (DEIS 63 – 64). The proposed treatments will reduce stand density and increase the vigor and growth rates of the remaining trees. Over time the proposed treatments result in an increase in the amount of LOS over the no action alternative because existing large trees will persist longer and additional trees will reach large stature quicker (DEIS p. 49 - 50, 51 – 52, 63 – 64). We disagree with the commenters statement that the Forest Service will be back within 20 to 30 years to cut down these trees or any growing up close to but under 21 inches dbh. Current Forest Plan direction is to favor the development of LOS and move the landscape towards the historic range of variability. Assuming these trees would be cut down is not a reasonably foreseeable action. Future actions in the project area would be responsive to future landscape conditions, and policies and direction in place at that time. The projections of future LOS abundance are measures of the effects of the activities proposed in the current Jackson project. They make no assumptions about future management actions other than continued fire suppression (DEIS 49 – 50).

Comment: *How is a 47% increase in total LOS in 20 years calculated? If these new large trees are based on increased growth rates, the DEIS should disclose the model and site-specific data used for such calculations and also disclose how may other mature trees could attain large structure in 20 years if they were not removed by proposed logging. (Comment 8.41)*

Response: The projected increase of total LOS in 20 years is not 47% as the commenter stated. When compared with alternative 1 (no action) the projected increase of LOS in 20 years for alternative 2 is 3% and 2.8% for alternative 3 (DEIS, p.62). The DEIS (p. 49) discusses the growth rates used in the viable ecosystems model, and cites studies that support the use of those growth rates. LOS is measured across the landscape by acres, not by the number of mature trees that can attain large structure. Alternative 1 (no action) displays the number of LOS acres that are projected for year 20 without the proposed logging as the commenter requests.

Comment: *We support no trees equal to or greater than 21" dbh being logged, but the limit should really be 15" dbh as there has been so much past and recent logging of large trees that there is now a regional deficit in trees over 15" dbh (as admitted in the Blue Mountains draft revised Forest Plan scoping document) as well as a well-documented deficit in trees over 20" dbh (see the science in the Interior Columbia Basin Ecosystem Management Plan). (Comment 8.44)*

Response: The reference the commenter provides concerning trees 15 inches dbh and larger comes from the scoping letter for the Blue Mountain Forests Plans revision. This Revision, scoping letter, and analysis behind it are applicable to the Malheur, Umatilla, and Wallowa-Whitman National Forests. It is not applicable to the Ochoco National Forest.

The landscape analysis performed for the Jackson project area was conducted to meet the ecosystem characterization requirements contained in the Regional Forester's Forest Plan Amendment #2 of June 5, 1995. The landscape analysis included five size/structural classes as described on p. 40 and 41 of the DEIS. Structural class 4 (small) constitutes a size range of 9.0 to 20.9 inches dbh. Historic ranges of variability have been developed for these classes and existing conditions for these classes are derived from analysis of satellite imagery. There is no further breakdown of size/structural classes, nor any direction that this type of analysis is necessary to characterize the landscape. Thus, the Jackson project did not specifically analyze the abundance of trees 15 to 20 inches dbh. The analysis does, however, indicate that the abundance of trees 21 inches dbh and larger is below the historic abundance (DEIS p. 43). For this reason, and to meet the standard provided in the Regional Foresters Amendment #2, the Jackson project does not propose the harvest of trees 21 inches dbh or larger as the commenter recommends (DEIS p. v, vi, 13, 14, 18, 50, 60, 64, 65, 177, 178).

Comment: *How would "old" junipers be determined? (Comment 8.46)*

Response: Appendix A of the FEIS has been updated to define the characteristics of old juniper trees. These characteristics include crown form, branching structure, bark color and bark features as described in *Biology, Ecology and Management of Western Juniper* (Miller et al. 2005) and summarized in *Western Juniper Management: A Field Guide* (Barrett 2007).

Comment: *These [stand structure conclusions listed in the Alternative Comparison table] are impossible to predict for 20, 30 & 50 years out without assuming unrealistic static conditions re: LOS, MSLOS, and insect risk. This is very misleading, inaccurate and unprofessional use of science. Models are biased by "garbage (data) in, garbage (assumptions) out." (Comment 8.78)*

Response: The projections included in the DEIS (p. 31) are provided to demonstrate the effects of each alternative and to provide a means of comparison between alternatives. The projections include differing growth rates resulting from the proposed activities based on the references cited on DEIS p. 49. They include assumptions about succession and future growth

only; they do not include future disturbance events such as widespread insect and disease occurrences, fire, or management activities other than continued fire suppression (DEIS p 49 – 50). Including assumptions about future stand dynamics influenced by disturbance as the commenter suggests would be purely conjecture.

***Comment**: What site-specific data goes into the VEMG model? What are the assumptions built into VEMG model results? Why are these not disclosed, as they should be, in the DEIS, under NEPA?...Has this guide been peer-reviewed by outside, independent scientists? (Comment 8.80)*

Response: Information about the Viable Ecosystem model is disclosed on DEIS p. 40 – 41 and 49 – 50. The HRVs were developed for the 1820 – 1900 time period. They are based on fire history, land survey notes from the 1870s, USDA publications circa 1900, and anecdotal information from various sources. These HRVs were developed to perform landscape level analysis in compliance with the Interim Ecosystem Standard contained in the Regional Forester's Forest Plan Amendment #2 (June 1995). The Standard requires the characterization of watersheds for patterns of stand structure and comparison to the HRV. The standard also provides guidance that the HRV "should be based on conditions in the pre-settlement era."

A review of the Ochoco National Forest's implementation of the Regional Forester's Forest Plan Amendment #2 was conducted by the Regional Office in 1997. This review found that, "The Viable Ecosystem Management Guide (VEMG) is a sound, reasonable, and good guide for ecosystem management. It is especially good in identifying the Historical Range of Variability (HRV) for watersheds on the Ochoco National Forest" (August 1, 1997 Regional Forester Letter, on file at Ochoco National Forest).

***Comment:** What is the data/evidence basis for increasing single-strata LOS? (Comment 8.87)*

Response: Single strata LOS was historically the most abundant LOS stage within the Jackson project area (DEIS p. 59). This conclusion is based the Historic Ranges of Variability (HRVs) that were developed as described in the Viable Ecosystem Management Guide. Currently the single stratum LOS is well below the HRV in the Jackson project area with about 1,200 acres existing as opposed to over 10,000 to 20,000 acres historically (DEIS p. 43, 59). The Regional Forester's Plan Amendment #2 contains direction to manipulate vegetative structure in a manner that moves it toward HRV; it also contains direction to "maintain open, parklike conditions where this condition occurred historically." It further encourages "the development and maintenance of large diameter, open canopy structure."

***Comment:** What is the basis for assuming more than natural susceptibility to insects and disease? (Comment 8.89)*

Response: One of the purpose and need statements on p. 2 of the DEIS is "reduce the susceptibility of the landscape to large-scale infestations by insects and disease." The DEIS (p. 56) further describes vegetative stages of the viable ecosystems model that are associated with a high risk to insects and disease. Risk factors that are associated with susceptibility to insects and disease are described on p. 54-56 of the DEIS. The DEIS does not assume, as the commenter suggests, more than natural susceptibility to insects and disease.

***Comment:** How is conifer "encroachment" within aspen areas determined? (Comment 8.90)*

Response: The DEIS (p. 67) describes how aspen need full sunlight to thrive. When conifers are growing near aspen they compete for sunlight and limited site factors – water, nutrients and growing space (DEIS, p.67). Appendix A of the DEIS (Aspen Treatments, p. 280) describes the proposed removal or elimination of conifers within 75 feet of aspen. By

describing the proposed treatment, the Forest Service has described how encroaching conifers are defined and determined in the field.

Comment: *What is the baseline data determining the HRV for the area? From what kind of data, from what year, from what locations exactly? Typically FS HRV data is from years after heavy logging has already taken place from areas not in the project area. (Comment 8.93)*

Response: The Ochoco National Forest uses the Viable Ecosystem Management Guide (VEMG) to describe several biophysical environments (Plant Association Groups or PAGs) and multiple vegetative conditions that could exist within each PAG. Comparisons are then made between the existing abundance and the HRV for each condition (DEIS p. 2-3, 40 – 49). The VEMG provides the framework to perform landscape level analysis in compliance with the Interim Ecosystem Standard contained in the Regional Forester's Forest Plan Amendment #2 (June 1995). The Standard requires the characterization of watersheds for patterns of stand structure and comparison to the HRV. The standard also provides guidance that the HRV "should be based on conditions in the pre-settlement era."

As described in the VEMG, HRVs were developed for the 1820 – 1900 time period. They are based on fire history, land survey notes from the 1870s, USDA publications circa 1900, and anecdotal information from various sources. A review of the Ochoco National Forest's implementation of the Regional Forester's Forest Plan Amendment #2 was conducted by the Regional Office in 1997. This review found that, "The Viable Ecosystem Management Guide (VEMG) is a sound, reasonable, and good guide for ecosystem management. It is especially good in identifying the Historical Range of Variability (HRV) for watersheds on the Ochoco National Forest" (August 1, 1997 Regional Forester Letter, on file at Ochoco National Forest).

Fuels and Fire

Comment: *Attempting to eliminate fire in the general forest harms the natural resources. Manipulation of the fire cycle kills the flora and fauna species that are dependent on fire.*

Projects to reduce fire intensity must only be undertaken within a mile of the WUI.

Stand-replacing fires are not catastrophic in spite of USFS claims to the contrary. Reducing fuels in the general forest not associated with a WUI is an excuse to extract volume. If forests aren't supposed to burn in the forest then why does fire (lightening) come from the sky during the summer when the humidity is low and the temperatures are high. (Comment 1.9)

Response: Stand replacing or uncharacteristically severe wildfire is not desirable across widespread portions of the project area, not just within a mile of the WUI. This would have potentially significant negative effects on many forest resources, including critical fish and wildlife habitat, increased erosion potential and related stream sedimentation, as well as detrimental soil conditions.

Fire exclusion over the past 90-100 years has reduced the acres burned by naturally occurring low intensity fires and allowed the buildup of surface fuels, the development of ladder fuels and an increase in fire intolerant species such as grand fir. Stands have become denser and the potential for high severity fires has increased. See hazard and risk analysis, DEIS, p. 75-91. One of the purposes of the project is to reduce the potential for high intensity wildfires and maintain conditions that currently support low intensity fires (DEIS p. 2).

Comment: *Leaving fire intolerant species such as grand fir that are over 21" dbh is contrary to Purpose 2 on p. 2 of the DEIS to, "reduce the potential for high intensity wildfires and maintain conditions that support low intensity fires." Large fire intolerant species like grand fir that have*

limbs almost to the ground act as ladder fuels that could lead to crown fires. Removing fire intolerant species over 21" dbh would better help meet Purpose 2 of reducing the potential for high intensity wildfires. (Comment 4.3)

Grand fir often have limbs to the ground creating ladder fuels that can move fire from the ground to the crown. Removing grand fir trees as appropriate, regardless of the diameter, will effectively help meet purposes 1, 2, 3, 6 and 7.

Are a sufficient number of acres being treated in the Jackson project area to truly reduce the potential for high intensity wildfire? It is imperative that as many acres be treated in Condition Classes 2 and 3 as is possible. Further, has the forest considered doing maintenance treatments on acres in Condition Class 1? (Comment 5.2)

Response: The Ochoco National Forest Land and Resource Management Plan, as amended in 1995 by the Regional Forester's Forest Plan Amendment #2 (DEIS p. 7), requires that all live trees 21 inch dbh or larger that currently exist be maintained (DEIS p. 60).

Fuels treatments are described in the DEIS (p. 280-282) and include maintenance burning as well as reduction of natural and activity fuels. DEIS p. 76 discloses that both action alternatives would reduce the acres of high and moderate risk of loss to 23% of the Jackson project area.

Comment: *Much of the fuel accumulation referenced in paragraph two of this section ["fuels" section in summary] could be due (and predictable due to) naturally denser high-elevation and moister mixed conifer forest that was logged and burned in the 1980s and 1990s but is still well within its historic fire return interval and recovering past density in the form of small trees regenerating—often grand fir and lodgepole pine seedlings and saplings that naturally grow in more densely as such sites recover from past logging or wild fire. This is normal, not abnormal, for such sites and the Forest Service should not be trying to prevent such density or keep it artificially low. (Comment 8.34)*

Response: A stated purpose of the Jackson project is to "…..maintain conditions that currently support low-intensity fires" (DEIS p. 2). Low-intensity fires were historically the dominant disturbance factor in the watershed and stand structures that resulted from them were more common on the landscape than today (DEIS p. 3, 5, 42 - 43). This includes single-stratum Late and Old structure, which is well below its historic range of abundance (DEIS p. 3, 58 – 59). If conditions that currently support low-intensity fires were not maintained it would increase the potential for the unwanted loss of many resource components due to high intensity fire, limit suppression options in the event of a high intensity fire, reduce fire fighter safety, and increase the cost of fire suppression (DEIS p.5).

Comment: *Why is fire such a great preoccupation of the Forest Service regarding this specific project area? It is not near any community wildland urban interface and is naturally prone to landscape-scale wildfire and crown or stand replacement fire over large areas, including moister mixed conifer, high elevation stands, and lodgepole pine stands. (Comment 8.38)*

Response: Historically, fire has been the dominant natural disturbance in the Jackson project area. A fire scar analysis for the years 1650 thru 1900 from a dry mixed conifer site 10 miles southwest of the Deep watershed shows an average fire return interval of 15 years (Heyerdahl 2010). A fire scar analysis for the years 1770 thru 1900 from a dry mixed conifer site 20 miles northwest of the Deep watershed shows an average fire return interval of less than 10 years (Burleson 1981). A fire scar analysis from a site adjacent to a moist mixed conifer site 15 miles west of the watershed shows an average fire return interval of 33 years (Dean 2009).

A fire scar analysis conducted in the middle of the Deep Creek watershed in November 2010 for catfaces and other evidence of fire found 71 scars on 10 samples (Dean, Scholz 2010). It is evident from numerous scars on the trees near Happy Camp Creek that low intensity fire was historically a common occurrence. Judging from the size class and density of lodgepole in the understory, which (along with grand fir) is not a fire tolerant species, it appears that fire hasn't occurred here in many decades. Fire-adapted ponderosa pine, western larch and Douglas fir are the dominant species on the Ochoco, and are not naturally prone to landscape-scale stand replacement fires.

Comment: *The area needs to be analyzed site-specifically for varying fire regimes and fire return intervals that would have occurred historically with different fire regimes and fire return interval areas being treated differently…How is the need to increase early seral fire-tolerant species determined? This is not uniform across the project area. (Comment 8.88)*

Response: Fire regimes describe the role of fire in terms of frequency and intensity (Agee 1993). Discussion of the historic role of fire, which includes site specific information on fire regimes and fire intervals in the Jackson project area, has been added to the FEIS (p. 73). The need to increase early seral fire tolerant species was determined by evaluating planning direction identified in the Forest Plan, identifying desired future conditions, and comparing then to the existing condition in the project areas (DEIS p. 2). It was determined that Jackson planning areas is deficient in early seral fire-tolerant species and was therefore incorporated into the purpose and need of the project. Unit-specific prescriptions are included in the final EIS in Appendix B.

Climate Change and Carbon Cycling

Comment: *We are also concerned by the Jackson project's potential impacts to loss of carbon storage that would otherwise exacerbate climate change as released CO2. (Comment 8.24)*

Response: Climate change and carbon cycling are discussed in the draft EIS (p. 250 – 252). Since the proposed management actions in this project would leave treated stands fully stocked after implementation (fully capable of utilizing the available moisture, nutrients, and growing space on the treated sites), the vegetation would still continue normal respiration processes and effects to atmospheric carbon would be inestimable on a local, regional, national, and global scale.

Soils, Water, Fisheries, RHCAs

Comment: *Jackson project logging activities will be a source of sediment during precipitation events. The only way to prevent erosion from bare soil created by logging activities is to place sediment traps between bare soil and live water…The log extraction activities that will occur on the Jackson Vegetation management project will adversely affect hydrological process by reducing canopy interception, decreasing hydraulic conductivity and increasing bulk density, collapsing subsurface pipes, increasing local pore water pressure which will increase the chance of landslides. The Responsible Official must not deny that this damage will occur without scientific citations to verify the claim. (Comment 1.2)*

Response: This comment suggests that the need for action (DEIS 1-11) is outweighed by potential adverse impacts. The environmental consequences have been thoroughly discussed and disclosed in Chapter 3 of the FEIS, including findings for wildlife, fisheries, soils and hydrology. Project design features, including Best Management Practices will minimize potential adverse effects (DEIS p. 15-30).

The DEIS, p. 110, discloses that the primary activities that affect sediment delivery within this project area are harvest and road building. Through the combination of BMPs and project design criteria, the potential for sediment from commercially harvested area is reduced to non-existent or negligible quantities (DEIS p. 111).

Comment: *We encourage the Forest to include relevant citations related to shade response and/or stream temperature from broadleaf enhancements. (Comment 2.1)*

Response: The ONF recognizes that there is a data/knowledge gap in the literature regarding shade response and/or stream temperature from broadleaf enhancements. However, the ONF also recognizes the value of broadleaf plant communities, their diminished range, and the need to expand their range across the planning area (DEIS p. 5). Therefore, limited riparian treatments were developed by an IDT with the goal of improving riparian stand conditions to increase shade and incrementally reducing temperature but also to improve other values including (other aspects of) fish and wildlife habitat. Also important, riparian treatments were developed on a very limited scope and would be broadly distributed across the watershed to ameliorate impacts (see FEIS Table 61). These treatments are also consistent with the 2004 Deep Water Quality Restoration Plan.

Riparian broadleaf trees and shrubs provide an important component in RHCAs. They maintain proper water temperatures by shading the streams and they contribute to bank stability because their roots spread horizontally, which creates a roughness element that reduces the velocity and erosive energy of over-bank flow during high water events. Studies have shown marked differences among riparian species and vegetation types in root characteristics and their influence on bank stability (Lyons and others 200; Simon and Collison 2002; Wynn and others 2004). Broadleaf vegetation also contributes allochthonous organic matter in the form of leaves, twigs and other fine litter and indirectly as terrestrial invertebrates (Bisson and Bilby 1998). For most low order streams in forested watersheds, much of the energy for aquatic food webs is derived from allochthonous inputs (Fisher and Likens 1973; Sedell and others 1978; Vannote and others 1980; Newbold and others 1982). Different plant sources vary widely in nutritional quality, and require different degrees of instream processing and conditioning by microbes and invertebrates (Allen 1995; Webster and Benfield 1986). In some areas, seasonal inputs of terrestrial insects from riparian areas are an important food source for drift feeding fish species (Young and others 1997). Such inputs are highest from closed canopy riparian areas dominated by deciduous plant species (Baxter and others 2004, 2005; Edwards and Huryn 1995; Nakano and others 1999). Large overstory conifers are also important, as they provide some shade and bank stability, and over time contribute to the large wood element in streams.

The increasing density of young conifers in riparian areas is affecting the ability of broadleaf shrubs to grow and spread. Many broadleaf species are shade-intolerant; the young conifers compete with the riparian shrubs for sunlight and water. In addition, this dense conifer understory is competing with the large overstory trees, increasing the risk of competition-related mortality in the overstory (DEIS p. 5-6). It is also generally recognized in the literature that hardwoods are generally shade intolerant and that treatments have been successful at increasing growth. The following studies and brief summary of results are included below:

Jones, B. E., Rickman, T. H., Vazquez, A., Sado, Y. and Tate, K. W. (2005), Removal of Encroaching Conifers to Regenerate Degraded Aspen Stands in the Sierra Nevada. Restoration Ecology, 13: 373–379. doi: 10.1111/j.1526-100X.2005.00046.x

- Results showed that conifer removal created the proper growth environment (sunlight) required for aspen regeneration.

Kilpatrick, S., and D. Abendroth. 2001. Aspen response to prescribed fire and ungulate herbivory. P. 387–394 in W. D.Shepperd, D.Binkley, D. L.Bartos, T. J.Thomas, and L. G.Eskew, compilers. Sustaining aspen in western landscapes: Symposium Proceedings. USDA Forest Service Rocky Mountain Research Station, RMRS-P-18, Grand Junction, Colorado.

- Found that successful aspen regeneration was induced by either conifer removal or fire, and that all treated sites had adequate sucker densities for clone establishment 3–9 years post-treatment.

Shepperd, W. D. 2001. Manipulations to regenerate aspen ecosystems. P. 355–365 in W. D.Shepperd, D.Binkley, D. L.Bartos, T. J.Thomas, and L. G.Eskew, compilers. Sustaining aspen in western landscapes: Symposium Proceedings. USDA Forest Service Rocky Mountain Research Station, RMRS-P-18, Grand Junction, Colorado

- Removed competing conifers around two decadent aspen trees that were not sprouting, which stimulated root suckering and expanded the clone to 0.1 ha in size.

Benedict, T. 2001. Aspen regeneration in South-Central Colorado, San Isabel National Forest. P. 377–386 in W. D.Shepperd, D.Binkley, D. L.Bartos, T. J.Thomas, and L. G.Eskew, compilers. USDA Forest Service Rocky Mountain Research Station, RMRS-P18, Grand Junction, Colorado

- Had 346–1,031 stems/ha of aspen 4 years following conifer removal

Comment: *We encourage the Forest to pursue the temperature monitoring proposed in the DEIS and believe the related findings will be useful for future empirically based conclusions of the short, medium and long term shade and stream temperature effects of broadleaf enhancements. (Comment 2.2)*

Response: Monitoring is also described on FEIS p. 32. The Responsible Official will decide what monitoring will be authorized and implemented as part of the Jackson project and will document this decision in the Record of Decision for the Jackson Vegetation Management Project.

Comment: *[The Jackson project] violates OR's Clean Water Act/INFISH (riparian management objectives)/Riparian Habitat Conservation Areas. (Comment 3.5)*

Response: All action alternatives include design features intended to meet standards and guidelines in RHCAs (DEIS p. 15-20). Appendix C (DEIS p. 332-339) discloses how design elements and procedural requirements would meet INFISH standards and guidelines. The final EIS (p. XXX) describes how action alternatives are consistent with the Clean Water Act and Oregon state water quality standards.

Comment: *[The Jackson project risks] severely disrupting water quality and hydrologic flows and obliterating streams. (Comment 3.3)*

Riparian concerns are huge with this sale as the forest is largely concentrated along riparian drainages. Commercial logging could cause streams to go dry and affect the whole ecosystem drastically. We believe there should be no commercial logging and less or no non-commercial thinning in RHCAs but alternative 3 does not address any of our other concerns or fully address our riparian concerns.

Response: All action alternatives include design features and Best Management Practices to minimize or eliminate effects to riparian systems and water quality (DEIS p. 15-20, 21 and Appendix C). Effects to hydrologic features and water quality were analyzed for the draft EIS (p. 99-152); additional analysis was completed for the FEIS (p. 101-108). Neither action

alternative is anticipated to severely disrupt water quality or hydrologic flows, and neither would obliterate streams.

Comment: *By not allowing commercial harvest in the RHCAs the larger conifers that provide the most shade would remain and continue to shade out shade intolerant hardwoods. To better promote growth of hardwoods in RHCAs the largest conifers, even those over 21" dbh, should be removed to allow sunlight to reach the shade intolerant hardwoods. This would increase bank stability in the long term by increasing the amount of hardwoods present. (Comment 4.11)*

Response: Alternative 2 proposes commercial harvest within RHCAs as described on p. 15 and 16 of the DEIS, design elements for alternative 2. On p. 2 of the DEIS one of the purpose and need statements is to "increase riparian vegetation and large tree structure in RHCAs". Trees 21 inch DBH and larger provide large structure for RHCAs (DEIS, p.6) that contributes towards meeting the Riparian Management Objectives (RMOs). The Inland Native Fish Strategy (INFISH) amended the Ochoco National Forest Land and Resource Management Plan in 1995 and provided RMOs for the large woody debris habitat feature (DEIS, p. 5). In addition, many of the conifers greater than 21 inch DBH within RHCAs are part of the historic stand structure and need to be retained (for the Jackson project area) to meet the Ochoco National Forest Land and Resource Management Plan as amended in 1995 by the Regional Forester's Forest Plan Amendment #2 (DEIS p. 7). The amendment requires that all live trees 21 inch dbh or larger that currently exist be maintained (DEIS p. 60). INFISH also has a RMO for water temperature, which states that management activities should result in no measurable increase in the 7-day moving average daily maximum water temperature on any adult holding habitat or spawning or rearing habitats (DEIS, p. 122). For both action alternatives, proposed treatments in RHCAs have specific design elements that address how thinning operation would be accomplished to benefit hardwoods while minimizing effects on streams (DEIS, p.15-19). This project does not propose to change the diameter limit for harvest in RHCAs for hardwood restoration.

Comment: *Alternative 1 and 3 do not increase riparian vegetation as well as alternative 2 because they limit the release of hardwoods by having no commercial thinning in RHCAs. Even Alternative 2 doesn't do enough. There are 6,332 acres of RHCAs (DEIS p. 7) but Alternative 2 proposes to treat only 1,465 acres or less than ¼ of all the RHCAs. (Comments 4.12 and 5.5)*

Response: Alternative 2 proposes both commercial harvest and non-commercial thinning within RHCAs (DEIS, p. 31). Alternative 1 is the no action alternative and does not propose any treatments (DEIS, p. 12). Alternative 3 was designed respond to a significant issue by minimizing impacts to RHCAs (DEIS, p. 13) and only proposes 113 acres of non-commercial thinning in RHCAs for aspen restoration (DEIS, p.14, 147-149). Recovery of riparian vegetation is being addressed throughout the Jackson project area not only by the Jackson project but by a variety of projects that are being implemented under previous decisions (see DEIS Table 122, p. 257).

Comment: *We would suggest that all conifers, regardless of size, within the 6-12 foot zone be harvested and removed for wood fiber. Utilization of these trees is consistent with the Forest Plan Standards and Guidelines. Specifically, Forest Plan p. 4-201 states, "Merchantable trees may be removed if sufficient trees remain to provide root strength for bank stability or if streambank stability is good or excellent." (Comments 4.13 and 5.6)*

Response: The Ochoco National Forest Land and Resource Management Plan was amended in 1995 by INFISH (DEIS, p.5). INFISH provided Riparian Management Objectives (RMOs) for several fish habitat features (DEIS, p.5) including large woody debris and water temperature (DEIS, p.122). "Large trees are needed in RHCAs because they become large woody material when they fall" (DEIS, p.6) Removing all the conifers, regardless of size,

within the 6-12 foot zone does not meet the RMO for large woody debris and most likely would not meet the RMO for water temperature since it would remove stream shade in 6-12 foot zone. Stream shade can be a useful indicator for water temperature (DEIS, p. 123). The DEIS states on p. 6 there is a need for fewer conifers within RHCAs and by thinning conifers, hardwood trees and shrubs can be encouraged while the growth rates of the remaining conifers in RHCAs can be increased so they can grow large and eventually provide future large wood to streams. The Jackson project does not propose removing all the conifers within the 6 to 12 foot zone to benefit riparian vegetation.

Comment: *For category I and II RHCAs the diameter of conifers cut in the 12 to 28 foot distance from the stream is limited to 6 inches dbh and to 9 inches dbh in the 28-50 foot distance. Limiting the size of conifers to be cut to such small diameters severely restricts your ability to remove competition for hardwoods. (Comment 4.14)*

Response: There are multiple purposes for the Jackson project. Specifically related to RHCAs, p. 2 of the DEIS states a purpose of "increase riparian vegetation and large tree structure in RHCAs". The DEIS does not propose removing all the conifers from RHCAs in order to benefit hardwoods. On p. 6 of the DEIS it speaks to reducing the amount of conifers within RHCAs to encourage broadleaf species while increasing the growth rates of remaining conifers in RHCAs to provide for future large wood to streams. These objectives are proposed to be achieved through the design elements the Forest Service developed for treatments in RHCAs (DEIS, p. 15-19) which are addressed by RHCA category, different thinning treatments within different zones from the stream, to maintain shade (and avoid increased water temperature) while promoting broadleaf species and the growth of the remaining conifers in the RHCAs that provide for future large wood.

Comment: *At the distance of 50 to 300 feet from the category I and II RHCAs trees are to be thinned up to 21 inches dbh. It would be wasteful to leave these larger trees on the ground and it would contribute to fire danger. (Comment 4.15)*

Response: Leaving commercially thinned trees on the ground was not proposed in either action alternative (DEIS p. 15-18).

Comment: *By only allowing equipment on existing roads and trails in the 100 to 300 foot zone you are severely limiting the removal of the valuable trees to be cut in this zone and limiting the possibility of revenue for the US government. If designated skid trails were allowed in the 100 to 300 foot zone merchantable trees could be removed in this zone and also in the 50 to 100 foot zone through methods like line pulling that would keep equipment out of the 50 to 100 foot zone. Using designated skid trails in RHCAs would largely limit the impact of equipment in the RHCAs. We urge you to implement the removal of as many merchantable trees as possible through methods like designated skid trails and line pulling. (Comments 4.16 and 5.7)*

Response: Alternative 2 of the DEIS (p. 15-16) allows for removal of commercially thinned trees within the 50 to 300 foot RHCA zone. In the 50 to 100 foot zone, equipment would be restricted, and trees could be removed by methods such as directional falling and line pulling (DEIS, p. 15). In the 100 to 300 foot RHCA zone, ground based logging equipment is restricted to using existing skid trails (DEIS, p. 15). Existing skid trails are evident throughout the Jackson project area from previous timber sales (DEIS, p. 42).

Comment*: The DEIS (p 140) claims that logging would have no effect on instream LWD. This is unsupported by any analysis and seems highly implausible because logging causes subtraction of wood from the natural baseline. Even if the trees to be removed are small, they will not always be small (and furthermore, small wood can provide functional instream wood). See Heiken, D. 2010. Dead Wood Response to Thinning: Some Examples from Modeling Work. (Comment 6.13)*

Logging of mature trees reduces large tree recruitment in RHCAs and degrades existing riparian plant cover. (Comment 8.91)

Response: Due to the application of INFISH RMOs and project design criteria (PDC), there would be no short-term (<2 years/project duration) reduction in the amount of LWD as a result of the thinning activities proposed in the Jackson project. Riparian treatments were developed with an IDT (interdisciplinary team) with the goal of improving RMOs (including LWD recruitment) and reducing catastrophic wildfire. Commercial harvest of conifers is combined with non-commercial thinning and underburning to promote the attainment of Forest Service standards and guides for forest and stream health. When combined with non-commercial thinning, commercial harvest can lead to increased conifer tree growth which would increase future recruitment of large woody material. Commercial harvest and associated treatments would also benefit riparian-associated trees along streams, meadows and wetlands. Commercial harvest in RHCAs would reduce competition among conifers by thinning overstocked, live trees, which would lead to increased growth rates of the trees that remain (post-harvest basal area will be 60-80 feet); reference silviculture report (DEIS p. 50). Trees that remain would contribute to stream LWD over the long-term (present-100 years) as they mature to greater size, die and blow/fall over into the stream.

Any potential negative impacts to long-term (>10 years/post project implementation) LWD recruitment would be very minor when considering scope of the project area and distribution of activities across the watershed. Commercial harvest in alternative 2 is proposed on 107 acres within RHCAs (FEIS p. 40); <2% of RHCAs within the project area. Within category I streams (fish bearing), treatments are proposed within the RHCA (0.25% of RHCAs) but only in the outer-most zone (150-300 feet) of the RHCA, e.g., upslope of a road. One exception would be unit 400, which contains 3.4 acres of CT within the RHCA, approximately 2 acres of this unit is located within 150’ of stream channels (FEIS p. 40). For this activity type, the primary recruitment zone, extends up to 100 feet out from the stream bank. This zone is defined as 100’ because trees <21” are generally <100’ tall. The probability that a falling tree will enter the stream is low at distances greater than about one potential tree height away from the stream (McDade and others 1991; Van Sickle and Gregory 1990 in USDA 2010/GTR231). In a recent study conducted in central and southern British Columbia, Canada (Johnston et al, 2011), determined that LWD originated at ground distances up to 65m from streams, but found that 90% of LWD originated within 18 m (~60 feet) of streams.

To mitigate potential negative effects to LWD recruitment in unit 400 (<2 acres RHCA) and across the project area, an additional PDC was added to the FEIS (p. 20). This PDC will be applied to all RHCAs within the project area including 92.5 acres of Category III and IV RHCAs (non-fish bearing perennial and intermittent streams). In addition, This PDC would extend beyond the 50’ class IV RHCA buffer strengthening/improving the INFISH buffer. The PDC references the following:

> “Trees that are currently of a large enough size (6” + diameter) and located such that they contribute large wood to the stream channel will be retained during commercial harvest activities to maintain RMOs. Coordination with a fisheries biologist or hydrologist would occur on a case-by-case basis.”

Application of ‘shade setbacks’ (PDC DEIS p. 16-17) would further restrict activities in RHCAs because only trees up to 9” within 50 feet of stream channels (class I-III) would be thinned.

There would be a short-term (project duration) *increase* of LWD as some thinned material (small (<6” dbh) and medium (>12, up to 15”dbh) size classes) is recruited to streams in areas from PCT thinning. PCT thinning would occur on 1,359 acres; ~24% of RHCAs. PCT

thinning would be subject to shade-setbacks as described above and in PDC with the exception of 89 acres of hardwood (aspen) non-commercial thinning; recruitment of LWD (up to 15" dbh) in these areas would be greater.

Comment: *Rosenfeld & Huato (2003) found that large wood formed pools more reliably than small wood. Wood >24" dbh formed pools 42% of the time, while wood 6-12" dbh formed pools 6% of the time. However, from this one can conclude that the cumulative influence of several pieces of small wood can match the pool-forming function of large wood. Seven pieces of small wood are just as likely to form a channel-spanning pool as a large piece of wood. Rosenfeld, J. S ., and Huato, L. 2003. Relationship between LWD characteristics and pool formation in small coastal British Columbia streams. North American Journal of Fisheries Management 23:928–938. This means that the agency cannot completely discount the value of small wood, and it shows the cumulative value of abundant small wood which is often captured and exported by logging. In sum, NEPA analyses must account for the effects of logging on both the quantity and quality of wood. (Comment 6.14)*

Response: The value of woody debris of all size classes is recognized in project planning. There would be a short-term (project duration) *increase* of LWD as some thinned material (small (>6" dbh) and medium (>12, <15"dbh) size classes) is recruited to streams in areas from precommercial thinning. PDC were developed to protect and recruit woody debris of all size classes, short and long-term. Scope and scale of proposed activities would limit effects to long-term recruitment while improving fire resiliency of riparian systems, recruitment of woody debris of all size classes and overall riparian plant diversity.

Comment: *Ground-based logging and machine piling of fuels can have serious impacts on soils. We encourage the FS to avoid excessive compaction so that soil tilling is not allowed. Soil tilling should be avoided and minimized because it mitigates some soil impacts while causing significant impacts of its own. (Comment 6.16)*

Response: Project design features intended to protect soils are described on DEIS p. 20-21. The activities proposed in the Jackson project have been designed to meet Regional Standards and Guidelines for soils (DEIS p. 92). Table B-1 (Appendix B, DEIA p. 284-304) describes unit-by-unit soils protection measures and anticipated effects. Tree thinning with commercial removal compromises the majority of the proposed logging treatments. In both action alternatives, proposed activities are largely on existing skid trails, landings and roads and are not contributing to an overall net increase in detrimental soil conditions. Soil tilling is minimized and would be utilized on a total of 161 acres (DEIS p. 304).

Comment: *We urge strong measures be adopted to maintain stream shade, provide for woody recruitment in RHCAs, and minimize soil disturbance in RHCAs. (Comment 6.17)*

Response: Project design features (measures) intended to maintain stream shade, provide for woody recruitments and minimize soil disturbance are described in the draft EIS (p. 15-19). The Responsible Official will determine which measures are to be adopted and will document this decision in the Record of Decision for the Jackson project.

Comment: *One of ODFW's biggest concerns is the potential introduction of sediment from road building within 200 feet of stream channels, commercial harvest near streams, uncontrolled off-highway vehicle (OHV) use, and impacts from livestock grazing in riparian areas. (Comment 7.1)*

There should be no closed roads used as haul roads within 200 feet of class I – IV streams. This is within the sediment delivery zone.

Response: The Jackson project contains multiple BMPs and additional design criteria to reduce sediment delivery to streams from commercial harvest, prescribed fire and road-related activities. Sediment from commercial harvest and prescribed fire are expected to be

nonexistent and/or negligible (DEIS p. 111-112). In terms of road-related sediment, the action alternatives have the potential to improve conditions over the existing condition because project design criteria would include culvert removal, ripping, or tilling all temporary roads within the RHCA or within 200 feet of a stream. Sediment delivery would be decreased by 1.9 tons/sq.mi/year by the year 2021 (DEIS pg. 113). The effects of domestic livestock grazing and off-road vehicle use are outside the scope of this project. However, the DEIS (p. 234) describes how activities proposed in the action alternatives would improve forage conditions within the allotments and allow for an improved distribution of livestock. The Deep Creek, Deer, Happy and Little Summit Allotment Management Plans (AMPs) within the Jackson project area improve grazing management in riparian areas with the goal of expediting recovery in those areas.

Comment: *It is estimated that alternative 2 could increase the amount of sediment introduced into streams by 36.15 tons/sq. mile/yr over background levels from a combination of commercial harvest, prescribed fire, and roads associated with the project. (Comment 7.2)*

The Forest Service preferred alternative 2 would allow 107 acres of commercial logging in RHCAs, and non-commercial thinning within 1,465 acres of RHCAs -- right up to 5 feet of the water's edge. Prescribed fire would also be allowed to burn into RHCAs. Alt. 2 could potentially elevate sediment delivery to streams by 36.15 tons/square mile/year over background levels during the first year of logging. (Comment 8.4)

Response: The DEIS did disclose that the proposed action could increase the amount of sediment into the streams by 36.15 tons/sq.mile/yr. over background levels. This estimate is a potential maximum increase over background sediment delivery as derived from the Relative Erosion Rate (RER) model. As discussed in the DEIS (p. 107 – 108), the intended use of this model is to compare alternatives, not for predicting specific quantities of sediment yield. The DEIS further discloses that with the implementation of BMPs and project design criteria, the potential for sediment delivery would be much lower than the potential maximum model prediction and that alternative 2 would be consistent with applicable standards and guidelines. The effects of increased sediment delivery are addressed in the DEIS (p. 110-113).

Additional analysis completed for the FEIS led to a revised RER estimate: Alternative 2 could increase the amount of sediment by up to 28.94 tons and Alternative 3 by 20.30 tons (for a limited time, as described in the FEIS, p. 117). FEIS p. 117-118 also describe how the action alternatives would result in improvements in road-related sediment due to the current condition of roads in riparian areas and the opportunity for the Forest Service to close and rehabilitate these roads when project implementation is complete.

Comment: *It is apparent that sedimentation is an issue in the project area. As such, ODFW recommends minimizing the potential risk of sediment input into streams whenever possible (Comment 7.3).*

Response: Effects to water quality and fish habitat were analysis issues identified for the Jackson project (DEIS p. 10). These effects include sedimentation. Alternative 3 was developed (in part) to address sediment delivery concerns raised during scoping. The Jackson project incorporates BMPs and project design features to reduce potential sediment delivery (DEIS p. 15 – 21, 26 – 28).

Comment: *ODFW is concerned that without changing the management practices, the riparian areas will be impacted more heavily than they are currently because the cattle will have better access to streams by thinning the understory. (Comment 7.4)*

Response: The action alternatives would increase access and available forage for livestock in the uplands while facilitating opportunities for improving overall distribution throughout

the seven allotments in the project area. As a consequence, livestock utilization would be spread more evenly throughout the allotment thereby decreasing grazing pressure on riparian areas (DEIS p. 234). The Deep Creek, Deer, Happy and Little Summit Allotment Management Plans (AMPs) within the Jackson project area strengthen grazing standards in riparian areas with the goal of expediting recovery in those areas. The AMPs include: re-authorizing grazing in 4 allotments on a "pasture by pasture" basis, improving and creating new spring developments, increasing livestock exclosure fences and active management. These activities will encourage livestock to move into the uplands and disperse more evenly and reduce grazing pressure in riparian areas (DEIS p. 236).

Comment: *ODFW recommends that riparian vegetation monitoring program be established in order to monitor the effectiveness of vegetation management project and to monitor livestock grazing impacts in riparian areas. (Comment 7.5)*

Response: Temperature monitoring would be accomplished in identified streams using temperature recorders. In addition, temperature and pre and post shade monitoring will be accomplished on selected aspen/hardwood stand improvement projects on units that include 303d listed streams. Livestock monitoring is currently being implemented within the Jackson project area. Within all seven allotments, each pasture has designated monitoring areas associated with riparian areas to measure both stubble height/key species and stream bank alteration (DEIS p. 231) For details regarding Condition and Trend monitoring, see Rangeland Resources Report on file in the Jackson project file, Paulina Ranger District, Prineville, Oregon.

Comment: *ODFW is concerned that while commercially harvesting timber in RHCAs will offer long term benefits of increased shade, short-term impacts will be a reduction in the amount of shade, leading to an increase in water temperature. (Comment 7.6)*

Response: Alternative 2 proposes to commercially thin 107 of the 5,661 acres of RHCAs that are mapped across the planning area. In other words, only 1.9% of the RHCAs will have commercial harvest. The project incorporates design criteria applicable to commercial harvest that will maintain shade on Class I, II, and III RHCAs (DEIS p. 15 – 16, 136) and result in no measureable increase in water temperature (DEIS 136). Noncommercial thinning in RHCAs incorporates shade 'setbacks' as part of the project design. In these 'setback' areas, only trees that do not provide shade or bank stability would be removed so that the existing amount of stream shade is maintained with the exception of removal of conifers around incidental hardwoods encountered during implementation-with the exception of class IVs. Therefore, no measurable effect to shade is anticipated to result from noncommercial thinning activities (DEIS p. 136). Also, the secondary benefit will be to improve LWD recruitment and fire resiliency.

Comment: *ODFW also recommends a 200 foot buffer between any road and all classes of water-bodies. (Comment 7.7)*

Response: The Jackson project presupposes the use of the existing road system within 200 feet of water-bodies; however, design elements (DEIS pg 26-27) would minimize the impacts associated with their use. All new temporary roads within 200 feet of water-bodies will have design criteria (DEIS pg.27-28) that would minimize impacts and may even improve conditions by decreasing potential sediment delivery by 1.9 tons/sq.mi./year by the year 2021 (DEIS p. 113).

Comment: *Across the Deep Creek watershed, pool densities are low due to increased width to depth ratios of streams and lack of large woody debris in streams, probably due to decades of destructive livestock grazing and heavy past logging (including clearcutting) in the area. Nearly 86% of streams*

do not meet the desired condition for pool frequency. Regular monitoring of stream temperatures in the Jackson project area has established that summer maximum water temperatures exceed the statutory standard of Oregon in 10 major creeks. The seven day mean of the daily maximum stream temperatures in these creeks have consistently exceeded the 64 degree standard. Ten streams within the Deep Creek watershed are 303d-listed due to elevated summer water temperature (which threatens fish survival). All of this information can be found in the draft EIS, p. 122-124, yet the Forest Service proposes to risk further sedimentation of streams and plans to reduce shading of streams, which could further degrade riparian habitat and increase water temperatures in violation of Oregon's Clean Water Act and INFISH riparian management objectives, potentially jeopardizing the viability of Sensitive-listed redband trout and Columbia spotted frogs. (Comment 8.2)

Response: Specific effects of potential sedimentation and shade issues are outlined in the DEIS p.129-139 and updated in the FEIS Aquatic Species section p. 136-154. These effects are based on Project Design Features (DEIS Chapter 2, p. 15 – 20) that are specific to RHCAs, Fisheries and Water Quality. In addition, PDFs on DEIS p. 26 and 27 under Transportation, Temporary Roads and Temporary Road Crossings are specific to reduction in sediment that may enter stream channels. DEIS p. 28 also includes PDFs for Road Closures that will reduce potential sediment from entering streams. PDFs on DEIS p. 15 and 16 are specific to RHCA management and maintenance of shade.

FEIS p. 150 outlines that because of PDFs and the limited work within RHCAs there would be no measureable effect to shade and therefore should not result in a measurable increase in water temperatures. Fewer than 4 acres of perennial non-fish bearing (class III stream) would be affected on 303(d)-listed streams within the primary shade zone, <0.1 % of RHCAs within the project area. The section goes on to say that non-commercial thinning would result in increased growth rates for both conifers and riparian shrubs. This project would therefore be consistent with the Programmatic BA, and applicable INFISH and Forest Plan standards and guidelines as stated on FEIS p. 154.

The draft EIS (p. 142) addresses effects to pools. This analysis indicates that effects to pool frequency and quality would be negligible short-term (<2 years/project duration) and that in some cases (at stream crossings) would be expected to increase short-term from addition of LWD during stream crossing rehabilitation. Long-term, pool frequency would increase due to recruitment of LWD from riparian treatments. Additionally, in analysis conducted in the FEIS, pool frequency would not be measurably affected by riparian thinning because only <2 acres RHCA (unit 400) would be affected within the primary LWD recruitment zone (<150' from stream channels). Furthermore an additional PDF was included in the FEIS that would further mitigate potential negative effects both here and within the project area. The PDC references the following:

> "Trees that are currently of a large enough size (6" + diameter) and located such that they contribute large wood to the stream channel will be retained during commercial harvest activities to maintain RMOs. Coordination with a fisheries biologist or hydrologist would occur on a case-by-case basis."

This PDC will be applied to all RHCAs within the project area including 92.5 acres of Category III and IV RHCAs (non-fish bearing perennial and intermittent streams). In addition, This PDC would extend beyond the 50' class IV RHCA buffer strengthening/improving the INFISH buffer. Therefore, potential negative effects to pool frequency via LWD recruitment would be reduced from analysis conducted in DEIS.

DEIS p. 152 and FEIS p. 168 indicates that the project will not jeopardize the viability of the redband trout or Columbia spotted frog. In addition the MIS analysis, for redband trout concludes that "INFISH and Ochoco National Forest Plan Standards will be met for Redband

trout when the project design criteria described in the EIS are met, therefore this project will improve habitat conditions for MIS species (Redband Trout) long-term (>10 years) and will not contribute to a negative trend in viability on the Ochoco National Forest for this species."

***Comment**: Logging within RHCAs, stream-crossings, and logging equipment skid trails could kill individual Columbia spotted frogs as well as contribute sediment to streams and riparian habitat that could harm redband trout and Columbia spotted frogs. We are opposed to any such further degradation of streams, water quality, and riparian habitat through active management. (Comment 8.3)*

Response: Direct effects to frogs and fish are addressed in the DEIS p. 20-27. For frogs, application of Programmatic PDC (D) "limiting activities to within the channel migration zone or 100 year floodplain outside of egg laying/hatching period (March 1-May 31) is expected to be highly effective at mitigating direct impacts to frogs. Indirect effects are addressed in response to comments #8-2 and #8-53.

***Comment:** The Forest Service is also proposing to reduce existing shading of streams by cutting conifer trees around existing riparian hardwoods and in the process of conifer cutting around aspen clones. Further the Forest Service is tinkering with primary vs. secondary shading concepts based on only one study to justify logging of other conifer trees big enough and near enough to streams to be providing shade and lowering water temperatures. (Comment 8.5)*

Shade loss and water temperature increase must be avoided, not just monitored. (Comment 8.73)

Response: Reducing existing stream shade is not a proposed activity in the Jackson project.

Specific effects on shade are outlined in the FEIS Aquatic Species section p. 148-154. These effects are related specifically to Chapter 2 Project Design Features.

FEIS p. 152 indicates that there would be no measureable increase in temperature due to proposed activities, and that riparian shade is expected to increase within 5-10 years post-treatment.

***Comment:** Roads are known to be a primary source of sediment to streams. Yet Alt. 2 would add 4.2 miles of "temporary" roads (which are not really temporary as they create corridors for increased livestock and off-road vehicle damage, wildlife disturbance, illegal firewood cutting, and invasive weed dispersal) and 19.8 miles of re-opened closed roads that the EIS acknowledges could contribute more sediment to streams. We are opposed to planned increased sediment delivery, reduction of stream-shading, construction of "temporary" roads, and re-opening of closed roads for the reasons expressed in these comments and in the DEIS. (Comment 8.6)*

Response: An alternative that would have included no temporary road construction was considered but eliminated from detailed study because it would not meet the purpose and need for the proposed action (DEIS p. 30).

***Comment:** We are also concerned by the Jackson project's potential impacts to soils. (Comment 8.22)*

Response: The impacts to soils are disclosed and discussed in the draft EIS (p. 91-99). Table B1 (Appendix B) describes unit-specific mitigations that would reduce effects to soils and ensure that all activity units meet regional soil standards.

***Comment:** We are adamantly opposed to any reduction of stream shading, any degradation of streambank stability, and to any management activities that would further impede reaching RMOs for streams and RHCAs or further degrade 303d listed streams. We view further degradation as illegal when it degrades habitat or water quality parameters for which the stream is 303d listed--or could be foreseen to cause such degradation. This means that no trees providing shade or bank stability for*

streams should be cut, and that sedimentation of streams must be avoided with buffers for heavy or motorized equipment of at least 200 feet (the sediment contribution zone). (Comment 8.50)

Response: See response to Comment 8.5. No degradation of streambank stability is anticipated. The Aquatics Species section of the FEIS (Chapter 3) indicates that proposed activities are consistent with RMOs.

Comment: *We reject these proposed violations of INFISH buffers. (Comment 8.53)*

Response: INFISH (1994) does not specify that RHCA's are "no management" areas. The FEIS Aquatic Species section refers to INFISH standards and guidelines (TM1-b Infish p. A-7) that specifically states in part the following: Apply silvicultural practices for Riparian Habitat Conservation Areas to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives.

The FEIS Chapter 1 p. 2 under the Purpose and Need section includes items #4 and #5 that are specific needs for management in the RHCAs. In addition p. 5 and 6 of the FEIS speak directly to the need for management of these areas.

The FEIS Aquatic Species section under "Desired Condition" states there is a need to manage vegetation to promote the recovery of deep-rooted, riparian vegetation to protect banks from erosion, capture sediment, and control channel patter, profile, and dimension. Additionally there is a need to manage vegetation in the project area to promote recover of stream channel patter and morphology, specifically width-to-depth ratio, toward the ONF-LRMP and Pacfish/Infish standard.

Effects to riparian vegetation and meeting RMOs is addressed in the Aquatic Species section of the FEIS .

Comment: *It is not necessary to construct fireline within RHCAs. Not everywhere has to be burned. We oppose fireline construction within RHCAs due to potential sediment contribution and compaction issues. (Comment 8.56)*

Response: The Jackson project does not intend to construct firelines in RHCAS. Firelines would only be constructed if necessary in order to meet resource objectives and only if consistent with the Programmatic BA and/or with consultation. If firelines are constructed in RHCAs, PDFs have been developed to minimize disturbance to soils, streams and aquatic resources (DEIS p. 19-20).

Comment: *Don't allow any crossings, landings or road impacts within "scabland"/forest interface buffers. (Comment 8.57)*

Response: While scab/stringer interface buffers are not required by the Forest Plan, buffer recommendations were included in project design based on the Forest Soil Scientist's professional opinion and experience in this type of terrain. Adequate buffering helps to reduce potential erosion along the scab/stringer interfaces by providing areas for infiltration and breaking up the horizontal continuity of disturbance along stringers. Buffers should be of sufficient width and roughness to slow the flow and dissipate the energy of potentially erosive surface and rill erosion. There is an existing network of skid trails, landings and roads in scab/stringer interfaces. The recommendation for an interface buffer is to limit crossings of these areas to existing disturbance and/or design additional harvest activities to reduce impacts in these buffer areas.

Comment: *The Forest doesn't need more roads crossing streams but less. Avoid creating new stream crossings. (Comment 8.59)*

Response: The Jackson project does propose the construction any new permanent stream crossings. Implementing the proposed action would require a maximum of 10 new/existing temporary stream crossing on Class IV streams all of which would be constructed utilizing PDFs to ensure minimum disturbance (DEIS p. 27).

Comment: *There is always a "feasible alternative" to planned destructive activities (such as roads and trails constructed across "scablands") - don't do it… Instead, just avoid any disturbance of "scabland" habitat… You shouldn't "need" any crossings, landings or roads across "scablands"… This [rounded road crown and French drains or pipes] sounds unlikely to be successful. (Comment 8.69)*

Response: On the ONF there are many existing roads and landings on scablands. These include arterial, collector and local roads. These roads serve as part of a critical harvest network for timber harvest operations. Many of the local roads are either operational maintenance level 2 (high ground clearance vehicles only) or level 1 roads (which are closed until needed for harvest activities or administrative use). In addition to these roads other existing disturbance will be re-used in this project. These are often the only feasible egress and ingress to stringer units in this highly dissected landscape defined as scab/stringer terrain. The re-use of these roads will often allow us to reduce the number of stream crossings on class 4 streams so there is a net benefit in overall reduction of disturbance.

Comment: *Just avoid landslide terrain - the Forest Service doesn't have to log everywhere planned. (Comment 8.70)*

Response: The dormant deep-seated rotational landslides present in the Jackson planning area moved on the underlying basalts around 10,000 years ago. Protection of springs and seeps by providing a buffer is important. The additional compaction of ground surrounding wet areas could alter the subsurface water flow, increasing the risk for reactivation of landslide debris, depending on the steepness of the slope.

This is in compliance with the Regional Forester's Eastside Interim Management Direction, Forest Plan Amendment No. 2, Alternative 2, as adopted (USDA Forest Service, 1995a) for the interim riparian standard. Springs and landslide-prone area less than 1 acre will be protected by a slope distance of 50 feet (INFISH, 1995). Unstable terrain and springs greater than 1 acre will be protected by a buffer of 150 feet (INFISH, 1995). If there is any indication of recent landslide activity, the area will be evaluated by the geologist and the buffer may be increased.

The dormant landslide terrain inside the proposed units on slopes greater than 25% are 20 acres (portions of 3 units: 40, 230, 435) in Alternative 2 and 19 acres (portions of 3 units: 40, 230, 435) in Alternative 3. Any evidence of recent movement will be evaluated by the geologist and the affected areas will be removed from harvest.

Comment: *As far as we can tell from the DEIS, nothing else is planned except tilling, which only deals with compaction and may create its own impacts. (Comment 8.75)*

Response: Standardized requirements for waterbars and/or placement of slash for roughness on skid trails are included in project design (see Chapter 2 of the draft EIS). These requirements are written into the C provisions in timber sale contracts.

The effects of tillage and a discussion of tillage effectiveness are included in the Jackson soils report, which is located in the Jackson project file, Prineville, OR.

Terrestrial Wildlife and Wildlife Habitats

Comment: *Dead and dying trees are important habitat for scores of wildlife species. Dead and dying trees have much greater value to society if they remain in the forest. Dead trees decompose to make organic material to enrich the soil. A sure way to create an unhealthy forest is to remove the dead and dying trees. (Comment 1.6)*

> **Response:** The Jackson project does not propose the removal of dead trees except as required for safety (DEIS p. 175). The DEIS recognizes the value of snags (dead trees) as an important component of habitat for many wildlife species. A snag analysis has been completed for the DEIS (p. 172-178). Although some dying trees may be removed through the proposed action, the Jackson project does not propose the removal of all dying trees within the analysis area. Commercial harvest (thinning) is proposed on approximately 10% of the acres in the analysis area and not all trees are removed on those acres as a result of the thinning.

Comment: *The DEIS fails to consider forest fragmentation (Comment 3.9).*

> **Response:** As described on DEIS p. 265, "fragmentation" can be defined as the breakup of a large land area (such as a forest) into smaller patches isolated by areas converted to a different land type; the opposite of connectivity. Fragmentation is not directly discussed in the draft EIS because no treatments are proposed that would result in forest fragmentation; there is no proposed conversion of land type that would break up contiguous blocks of forest. Connectivity between stands of LOS is addressed in the draft EIS; no reduction in connectivity is anticipated as a result of any action alternative (DEIS p. 65-67).

Comment: *It is not clear what the different alternatives do relative to snags. Under the project design features common to all alternatives on p. 23 of the DEIS, it really does not give the reader any insight to snag retention levels and what types of trees will be left for snags and recruitment. (Comment 4.19)*

Forest Plan p. 4-200 it states, "Silvicultural prescriptions must provide for snags, and trees for future snags, that will meet the habitat requirements for cavity nesting species, according to management area objectives (see Management Area Standards and Guidelines for Wildlife and Fish); exceptions could be fuelbreaks or situations where snags could cause a safety hazard. (Comment 4.20)

> **Response:** The DEIS (p. 175-176) includes a discussion on effects to snags from the proposed alternatives. The snag analysis can only be utilized at a landscape level, not unit by unit. It gives a general overview of the existing condition and the desired snag levels the Forest is striving for. The DEIS (p. 172-175) states the desired snag retention levels for each different habitat type. Appendix A (DEIS p. 279-280) describes the proposed silvicultural treatments and the planned post-harvest residual basal area per acre. Recommended stocking levels are derived from "Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest" (Powell, 1999). In addition, the DEIS (p. 65-66) describes the proposed stocking levels within connectivity corridors. All recommendations meet the Regional Forester's Forest Plan Amendment standards.

Comment: *The DEIS does not adequately disclose the adverse effects of logging on the quality of habitat for species that prefer relatively dense older forests such as pileated woodpecker and goshawk. (Comment 6.4)*

The DEIS analysis of effects to goshawks focuses on effects to post-fledging areas, but does not clearly disclose potentially significant adverse effects on thousands of acres of habitat existing outside of the PFAs. The DEIS (p 193) asserts that logging will be beneficial to goshawk habitat, but

the only support for this assertion is the notion that "the canopy will be opened up." However, the science indicates otherwise. (Comment 6.5)

Response: In the DEIS (p. 180-182), the effects of the action alternatives on pileated woodpecker primary nesting habitat are disclosed. As described, the pileated woodpecker occurs primarily in dense mixed conifer forests and treatments to these stands are explained. In both action alternatives, the primary nesting habitat for pileated woodpeckers would remain within HRV.

The DEIS states that "habitat conditions may be improved through an opening up of overly dense understory conditions" (DEIS p. 193). The statement is in reference to noncommercial thinning and prescribed burning. The primary canopy layers would be retained and thinning the small diameters trees would improve habitat by reducing competitive stress on the remaining primary canopy layers. Various studies suggest that overly dense understories may obstruct flight corridors used by goshawks to hunt prey (Wisdom et al. 2000). Dense understories can also lead to high risk for stand replacement fires which would lead to a deterioration of nesting and foraging habitat.

Post treatment primary nesting habitat for goshawks is described under each alternative. As stated in the DEIS, Alternative 1 would result in 27,653 acres, Alternative 2 would result in 28,851 acres and Alternative 3 would result in 28,521acres that meet the criteria for primary nesting habitat based on dominant tree size (DEIS p. 193). The trade-off between short-term effects and long-term benefits was a subject of the discussion in the effects disclosures on p. 192-195: "some treated stands would be structurally less complex following treatment and thus though still suitable, they may have reduced habitat quality immediately following treatment. Thus, though the amount of habitat available at the landscape scale would increase under this alternative, not all of the recruited habitat would be of optimal quality in the short term. Both alternatives 2 and 3 are expected to affect habitat availability at the landscape scale in 30 years due to increase in size class and improved growth and vigor in treated stands." Habitat use by goshawks is described in the Wildlife Report, which is incorporated by reference (p. 133): "Nest areas contain one or more stands of large, old trees with dense canopy cover." The Wildlife Report also acknowledges that habitat suitability would be reduced in the short-term in commercially thinned areas.

Comment: *Canada lynx - known to be historically (and recently) in the sale area and earlier with a designated Lynx Analysis Unit encompassing much of the sale area -- with grand fir and lodgepole pine habitat with snowshoe hare, their preferred prey -- yet this designation was removed for political reasons. Yet the Jackson DEIS fails to analyze impacts to this species from proposed forest fragmentation, habitat degradation, and human disturbance. (Comment 8.12)*

Response: The Ochoco National Forest, following the Canada Lynx Conservation Assessment and Strategy, is within the listing range for the Canada lynx *(Lynx Canadensis)*, but Canada lynx habitat was remapped in 2001. Due to insufficient quantities of primary habitat, Key Linkage Areas (KLA) and Lynx Analysis Units (LAU) are not currently mapped on the Ochoco National Forest. In addition, The Deschutes and Ochoco National Forests requested informal consultation (March 30, 2001) on continued implementation of their respective Land and Resource Management Plans (LRMPs) with LAUs mapped in accordance with the 2000 LCAS. The U. S. Fish and Wildlife Service (USFWS) gave concurrence that the mapping was consistent with the current mapping direction. Based upon the lack of habitat to support lynx residency and reproduction and the view that lynx are not a resident, reproductively active animal in Oregon, it has been concluded that implementing forest plans using the current mapping would result in "may affect, but not likely to adversely affect" (NLAA) conflict determinations. See DEIS p. 153-154.

Comment: *Wolves need large ungulate prey--elk and deer. This sale would remove significant amounts of forest thermal cover (including hiding cover) for already declining mule deer and less than optimal numbers of elk, and would increase human disturbance detrimental to wolves, yet the DEIS fails to even mention gray wolves, let alone assess potential impacts to them. (Comment 8.13)*

> **Response:** Currently, the Ochoco National Forest is not within occupied Grey Wolf range. The Grey Wolf is not a resident species and there are no breeding pairs or packs within the project area or on the Ochoco National Forest.

Comment: *The Forest Service declares the peregrine falcon to be "not present" in the project area so as to be able to determine that there would be "No Impact" to them from proposed actions. Yet we saw a peregrine falcon in one of its famous fast dives above a cliff over Deep Creek in a Deep (now Jackson) sale unit. The DEIS admits that sightings have occurred on the Ochoco National Forest but concludes that suitable nesting habitat is not present and that "migratory individuals that may pass through the project area would be able to avoid any potentially disturbing activity." (DEIS p. 159) Therefore it's apparently not considered an issue for the Forest Service -- but we think it is for the peregrine -- from cumulative effects. (Comment 8.14)*

> **Response:** The effects to peregrine falcons are address in DEIS pg. 158-159, and the Wildlife Report pg 23. No suitable nesting habitat occurs in the project area. There are no known peregrine falcon nests within the project area or on the Ochoco National Forest. There are no sightings recorded within the project area.

Comment: *The Forest Service neglects to consider that eastern Oregon is a fire ecology bioregion, and to consider the needs of some species, such as black-backed and Lewis' woodpeckers, for periodic stand replacement fires. Scientists have recently concluded that naturally recovering (unlogged) stand replacement burns are now at a deficit in eastern Oregon compared to historic levels. The Lewis' woodpecker is dependent on such burns to create its habitat niche, yet the Jackson sale plans to reduce the "risk" of stand replacement fire--even where it would naturally occur in higher elevation and moister mixed conifer and even within mixed severity fire regime ponderosa pine and Douglas-fir forest. The DEIS fails to analyze the impact of such habitat prevention for the Lewis' and black-backed woodpeckers and other fire-dependent species. (Comment 8.15)*

> **Response:** The DEIS and wildlife report recognize that the abundance of high density snag patches is lower than what would have occurred historically within the Eastside Mixed Conifer Habitat Type (DEIS pg. 17). The high densities categories is below HRV for the watershed for densities of 12-24 snags per acre and also 36 plus snags per acre for snags greater than or equal to 10”dbh. The higher snag densities would be relatively rare on the landscape with approximately 2% of the landscape would have snag densities 18 snags per acre or greater. These higher snag densities would likely occur following large fires or an epidemic insect or disease outbreak which has not occurred in the watershed. Approximately 13,000 acres would remain in a condition that would result in mixed severity or high severity burn. These acres would continue to provide the potential for high snag densities /or burned forest conditions important for species like the black-backed woodpecker and Lewis’ woodpecker. Green forest habitat is also an important habitat component and there is a need to reduce the risk of stand replacement fires, not low intensity fires within portions of the project area.

Comment: *This butterfly [Johnson’s hairstreak] is dependent on dwarf mistletoe in trees for laying their eggs and to feed their caterpillars. Both action alternatives proposed would substantially reduce the level of mistletoe in infected stands, yet the Forest Service fails to analyze what negative effects this could pose to the Sensitive-listed butterfly. Suitable habitat can also be lost through logging. The Forest Service does not know if the Johnson's hairstreak is present on the Ochoco or what its population or viability threshold might be, yet concludes that the proposed action "will not likely*

contribute to a trend towards federal listing or cause loss of viability to the population or species" based on a complete lack of relevant information. (Comment 8.16)

Response: The DEIS pg.55 describes dwarf mistletoe within the project area. Larch dwarf mistletoe is widespread, ponderosa pine dwarf mistletoe is not widespread, and Douglas-fir dwarf mistletoe is assumed to be scattered. Schmitt and Spiegel (2008) state that in the absence of recent large scale disturbance, dwarf mistletoe infestation levels can occur in early, mid, and late successional stands (DEIS pg.163). The project area has not experienced a large scale fire event in recent years. Therefore, mistletoe infection is assumed to be present and scattered across the forested acres (40,281acres) in all stand age classes, and could therefore serve as a host for the caterpillar, if it occurs in association with the mistletoe species present on this Forest. The DEIS pg.163 discloses the potential of proposed activities to reduce the level of mistletoe in treated stands. This could result in modification of food source for larval hairstreak and a place to lay eggs. Commercial harvest would occur on 5,744 acres under Alternative 2 and 5,545 acres under Alternative 3. The DEIS states that harvest can reduce mistletoe, but would not eliminate it since infected overstory trees would not be removed (DEIS p. 55). Because there would be a reduction in dwarf mistletoe on treated acres with potential effects to the hairstreak the determination that proposed actions "may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause loss of viability to the population or species." Current levels of mistletoe infection are expected to remain unchanged in untreated forested stands throughout the project area.

Comment: *The DEIS fails to consider the possibility of more forest fragmentation and human disturbance from the Jackson project cumulatively with other projects leading to a trend toward up-listing or loss of viability for wolverine, even though the north end of the project area is near wilderness and has some suitable wolverine habitat and wolverine are known to need huge areas for scavenging (a home range for wolverine is up to 150 square miles). Wolverine have been historically in the area, with sightings in the Jackson Creek subwatershed in 1985 and 1994. Wolverine sightings have also been document south of the project area, elsewhere on the Ochoco National Forest, and on the Deschutes and Malheur National Forests in the region. (Comment 8.17)*

Response: The project area has a very low potential of providing reproductive habitat for wolverines because the area lacks high elevation moist grand fir or sub alpine habitat types and there are no boulder fields in the project area (DEIS p. 156). Wolverine occurrence in the analysis area would be infrequent at best due to high road densities and human disturbance (DEIS p. 156). The analysis area does not have sufficient reproductive habitat and only the upper portions of the area provide habitat for foraging and dispersal. A determination of "may impact individuals or habitat, but not likely to result in a trend toward federal listing or loss of viability of the species or populations" was reached for Alternatives 2 and 3 (DEIS p. 157).

Comment: *Potential impacts to rare species, such as American marten and potential Pacific fisher, are not considered at all in the Jackson DEIS. (Comment 8.18)*

Response: Management activities considered in this EIS require a Biological Evaluation to be completed (FSM 2670.1,2671.44). Included in Biological Evaluation are species listed as Sensitive (S) by the USDA Forest Service Region 6 that are suspected or documented on the Ochoco National Forest (USDA Forest Service, 2008). The fisher and marten are not suspected or documented on the Ochoco National Forest or within the project area. Currently, mapped habitat for these species does not occur in Crook or Wheeler counties (2011 NatureServe). No further analysis is required.

Comment: *We are opposed to commercial logging and burning in suitable and primary pileated woodpecker habitat (alt 2 would eliminate 13% of existing primary nesting habitat for pileated in the project area--584 acres--and degrade or eliminate habitat suitability for pileated through*

commercial logging in 4,196 acres of grand fir and Douglas-fir plant association groups, with canopy closure to be reduced to less than the 60% (probably much less) that pileated need. (DEIS p180)...the cumulative effects of many such projects (not discussed) over time in pileated habitat over time across the Paulina District and the Ochoco National Forest. This is lost habitat over both the short and long term for both species. (Comment 8.19)

Response: The effects to the pileated woodpecker and habitat are disclosed in the DEIS pg. 178-183. Alternative 2 would reduce pileated primary nesting habitat by 820 acres (19%). Alternative 3 would reduce pileated primary nesting habitat by 793 acres (18%). Both Alternatives retain primary reproductive habitat within the range of habitat that would be expected to occur historically (HRV) for the entire project area. A viability analysis has been completed for the pileated woodpecker (Wildlife report). Action alternatives would affect less than 2% of the 135,961 acres of pileated primary nesting that occurs across the forest; the viability of pileated woodpeckers is expected to be unaffected by proposed activities.

Comment: *Though the DEIS admits that northern goshawk are dependent on denser forest conditions, and that important habitat attributes for goshawk include snags, down logs, woody debris, large trees, and shrubs in the understory, (DEIS p 191) the Forest Service nonetheless plans to commercially log in all but one of seven Post-Fledging Areas (where young goshawk are raised and trained to hunt), to non-commercially thin in all seven PFAs, and to do prescribed burning in all but one of the PFAs, including management of this kind that would exceed 50% of two PFAs' acreage, which could result in changes in forest structure and down wood that could reduce (or eliminate) goshawk prey species. Goshawks are easily disturbed and driven away from historic nesting areas and the cumulative trend over the four National Forests we monitor has been elimination of suitable goshawk habitat. Therefore we are opposed to all commercial logging and burning in PFAs. Any non-commercial thinning should be greatly limited and only done to save a stand from total collapse, as goshawk are adapted to dense forest conditions...Thirty acres [treatment buffer around nest stand] is not enough to protect goshawk viability...the cumulative effects of many such projects (not discussed) over time in goshawk habitat over time across the Paulina District and the Ochoco National Forest. This is lost habitat over both the short and long term for both species. (Comment 8.20)*

Response: Goshawk habitat and effects are described in the DEIS pg. 190-195. The Regional Forester's Forest Plan Amendment #2 established standards and guidelines for the management of goshawks:

1. Protect every known active and historically used goshawk nest-site from disturbance.
2. 30 acre nest cores will be established around every known active nest and will be deferred from harvest.
3. A 400 acre Post Fledgling Area will be established around every known nest site. Within the PFAs retain LOS stands and enhance younger stands towards LOS condition.

All alternatives meet standards as described in The Regional Forester's Amendment #2. In addition the potential for total treatments exceeding 50% of any PFA, may result in changes in forest structure and levels of downed wood that could affect goshawk prey species (DEIS pg.193). The design criteria that would mitigate the potential effects to potential prey species and the potential for excessive disturbance are included in the FEIS p. 22. Total treatments in PFAs would not exceed 50% of the PFA. In addition 10% of commercial treatment units would be left untreated as well as 15% of pre-commercial units.

Comment: *Despite a declining mule deer population and an elk population below optimum levels, the Forest Service is planning to drive total forest cover and percent of area in cover below Forest Plan standards (another cumulative FS trend) through commercial and non-commercial logging and*

tries to finesse this by calculating forage benefits into the total Habitat Effectiveness Index. The DEIS fails to analyze the actual repercussions to deer and elk populations and reproductive success of further reducing thermal and hiding cover...The elk habitat effectiveness index goes way down, as admitted here, and should be acknowledged as a violation of the Forest Plan. (Comment 8.21)

Response: The effects to deer and elk are discussed in the DEIS p. 187-189, and updated in the FEIS p. 214-219. The Jackson project is consistent with the Ochoco Forest Land and Resource Management Plan and Standards and Guidelines. The potential effects of reducing thermal cover below guidelines in the forest plan are disclosed. Both alternatives meet HEI, which is the forest plan standard. The LRMP p. 4-258 states that, "It is expected that individual projects will be above and below these values (thermal cover and road densities), but that the overall objective (HEI) for the management areas will be met. Quality and quantity of cover, and open road density should be designed in concert to achieve the desired habitat effectiveness index (HEI) shown."

Comment: *We are also concerned by the Jackson project's potential impacts to neotropical songbirds affected by removal of forest canopy layers and/or by Spring burning of nesting areas. (Comment 8.25)*

Response: The effects to Neotropical Migratory Birds and Focal Species are addressed on DEIS p. 196-202, as well as potential effects to nesting birds because of the potential for portions of activities to occur during nesting seasons. Even though there are potential benefits from spring burns in relation to the potential for higher moisture content in large fuels as well as duff layers creating conditions for more mosaic type burns, the majority of prescribed burning on the forest occurs in the fall outside of the nesting period. Very little spring burning occurs on the forest.

Comment: *So where is the evidence that bald eagles, golden eagles & osprey won't abandon nest with arterial or collector road disturbance near nests. (Comment 8.61)*

Response: Haul would not be restricted on arterial or collector roads, although site specific recommendations would be made to reduce disturbance, such as restricting compression braking or avoiding parking near nest sites. Additional restrictions would occur on three digit roads as described within the DEIS p. 22.

Comment: *From what science is the 330-foot buffer derived? How is this thought to be adequate? (Comment 8.62)*

Response: The 330 buffer as the primary buffer and an additional 330 feet in the secondary zone typically results in a minimum 660 foot buffer. The buffers are standards and guidelines from the Ochoco Forest Plan (Hawks and Owls) p. 4-249.

Comment: *The hazard can always be mitigated by not logging in that area - no felling of Lewis', whiteheaded, pileated and other woodpecker nest snags. (Comment 8.63)*

Response: Effort is made during unit layout, design, and implementation to avoid snags, snag patches and hazard trees. A relatively small number of hazard trees generally are removed as result of harvest activities compared to what is present on a landscape scale. Refer to the snag analysis within the DEIS p. 171-178.

Comment: *How is 100% maximum potential for primary cavity excavators determined to be only a minimum of 2.5 snags per acre? Wouldn't it be as many snags as can or do exist in unlogged forest?...Not all snags are suitable for nesting, requiring more snags. (Comment 8.79)*

Response: Thomas et. al. 1979 described maximum potential population in Wildlife Habitats in Managed Forests, the Blue Mountains of Oregon and Washington shows a variety of densities at which cavity excavators/nesters utilize snags. At the 100% population level, in

both the ponderosa pine and mixed conifer communities, the white headed woodpecker required the most snags of all cavity excavators at 2.25 snags per acre. All other species required less. Appendix 29 (p. 423-437) in this same publication lists all references utilized for species specific information. The Eastside Screens management direction is to provide for 100% maximum potential population.

Comment: *DecAID is explicitly not supposed to be used to determine the number of snags needed to ensure species viability yet it is implicitly used for this. (Comment 8.81)*

Response: The Viable Ecosystems model and DecAID were utilized to develop a historic range of variability for snags at a landscape level. The DEIS p. 172 describes all the information utilized for the snag analysis, of which DecAID was one part. VEMG, GNN and DecAID together helped determine snag abundance and distribution within the project area and across the Forest.

Landres et. al. noted that by managing habitat within HRV it is assumed that adequate habitat will be provided because species survived those levels of habitat in the past to be present today. Thus, if we manage current habitats within the range of historic variability, we will likely do an adequate job of ensuring population viability for those species that remain (Landres et al. 1999).

Comment: *This [statements about fire creating and consuming snags, and historic snag abundance] is simply not true. Fires create hardened snags that last longer and many snags have been removed by logging, roading, hazard tree reduction, and firewood cutting. (Comment 8.82)*

Response: The DEIS p. 176 states that the effect of fire on snag retention would likely result in a higher number of hard snags, with a concurrent reduction in soft and hollow snag habitat. In addition, the Jackson Snag Analysis Report on file at the District office states that snags have been reduced in some areas due to past timber harvest practices as well as hazard tree removal and ongoing fuel wood removal projects.

Comment: *[In reference to statement that fire-created snags fall within a 5-10 year period] Actually, large diameter, fire-hardened ponderosa pine snags are known to persist for 80 years or more, not just 5-10 years. (Comment 8.83)*

Response: There are many factors that affect snag creation and retention. Richard Everett et. al. found that snag fall rates were affected by aspects, slopes, micro-topography, snag size and species. Approximately 50% of the Douglas fir less than 23cm fell within the first 7-12 years while approximately 50% of the Douglas fir snags greater than 41cm fell within 15 years. They did find approximately 40% of the larger, thick-skinned bark trees remained standing in some of their oldest burn units (up to 81 years). Landram et. al. also found many factors contribute to rates of snag creation, decay, inventory, and fall, including soil characteristics, topographic position, climate, stand density, incidence of root disease, windstorms, and firestorms, amount of decay before death, time since death, species, diameter and the proportion of heartwood. (Landram et. al, 2002)

Comment: *[In reference to statement about current snag densities being higher due to increased stocking levels, etc] This would be small snags less useful to key primary cavity nesters. (Comment 8.84)*

Response: The DEIS (p. 54-58) describes how insects and diseases affect overstocked tree stands in general and specifically within the Jackson planning area. It states that Ponderosa pine, for example, is a susceptible host to both beetles in overstocked stands. Bark beetle mortality is symptomatic of over-stocked stand conditions that create competition stress and reduce tree vigor (Schmidt et al.1994, Graham and Knight 1965). The primary concern is the

loss of large diameter mature ponderosa pine. Mortality caused by the western pine beetle tends to occur in scattered locations (within the planning area) where large, overstory ponderosa pines are crowded by a dense understory of conifers. The dwarf mistletoe discussion shows how trees in both the overstory and understory can be affected.

Comment: *What type of data from where exactly, from what year, was used to come up with the assumption that snags greater than 10" dbh are more numerous than historically (pre-European logging) within the eastside mixed conifer forest type?...how was this [it is estimated that 17-25 percent of the area would be devoid of snags] calculated?...Why is it thought that historically 31-43% of the project area would have been devoid of snags? Is your HRV data based on a year after heavy logging? (Comment 8.85)*

Response: The DEIS, p. 172 describes the data sources utilized for the snag analysis. The data comes from a combination of information from the Forest-wide Viable Ecosystems Management Guide (VEMG) (Simpson et al. 1994), the Landscape Ecology, Modeling, Mapping and Analysis team's Gradient Nearest Neighbor (GNN) Models (Ohmann and Gregory 2002), and DecAID (Mellen-Mclean et al. 2009).

There is a more in-depth discussion on where the data originated from, the models utilized and the assumptions made in the Jackson Snag Analysis Report on file at the District office. In short, the Gradient Nearest Neighbor (GNN) Model was utilized to estimate existing snag levels at the landscape level. VEMG was utilized to estimate the HRVs for the habitat types within the planning area. In DecAID, data from unharvested stands provides a reference condition in the various habitat types for distribution of snag size and densities across a large landscape. DecAID analyzes snag habitats not only by habitat type and structure, but by snag size (> 10" dbh and $\geq$ 20" dbh) (Mellen-McLean et. al., 2009).

Comment: *[Regarding primary cavity excavator and snag analysis] inadequate cumulative effects analysis - conclusory without supporting site-specific & species-specific data. (Comment 8.86)*

Response: The FEIS (p. 207-209) speaks to cumulative effects to snag habitat.

Sensitive Plants and Invasive Plant Species

Comment: *We are also concerned by the Jackson project's potential impacts to sensitive plants. (Comment 8.26)*

Response: All sensitive plant populations occurring in proposed commercial harvest units would have a 100-foot no harvest buffer, which means no machinery, skidding, or logging activities would occur within the buffered area. This is an appropriate protection for sensitive plants as outlined in the Conservation Assessment for *Calochortus longebarbatus* var. *peckii* (Dewey 2011).

Comment: *Drop all commercial logging units in or near Peck's mariposa lily habitat and sensitive moonwort habitat…Drop units 21, 397a, 473, 645 and 733 (NCT in Botrychium habitat)…Drop proposed handpiling and grapple piling in or adjacent to rare plant populations...drop temp road construction in needlegrass habitat...no exceptions should be made to sensitive plant design features. (Comment 64)*

Response: All sensitive plant populations occurring in proposed commercial harvest units would have a 100-foot no harvest buffer, which means no machinery, skidding, or logging activities would occur within the buffered area. This is an appropriate protection for sensitive plants as outlined in the Conservation Assessment *for Calochortus longebarbatus* var. *peckii* (Dewey 2011) and 13 *Botrychium* species (Ahlenslager & Potash 2007). The design criterion for sensitive plants states that no hand or grapple piling from activity fuels will occur within

sensitive plant habitat. All design criteria will be followed and monitored by a Forest Service botanist.

Comment: *This is not prevention [in reference to first two bullets under Non-native Invasive Plants (Noxious Weeds) section in design features] but control of existing populations. (Comment 66)*

Response: In order to meet Standard 1 of the 1995 ROD for Preventing and Managing Invasive Plants the prevention of invasive plant introduction, establishment and **spread** will be addressed in vegetation management plans, treating existing weed populations before vegetation management activities occur will prevent their spread to new sites within the management area. Effectiveness monitoring related to project objectives is outlined in the 1995 Weed EIS and will be followed to ensure that non-native invasive weeds are not continuing to spread after vegetation management activities are implemented.

Forest Plan and other Legal Consistency

Comment: *The forest plan is a contract with the public and must not be violated every time a project is proposed that is inconsistent with the plan. Rather than amending the plan to allow a harmful project, the project must be significantly modified to become consistent with the plan or dropped. (Comment 1.7)*

We are strongly opposed to forest management through Forest Plan amendments. The old Forest Plan is arguably too weak, given all the damage that has been done under it; therefore it should not be further weakened through amendments, mooting the purpose of having a Forest Plan--to have standards and guidelines controlling and reducing or eliminating ecological harms. Further, successive "non-significant" Forest Plan amendments, repeated from timber sale to timber sale across the region and from one part of a National Forest to another, as they have been, become significant Forest Plan amendments cumulatively that cannot be dismissed as allowing for Findings of No Significant Impact. (Comment 8.48)

Response: The proposed amendments are consistent with the Regional Forester's June 11, 2003, letter on guidance for implementing Eastside Screens. In that letter the Regional Forester encouraged Forest Supervisors to consider site-specific Forest Plan amendments that would meet LOS objectives of increasing the number of large trees and LOS on the landscape. The commercial harvest proposed in LOS in PAGs that are below HRV is consistent with the intent of the Eastside Screens to maintain and/or enhance LOS.

Non-significant forest plan amendments are allowed under Forest Service Manual 1926.51 and can result from:

- Adjustments of management area boundaries **<u>or management prescriptions</u>** resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple-use goals and objectives for long-term (emphasis added).

The Record of Decision for the Jackson project will not include a "Finding of No Significant Impact;" this document is not part of the Environmental Impact Statement process.

Comment: *Please take protective action if any of the new species proposed for ESA Listing Might exist or have habitat in, near or downstream from the project area. Provide a list of the species that occupy habitat or have unoccupied habitat in the project area in the final EIS and describe how the project will affect the species on Chapter 3. (Comment 1.17)*

Response: All federally listed species or species proposed for listing that have habitat in or are known to occur within the Jackson project area were identified and effects were disclosed in the draft EIS (p. 116, 153, 202).

Comment: *In addition, leaving these late-seral fire intolerant trees is counter to the Standards and Guidelines in the Forest Plan (see Forest Plan p. 4-201). (Comment 4.7)*

> **Response:** The Forest Plan standard and guideline referenced on p. 4-201 specifies that: "Uneven-aged management is most applicable where silvicultural activities will result in stands dominated by early successional species including ponderosa pine and western larch. Dominance ….is established when stocking by early successional species can be maintained at or above 50 percent of the minimum stocking basal area established in the silvicultural prescription, on 80 percent of the treated acres." Retaining some trees of late seral species within these stands is not counter to this standard and guideline.

Comment: *Under the title "General Forest" on p. 7 it's noted that the Forest Plan says, "In ponderosa pine stands, management will emphasize production of high-value (quality) timber." Using a 21" diameter limit does not allow the highest value trees to be harvested for timber. The 21" diameter limit is contrary to the Forest Plan. (Comment 4.10)*

> **Response:** The Ochoco National Forest Land and Resource Management Plan as amended in 1995 by the Regional Forester's Forest Plan Amendment #2 (DEIS, p. 7), requires that (for the Jackson project) all live trees 21 inch dbh or larger that currently exist be maintained (DEIS, p. 60). This project does not propose to change the diameter limit for harvest.

Comment: *All too often it seems that trees selected for snags, particularly recruitment, are high-value trees and the defective low-value trees are marked for harvest. This is contrary to the Forest Plan standards and guidelines. (Comment 4.22)*

We see an increasing trend to leave the larger overstory trees that are heavily infested with mistletoe yet this is also contrary to Forest Plan standards and guidelines. (Comment 4.23)

> **Response:** During marking trees are not designated as being selected for future snags. The Forest Plan also has a standard (p. 203) which states: "Timber marking guidelines should be developed which retain the most vigorous trees of best quality. First priority for leave trees are those with demonstrated good vigor. Second priority are those trees which will produce high values products in the future." The Forest Plan as amended precludes the harvest of live trees 21 inches and larger.

Comment: *You state that "Under Scenario A of the [Eastside Screens], the Interim Wildlife Standard directs that no harvest activities will occur within late and old stands and that no trees larger than 21 inches DBH will be cut." (DEIS p. 60) We do not agree with this statement. What Scenario A in the Eastside Screens says is: "If either one or both of the late and old structural (LOS) stages falls BELOW HRV in a particular biophysical environment within a watershed, then there should be NO NET LOSS OF LOS from that biophysical environment. DO NOT allow timber sale harvest activities to occur within LOS stages that are BELOW HRV." (Comment 4.27)*

> **Response:** This statement in the DEIS is in error. The statement has been corrected in the FEIS.

Comment: *So using the DGF PAG as an example, on DEIS p. 59 in Table 29, we see that the multi-strata LOS is within HRV and the single-strata is below. Scenario A says that since one is below (single) then there should be NO NET LOSS OF LOS. Furthermore you may not allow any timber sale harvest in the DGF PAG single-strata LOS since it's below HRV. (Comment 4.28)*

> **Response:** This is correct. There is no harvest proposed in Dry Grand Fir single-strata LOS stands. Harvest within multi-strata LOS stands is proposed to move it towards the single-strata condition. Both action alternatives result in an increase in single-strata LOS and a corresponding decrease in multi-strata LOS (DEIS p. 61-62).

Comment: *We also do not agree with the proposed forest plan amendment. The proposed forest plan amendment for Alternative 2 found on DEIS p. 13 is for 84 fewer acres of the multi-strata DGF PAG than the estimated HRV Low value. In addition the amendment would allow for an additional 31 acres of the multi-strata DF PAG to be below the estimated HRV Low value. We are not sure this is the correct way to look at the forest plan amendment. Going back to our earlier comment that the Eastside Screens Scenario A says there is to be NO NET LOSS OF LOS from that biophysical environment, we believe any forest plan amendment would be necessary if there is a net loss of LOS within a biophysical environment (in this case a PAG). In this case, there is no net loss but there is a change from multi-strata to single-strata. So we don't believe a forest plan amendment is necessary. (Comment 4.31)*

> **Response:** Although there will be no net loss of LOS a Forest Plan amendment is necessary because; 1) Douglas-fir multi-strata LOS is currently below the HRV and harvest is proposed within mapped stands of this condition (DEIS p. 13 - 14, 60), and 2) harvest within the Dry Grand Fir PAG will reduce the amount of multi-strata LOS to slightly below the historic abundance (DEIS p. 13 - 14, 61).

Comment*: If you look at the DGF PAG, there are currently 3,433 acres total. Alternatives 2 and 3 would both reduce that to 3,407. Thus your amendment should be to allow for a reduction in total DGF LOS of 26 acres. However, it's not clear how you can treat 524 acres of multi-strata DGF and have an increase of only 498 acres in the single-strata. Where are these 26 acres going? (Comment 4.32)*

In the case of the DF PAG, the existing total LOS acres is 506 and both action alternatives actually increase this by one acre thus there would be no need for a forest plan amendment for this biophysical environment or PAG. (Comment 4.33)

> **Response:** Table 33 (DEIS p. 61) contains rounding errors and will be corrected in the FEIS. There is no loss of LOS in the Dry Grand Fir PAG or in any of the PAGs. All acres of multi-strata LOS that are treated will move towards single-strata LOS since no large trees are proposed to be harvested. There is no increase in the total amount of LOS immediately resulting from the proposed activities.

Miscellaneous

Comment: *Regarding site specificity: This applies to the science literature contained in the References section of this NEPA document also. It is not site-specific. If the Responsible Official rejects the source literature for the opposing views because it is not site specific or does not relate directly to the Jackson Vegetation Management project, then the Responsible Official should reject all literature in the References section that fails to mention the Jackson project and is also not site-specific. (Comment 1.1)*

> **Response:** All literature submitted by the commenter (approximately 300 citations) was reviewed and considered; documentation of this literature review is included in the project file. Within the relevant science submitted by the commenter, there were no actual opposing views or information that is inconsistent with science and analysis presented in the draft EIS.

Comment: *This project does not include fertilization to mitigate the loss of organic matter. (Comment 1.3)*

> **Response:** Research studies have been used to develop conservative recommendations for leaving sufficient coarse woody debris following management activities (Graham et al. 1994 Brown et al. 2003). Either action alternative would comply with project design features (DEIS p. 15-30) that ensure adequate retention of coarse woody debris and surface organic matter for biological activity and nutrient supplies for maintaining soil productivity on treated

sites. In addition, harvest activities would not remove existing down logs (DEIS, p. 23). Fertilization would not be necessary.

Comment: *There is no need for logs. It's unwise to push timber on the nation that isn't needed……it's clear that there is no need for any timber to be produced from national forest land even if the recession ends and the housing starts double…The Ochoco National Forest needs to do a better job in understanding the marketplace before offering timber for sale…This project is not needed as housing starts are at an all time low and timber from private industrial tree farms more than meets the domestic need for products made from softwood. (Comment 1.5)*

Providing wood products during a depression in prices and demand for wood doesn't make sense as part of the Purpose and Need. (Comment 8.92)

Response: The Jackson project does not propose to push timber on the nation. The socio-economic effects of the project are focused on the economy of central and southeastern Oregon (DEIS p. 69). Furthermore, local lumber demand is not entirely dependent on housing starts.

The local demand for timber is demonstrated by the fact that purchasers continue to buy timber sales that are offered on the Ochoco National Forest. Several commenters stressed the importance and need for economically viable timber sales (Reference comments from AFRC, Interfor). The Jackson project will help to support local infrastructure as both Alternative 2 and Alternative 3 contain commercial harvest activities.

Comment: *The Responsible Official ignores the wishes of the owners of the national forests by proposing this timber sale. The vast majority of American citizens abhor and reject the notion that commercial timber harvest improves the ecological health of the countless natural resources in the forest. The Responsible Official should listen to the public, serve the public, meet the needs of the public, promote grassroots public participation before proposing a project and be accountable to the American public. (Comment 1. 10)*

Response: The planning process for the Jackson project included public involvement at several points (DEIS p. 9). Comments that were received from the public were used to identify issues (DEIS p. 9-11) and subsequent alternatives. Several commenters stressed the importance and need for economically viable timber sales (Reference comments from AFRC, Interfor) and felt that the project did not propose enough vegetation management within the project area. The EIS for the Jackson project analyzed and the Responsible Official considered the effects of a "no action" alternative, which is responsive to some of the opinions expressed in the opinion polls cited by the commenter.

Comment: *If the Responsible Official is interested in contributing to the health of local and regional economies, proposing a timber sale is not the way. Even the Forest Service discloses that private profits from national forest recreation create jobs and economic community stability at a greater level than timber harvest. Seldom does logging affect local employment. All national surveys indicate that the majority of the recreating public avoids areas that have been logged. Logging does not contribute to the economic stability of local communities and industries. Logging focuses on only one local industry-the timber industry-while ignoring the many other local industries. (Comment 1.12)*

Response: Economic benefits are realized through many different sources on the Ochoco National Forest. Visitors who recreate on National Forest System lands bring economic benefit to local communities and wood products that are derived as a result of forest restoration activities are used to support local sawmills.

The socio-economic effects of the project are focused on the economy of central and southeastern Oregon (DEIS p. 69). Alternatives 2 and 3 propose commercial harvest activities

that would contribute to local and regional communities. Local demand for timber is evident as purchasers continue to buy timber sales that are offered on the Ochoco National Forest. The projected annual employment and income is displayed on Table 40, p. 71 of the DEIS.

Comment: *This member of the public feels that the science statements contained in the attachment to these comments constitute science that's at least as accurate as the science literature in the References section of the DEIS. The Responsible Official consciously excluded the science that describes natural resource harm from the References section on p. 270-278. The use of only carefully selected science selected that supports the timber sale clearly shows that the project is not based on best science. If the Responsible Official is concerned about basing this project on best science she will examine the literature cited in the attachments and modify this project according to the science that describes methods to reduce the environmental impacts of this timber sale. (Comment 1.15)*

Response: Literature cited by Mr. Artley (approximately 300 citations) was considered and is included in the electronic project file. A summary of the "Review of Opposing View Documents" is included in this response to comments. In general, the applicable science provided by Mr. Artley either supported the activities proposed in the Jackson project or did not provide information that refutes the proposed activities.

Comment: *Please do not apply herbicides containing the man-made chemical glyphosate anywhere near (or in) the project area for any reason. Exposure to herbicides that contain glyphosate causes non-Hodgkin's lymphoma….a form of cancer. Exposure to herbicides that contain glyphosate causes endocrine disruption in human cells. Exposure to herbicides that contain glyphosate causes skin tumors. Exposure to herbicides that contain glyphosate causes the death of liver cells in mammals. Exposure to herbicides that contain glyphosate causes chromosomal damage. (Comment 1.16)*

Response: No herbicide treatments are proposed in the Jackson EIS.

Comment: *This spectacular unique World Heritage Wilderness precious area must be saved! It is not a "sacrifice area" (Comment 3.2)*

Response: The Jackson project area does not contain any congressionally designated Wilderness areas. The majority of the project area (48,684 acres) is within the "General Forest" management area as described in the Ochoco Forest Plan (p. 4-86). According to the Forest Plan, management emphasis in General Forest is to produce timber and forage while meeting the Forest-wide standards and guidelines for all resources (DEIS p. 7). The purpose and need in the draft EIS (DEIS p. 1-6) describes management objectives that emphasize the health and sustainability of forested stands and riparian areas; "sacrificing" any of the project area is not part of the purpose and need.

Comment: *We are also concerned by the Jackson project's potential impacts to recreation values. (Comment 8.23)*

Response: The impacts to Recreation are disclosed and discussed on DEIS p. 237-241 and design features specific to Recreation are described on DEIS p. 26.

Comment: *Some of these stands in proposed timber sale units are actually still wide open from recent logging. Any further mature tree logging so soon would be detrimental. We are greatly concerned by the potential for serious cumulative impacts to soils, interior forest-dependent wildlife, wildlife dependent on old growth and mature mixed conifer forest, hydrologic flows, water quality, recreational values, and carbon storage. (Comment 8.35)*

Response: Cumulative effects to all resources are discussed throughout the disclosure of environmental effects in Chapter 3 of the DEIS. Effects of past actions are incorporated into the discussion of current condition. Commercial and noncommercial thinning are proposed in

stands where density reduction would benefit the remaining trees in terms of forest health, resiliency, and/or increased growth rate.

Comment: *We are opposed to managing the forest for livestock grazing by opening tree canopy to increase grass and shrubs. There are plenty of open areas in the project area providing forage already, and the forage should be prioritized for elk, deer, and pronghorn, not livestock. (Comment 8.45)*

Response: Forage production for livestock grazing is not listed as a purpose and need for the Action Alternatives DEIS p. 2-4. The proposed actions meets the listed purposes and needs for action, they also result in the rangeland resource related effects which are discussed in DEIS p. 231-237. The LRMP for the Ochoco National Forest (p. 4-11) as quoted on p. 1 of the Rangeland Resources Report indicates that its, "[s]tated goals are to provide forage for wildlife and domestic livestock in a manner consistent with other resource objectives and environmental constraints, while maintaining or improving ecological condition and plant community stability." Increases in herbaceous and shrub production are not only available as forage for livestock but also for wildlife, as well as increased availability for other components of the ecological system (structure, nutrients, etc).

Comment: *Is promised monitoring going to take place? Is funding for post-project surveys, monitoring, and post-implementation "restoration" activities like sub-soiling guaranteed? If not, ecological damage can not be assumed to be constrained within promised limits. (Comment 8.49)*

What guarantees that monitoring and mitigation will happen? What follow-up is planned to ensure adaptive learning?

Response: The Forest Supervisor will determine what monitoring, surveys, and project design criteria will take place as part of the Jackson project; her direction on monitoring will be documented in the Record of Decision.

Comment: *The overabundance of design features indicates a fundamentally destructive project - the more complex and numerous the design features, the more impacts are likely due to lack of avoidance of impacts re: hoping pdfs will work to mitigate planned violations...How much are costs raised by so many design features? At what point to costs exceed benefits - both ecological and net economic returns? Especially when there's virtually no market for timber. (Comment 8.51*

In practice so many design elements are hard to remember and to catch the situation in time - many of these precautions are unlikely to take place, e.g. suspension of road use. (Comment 8.60)

Response: A comprehensive set of PDFs are part of a well-designed project. Many of the design features on p. 15-30 of the DEIS are standard procedures incorporated into all project designs as they tier to Forest Plan standards and guidelines. For example, the LRMP (4-226) states that when designing the transportation system the number of stream crossings will be minimized and that temporary roads (LRMP 4-227) will not be constructed across scablands unless there is no other feasible alternative. In addition, Appendix C, DEIS p. 305, contains unit specific project design information that is used to ensure that project design criteria is carried forward from planning to implementation. Many of the design criteria are also included as standard clauses in a timber sale contract: For example, Timber Sale Provision BT6.24 "Protection Measures Needed for Plants, Animal, Cultural Resource and Cave Resources" allows for the protection of these resources and is included on the sale area map. The provision also requires that if a new discovery of additional areas need special protection either the Purchaser or Forest Service shall report to the need to the other party. All PDFs related to commercial thinning were reviewed by a timber sale administrator for the Ochoco National Forest and were determined to be implementable and economically feasible.

Comment: *Why are all range design features only to protect livestock interests and not also to prevent livestock entry into sensitive areas or invasive plant populations? Especially considering CT, NCT and burning opening up canopy and underbrush and disturbing soils, livestock should be kept out of sensitive plant and invasive plant areas until recovery. (Comment 8.65)*

Response: Project Design Features in this context apply to *the activities that will be authorized* in the decision subsequent to this analysis. "These design elements were developed to reduce the environmental effects of *the proposed activities* or to comply with the standards and guidelines in the Forest Plan." (emphasis added, DEIS p. 15). Rather than Project Design Features, Mitigation Measures associated with the authorization of livestock grazing are found in the NEPA document which analyzed this activity for the Jackson area (Westside Allotments Environmental Assessment, Decision Notice and Finding of No Significant Impact, 2005).

Comment: *Coordination [with archaeologist] does not ensure protection. A policy of not allowing damaging activities to overlap cultural sites does. Loss of cultural heritage is cumulative and has already occurred at unacceptable rates. (Comment 8.71)*

Response: Coordination with the archaeologist starts from the time the activities are first proposed to the final implementation of the project. All eligible (for nomination to the National Register of Historic Places) sites are identified within the project boundary. Their location in relation to proposed units and activities are analyzed, and early on, mitigation measures and design criteria are developed for the avoidance of those sites. Unit boundaries are changed, the prescription is changed to logging over snow, ripping of roads is changed to closing with berms or boulders, aspens are protected by directional falling away from the trees during the removal of encroaching firs. Before the project NEPA document is signed by the Responsible Official, a comprehensive State Historic Preservation Office (SHPO) report is written, with all protective measures provided, and SHPO must sign off on how we are proposing to protect every eligible site within the project area. The Jackson Vegetation Management Project SHPO report was 24 p. long, mostly due to specific measures written into the implementation plan on how every eligible historic resource will be protected. This report was reviewed and signed on March 28, 2012.

Comment: *How is this [pdcs for Historic Summit Trail] protecting the historic values of the site and "foreground visuals?" Respect the 600-foot buffer and don't commercially log or remove snags and trees within historic blazes. (Comment 8.72)*

Response: In 1985, a management plan was written for the Historic Summit Trail. In 1989, the Ochoco National Forest Land Management Plan included standards and guidelines protecting this linear route. Both documents were used in the archaeological analysis for those proposed units that include or are adjacent to the Summit Trail. The 1985 plan identified all traces still left within the Ochoco National Forest from this early 20th Century trail. Each segment was rated on its remaining physical integrity, and was given specific measures to follow to protect those remaining features. A total of 26 proposed units are adjacent to the Historic Summit Trail within the Jackson Vegetation Management Project. Protective measures that will fully protect the remaining integrity of this important historic linear route were written into the Jackson SHPO report and implementation plan; these include:

1. Stumps will not exceed eight inches in foreground areas.
2. Slash will be hand piled no closer than one hundred and fifty feet of the road. Piles will be no larger than eight feet in diameter and height and would be burned within two years.
3. Thinning unit boundary tags visible from Road 2630 will be removed when treatment is completed.

4. The re-use of established log landings within foreground areas will be permitted.
5. Slash from landings within the foreground areas will be removed as part of project activities.
6. Hazard trees may be felled along portions of Road 2630 which are used for timber haul routes. If a hazard tree contains a historic blaze, the project archaeologist will be notified for verification; the tree may be cut above the blaze.
7. The painting of leave trees within units will only take place on the side of the tree facing away from the road. Unit boundary tags visible from Road 2630 will be removed when treatment is completed.

APPENDIX E – PROJECT AREA MAPS

Map 1 – Vicinity Map

Map 2 – Management Areas

Map 3 – Fish Distribution and Riparian Habitat Conservation Areas

Map 4 – Plant Association Groups

Map 5 – Alternative 2- Commercial Harvest and Proposed Roads

Map 6 – Alternative 2 –Noncommercial Thinning, Juniper Thinning, and Hardwood Treatments

Map 7 – Alternative 2- Fuel Treatments

Map 8 – Alternative 3 – Commercial Harvest and Proposed Roads

Map 9 – Alternative 3 – Noncommercial Thinning, Juniper Thinning, and Hardwood Treatments

Map 10 –Alternative 3- Fuels Treatments

Map 11 –Recreation

Map 12- Key Wildlife Areas