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Draft Environmental Impact Statement

Upper Beaver Vegetation Management Project

Paulina Ranger District, Ochoco National Forest
Crook County, Oregon

Upper Beaver Vegetation Management Project
Draft
Environmental Impact Statement
Crook County, Oregon

Lead Agency:	**USDA Forest Service**
Responsible Official:	**Jeff Walter, Forest Supervisor** **3160 NE 3rd St.** **Prineville, Oregon 97754** **(541) 416-6500**
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Abstract: The Paulina Ranger District of the Ochoco National Forest has prepared a Draft Environmental Impact Statement (DEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. The Paulina Ranger District proposes to implement multiple resource management actions within the Upper Beaver Vegetation Management project area under the guidance of the 1991 Ochoco National Forest Land and Resource Management Plan (Forest Plan) as amended and as supported by the National Fire Plan and other national policy. The focus of the proposed actions is modification of stand structure across the planning area in order to improve the vegetative condition and restore plant communities toward the range of historic conditions. Three alternatives are considered in detail. Alternative 1 is the No Action alternative. Alternative 2 (the Proposed Action) would move forested vegetation toward the historic range of variability and contribute to the reduction of rusk of large-scale disturbances such as wildfire, insects and disease. This would be accomplished through commercial thinning, precommercial thinning, juniper removal, hardwood restoration, and fuels treatments. Alternative 3 would implement similar treatments to Alternative 2, but would avoid commercial activities in riparian areas. This DEIS discloses the direct, indirect, and cumulative environmental impacts resulting from the proposed action and alternatives. The Responsible Official has selected Alternative 2 as his Preferred Alternative.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decisionmaking process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, l986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to:	**Slater Turner, District Ranger** **7803 Beaver Creek Road** **Paulina, Oregon 97751** **(541) 477-6900**
Date Comments Must Be Received:	**45 days following publication of Notice of Availability in the *Federal Register***

SUMMARY

The Ochoco National Forest, Paulina Ranger District proposes to implement multiple resource management actions within the Upper Beaver Creek project area as guided by the Ochoco National Forest Land and Resource Management Plan (Forest Plan) as amended and as supported by the National Fire Plan and the President's Healthy Forest Initiative. The Upper Beaver Creek project area covers approximately 37,000 acres of National Forest System land within the Upper Beaver Creek watershed approximately 70 air miles east of Prineville, Oregon within Crook, Grant, and Wheeler Counties. Resource management actions apply to National Forest System (NFS) lands only and do not include private lands.

The focus of the proposed action is to improve the vegetative condition and restore plant communities towards a range of historic conditions. Several objectives have been identified to meet the intent of the project, including:

- Increasing large trees;
- Increasing late and old structure stands;
- Introducing large woody debris and hardwood plant species within the Riparian Habitat Conservation Areas while reducing the amount of western juniper;
- Reducing the amount of fuels to achieve and maintain low intensity fire conditions;
- Providing wood products to meet public needs and contribute to the health of local and regional economies.

Why This Project Is Needed

This project is being proposed because the overall vegetation within this watershed needs to be improved in order to move plant communities toward historic conditions. The following needs were identified:

- There is a need to increase large diameter trees, and late and old structure stands;
- There is a need to introduce hardwood plant species and large woody debris within Riparian Habitat Conservation Areas;
- There is a need to reduce the distribution of western juniper;
- There is a need to reduce the amount of fuels to achieve and/or maintain low intensity fire conditions; and
- There is a need to provide wood products for meeting public needs and contributing to the health of local and regional economies.

Comments on the proposed action, potential concerns, and opportunities for managing the Upper Beaver Creek project area were solicited from members of the public, other public agencies, adjacent property owners, and organizations. Methods used to request comments included publishing a Notice of Intent (NOI) to prepare an EIS in the Federal Register on April 15, 2008, local newspaper articles advertising the project on April 21, 2008, and a scoping letter mailed to approximately eighty-two interested parties soliciting comments on April 15, 2008.

Comments received during the scoping process were used to help define issues, develop alternatives and mitigation measures, and analyze effects. Through review and analysis of the scoping comments and input, the Upper Beaver Creek project area Interdisciplinary Team (ID Team) identified five issues related to the proposed activities:

- Removal of trees would cause changes to connectivity corridors;

- Proposed activities could cause changes to goshawk nest stands;
- Proposed activities in RHCAs could increase sediment and cause a decline in water quality. Commercial harvest and noncommercial thinning could also cause a reduction in shade on streams and cause an increase in stream temperatures;
- Equipment use during harvest activities and connected actions could change soil productivity; and
- Prescribed fire treatments would cause changes to habitat for migratory and sensitive land birds.

The issue associated with activities in RHCAs led the ID Team to develop an alternative to the proposed action; all other issues were resolved through project design. The alternatives analyzed in detail in this EIS are summarized below.

Alternative 1 (No Action) – The National Environmental Policy Act (NEPA) requires study and use of the no action alternative as a basis for comparing the effects of the proposed action and other alternatives. This alternative assumes no implementation of any elements of the proposed action or other action alternatives. The no action alternative represents making no attempt to actively respond to the purpose of and need for action or the issues raised during scoping for this project. For example, there would be no effort to modify existing vegetation or related fuels and habitat conditions in the project area. Actions such as ongoing Forest protection efforts and recurring road maintenance on system roads would continue as directed by the Forest Plan.

Alternative 2 (Proposed Action) – This alternative proposes a variety of commercial and non-commercial vegetation treatments along with prescribed burning to respond to the purpose of and need for action. This alternative proposes 2,674 acres of commercial thinning and 6,727 acres of precommercial thinning. Activities proposed within RHCAs include 220 acres of commercial thinning and 1,037 acres of non-commercial and fuels treatments. Class I and II streams would have 300 foot buffers on each side of the stream; commercial thinning with ground based equipment limited to existing roads, trails and landings would be allowed to within 100 feet of stream channels, and commercial thinning with no ground based equipment would be allowed between 100 and 50 feet from the stream channel. Hand thinning would be implemented between 50 and 12 feet from the stream channel. Class III and IV streams would have 150 foot buffers; thinning would take place with no ground-based equipment, and thinning objective would vary by stream class. Treatments 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). Prescribed burning is proposed across 4,233 acres in order to reduce naturally occurring debris on the forest floor and seedlings and saplings, maintaining low intensity fire conditions in stands that have been previously treated. Underburning to remove fuels generated by thinning activities is proposed over approximately 8,714 acres; grapple piling is proposed on about 2,045 acres where burning would be expected to damage the residual stand. Additional natural fuels treatments are proposed over 1,046 acres on Wolf Ridge. The proposal includes construction of a shaded fuel break along each side of the Summit Trail (approximately 600 feet on either side of the trail, amounting to about 309 acres) to protect the historic value of the Summit Trail and to provide for firefighter safety. Approximately 2.8 miles of temporary roads would be constructed; no new permanent roads would be constructed and all roads that are reopened during the project would be closed after activities are completed. Alterative 2 is expected to generate 2.0 million board feet (MMBF) of timber.

Alternative 3 – Alternative 3 was developed in order to respond to the key issue while meeting the purpose and need for action. Treatments were specifically designed to address issues relating to activities proposed in Riparian Habitat Conservation Areas that could increase sediment and

cause a decline in water quality and/or decrease soil productivity in RHCAs. Alternative 3 proposes 6,867 acres of precommercial thinning and 2,205 acres of commercial harvest. Activities proposed in RHCAs include 14 acres of commercial thinning and 990 acres of non-commercial thinning and fuels treatments. 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. Heavy equipment would not be allowed in these zones, but commercial harvest would be allowed within reaching distance of the logging equipment (30 to 50 feet). 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 densities would reduce competitive stress on the remaining trees. Natural Fuels Underburning (also called Maintenance Burning) is proposed across 3,942 acres in order to reduce naturally occurring debris on the forest floor and seedlings and saplings, maintaining low intensity fire conditions in stands that have been previously treated. Underburning to remove fuels generated by thinning activities is proposed over approximately 8,518 acres; grapple piling is proposed on about 1,902 acres where burning would be expected to damage the residual stand. Additional natural fuels treatments are proposed over 1,046 acres on Wolf Ridge. The proposal includes construction of a shaded fuel break along each side of the Summit Trail (approximately 600 feet on either side of the trail, amounting to about 309 acres) to protect the historic value of the Summit Trail and to provide for firefighter safety. Alternative 3 is expected to generate 1.65 MMBF of timber.

The Upper Beaver Creek Vegetation Management project purpose and need statement provides the focus and scope of the proposal as related to national and Forest-level policy and direction. Given this purpose and need, the Deciding Official (Forest Supervisor) will review the proposed action, the issues identified during scoping, the alternatives, and the environmental consequences of implementing the proposal and alternatives disclosed in this EIS. This forms the basis for the Deciding Official to make the following determinations:

- whether the proposed activities and alternatives address the issues, are responsive to National policy/guidance and Forest Plan direction, and meet the purpose of and need for action in the Upper Beaver Creek project area;
- whether the information in this analysis is sufficient to implement proposed activities; and
- which actions, if any, to approve; and
- whether to amend the Forest Plan to allow for vegetative treatments within Old Growth Management Areas.

COMMONLY USED ACRONYMS AND ABBREVIATIONS

BA	Basal Area
BCR	Bird Conservation Region
BF	Board Foot
BLM	Bureau of Land Management
CCF	Hundred Cubic Feet
CDA	Connected Disturbed Area
CEQ	Council on Environmental Quality
CF	Cubic Feet
CFR	Code of Federal Regulations
CMAI	Culmination of Mean Annual Increment
DBH	Diameter Breast Height
DEIS	Draft Environmental Impact Statement
EA	Environmental Analysis
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
FVS	Forest Vegetation Simulator
GIS	Geographic Information System
HUC	Hydrologic Unit Code
ID Team	Interdisciplinary Team
MA	Management Area
MBF	Thousand Board Feet
MIS	Management Indicator Species
MMBF	Million Board Feet
MPB	Mountain Pine Beetle
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NFSR	National Forest System Road
NOA	Notice of Availability
NOI	Notice of Intent
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
ORV	Off Road Vehicle
OHV	Off Highway Vehicle
PFA	Post-Fledging Family Area
PFC	Proper Functioning Condition
POL	Products Other than Logs
R6	Forest Service Region 6 (Pacific Northwest)
RHCA	Riparian Habitat Conservation Area
ROD	Record of Decision
SHPO	State Historic Preservation Office
SVS	Stand Vegetation Simulator
T&E	Threatened and Endangered
TCP	Traditional Cultural Property
TFB	Thin from Below
TSI	Timber Stand Improvement
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	United States Fish and Wildlife Service
WUI	Wildland-Urban Interface

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Structure

The Paulina Ranger District of the Ochoco National Forest has prepared this Draft Environmental Impact Statement (DEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This DEIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

Chapter 1. Proposed Action and Purpose of and Need for Action: The chapter includes information related to the background of the project proposal, the purpose of and need for the project, and a description of 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: This chapter provides a more detailed description of the proposed action and alternative methods for achieving the stated purpose. These alternatives were developed based on key issues raised by public comments, by other agencies, and internally. Chapter 2 also provides a discussion of proposed design criteria, mitigation measures, and monitoring. Finally, this section includes summary tables displaying the activities planned by alternative and a comparison of the alternatives' response to the key issues.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the existing condition of each resource and the effects each alternative would have on the environment. The effects of the No Action alternative provide a baseline for evaluation and comparison with the other alternatives. The analysis is organized by resource area.

Chapter 4. List of Preparers; List of Agencies, Organizations, and Persons to Whom the Statement is Sent; Index; Bibliography; and Glossary

Appendices: The appendices provide more detailed information to support the documentation and analysis presented in the EIS.

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

Project Location

The 37,000-acre planning area is located approximately 70 air miles southeast of Prineville, Oregon, and 12 miles northeast of Paulina, Oregon (Appendix 4, Map 1). The planning area is located within: Township 14 South, Range 25 East, Sections 26-36; Township 15 South, Range 24 East, Sections 1, 11-14, 23-27, 35; Township 15 South, Range 25 East, Sections 1-35; Township 15 South, Range 26 East, Sections 18, 19, 30-32; Township 16 South, Range 26 East, Sections 5-8, 17-19, 30.

Background

In 2004, the Ochoco National Forest conducted an ecosystem analysis of the Upper Beaver Creek watershed. The Upper Beaver Creek Watershed Analysis included an extensive look at forest fuels and vegetation conditions, the relationships between those conditions and changes in fire hazard, insect and disease dynamics, wildlife habitat, and riparian health (see Chapter 1, Local

Assessments). Vegetation patterns and occurrence within the analysis area are different now than what existed historically. Changes to the health, structure, composition, distribution, and function of forest stands have altered the natural processes that maintain a viable ecosystem. This has affected vegetative resiliency, wildlife habitat diversity and amount, water quality, visual quality, fuel loadings, and potential fire behavior.

Among other things, the watershed analysis determined that:

- There have been major increases in stand densities within the watershed. Fire exclusion has allowed understory trees to establish and develop over the past 100 years, resulting in overstocked stands. Overstocked stands generally are characterized by declining vigor, which may increase susceptibility to large-scale insect and disease mortality. Ladder fuels, which include understory trees that can carry fire to the overstory, increase the risk of stand-replacing wildfire.
- Stands dominated by medium and large trees are deficient across the watershed.
- Open park-like stands of ponderosa pine are absent.
- There is a surplus of ponderosa pine acres dominated by pole size trees (5 to 9 inch diameter) and small diameter trees (9 to 21 inch).
- The distribution of the Western Juniper Steppe Plant Association Group is out of balance.
- The number of insect outbreaks and pathogen incidents has increased since historic times.
- Grand fir and Douglas-fir have been able to expand into stands where they were not historically, which has resulted in the expansion of the range of insect and pathogen host trees, which can lead to large-scale forest disturbance events.
- Many Riparian Habitat Conservation Areas (RHCAs) in the project area currently have conifer encroachment. High stocking of conifers in RHCAs can lead to replacement of aspen and other deciduous broadleaf vegetation, shrubs and ground vegetation. Conifers don't provide the same habitat characteristics as these other types of vegetation in riparian systems; loss of riparian vegetation to conifers can have negative effects on water quality in affected streams by reducing shade and decreasing bank stability.

The project area has since been reevaluated using newer (2004) vegetation information. Many of the same trends identified in the watershed analysis still hold true, although the magnitude of some conditions may have changed. More area is covered by dense stands of smaller trees than was the case historically, while acreage of stands dominated by large trees is less than the historic condition. Douglas-fir, grand fir, and western juniper have increased in abundance. Hazards associated with insects and diseases are above the levels that were historically present.

Management Direction

Guidance for management activities is provided by the 1989 Ochoco National Forest Land and Resource Management Plan (Forest Plan), as amended. The Forest Plan establishes goals, objectives, standards, and guidelines for each specific management area of the National Forest, as well as Forest-wide standards and guidelines. Management Areas and associated standards and guidelines are described in Chapter 4 of the Forest Plan. This project is tiered to the Final Environmental Impact Statement (FEIS) for the Forest Plan, as amended by the Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (Eastside Screens) and the Inland Native Fish Strategy (INFISH).

Ochoco Forest Plan

Goals and Objectives and Standards and Guidelines for each of the management areas in Upper Beaver Creek project area are described below. See Appendix 4, Map 2 for Forest Plan management areas.

MA-F6 Old Growth – There about 814 acres of MA-F6 in three allocated old growth management areas within the project area, Beaverdam, Bear, and Sugar Creek. The three old growth habitats are ponderosa pine or ponderosa pine dominated mixed conifer. Connectivity habitat is also identified in the watershed, and meets amended Forest Plan direction. 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.

MA-F7 Summit Historic Trail – There are about 688 acres of the project area that are along the Summit Historic Trail; these include 333 acres of Partial Visual Retention Corridor, 333 acres of Visual Retention Corridor, and 22 acres of Preservation Corridor. 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).

MA-F12 Eagle Roosting Area - There are approximately 394 acres of bald eagle roosting area within the project boundary. The objective of this area is to provide winter roosting habitat for migrating bald eagles from December through April. The area will have uneven-aged stands which contain large trees at least 22 inches dbh and a few trees which are 36 to 40 inches dbh. Roost trees are generally 22 inches dbh and larger with an open structure allowing eagles to land easily. Roost trees in use will be preserved (Forest Plan, p. 4-70).

A Bald Eagle Management Area (BEMA) and associated Bald Eagle Management Plan (BEMP) exist for the Sugar Creek winter roost. This plan was assessed and finalized in 1991 and signed and incorporated into the Forest Plan in 1993 (USDA FS 1993). The BEMP identifies the need for active management of three forested stands that make up the BEMA. Site specific recommendations for treatment of the ponderosa pine stands are recommended. Some action in the BEMA has occurred to implement the plan. Further work may be needed to improve stand health, habitat quality of the BEMA, and provide for public safety in the Sugar Creek Campground.

Forest cover has expanded and become denser compared to historic conditions on most of the eagle roosting areas. Multiple canopies have developed beneath the large overstory trees located in the draws, increasing stand density to levels that impair vigor and health of the large trees. The large trees are at increasingly higher risk of mortality due to competition- related stress, bark beetles, dwarf mistletoe, and high-intensity fire.

MA-F13 Developed Recreation – There are about 39 acres of developed recreation in the project area in the Sugar Creek Campground and Sugar Creek Day Use Area. 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).

The current stand is uneven-aged with scattered overstory ponderosa pine with a mixture of ponderosa pine and western juniper of varying size and age in the understory. Stocking density of both pine and juniper is high. Competition-related stress is apparent in shortened needles, lower crown ratios, and very low growth rates. Bark beetles, including western pine beetle, mountain pine beetle, and red turpentine beetle, are active in the area; there is recent mortality of some large pine.

MA-F14 Dispersed Recreation – This management area applies to small dispersed sites (less than 5 acres) located throughout the project area on NFS lands; its objective is to provide and maintain a near-natural setting for people to utilize while pursuing outdoor recreation experiences (Forest Plan, p. 4-72). There are 51 individual dispersed recreation sites in the project area. These dispersed sites generally occur along roads, and many are concentrated near riparian areas and stream courses.

MA-F15 Riparian Areas and Riparian Habitat Conservation Areas (RHCAs) – There are approximately 4,457 acres of RHCAs in the project area. The Inland Native Fish Strategy (INFISH) amended the Forest Plan and identified Riparian Habitat Conservation Areas (RHCAs). The objective of MA-F15 areas is to provide for streamside vegetation and habitat to maintain or improve water quality. The focus of management within RHCAs is to meet riparian management objectives. RHCAs on fish-bearing streams extend 300 feet from the edge of the stream's active channel. RHCAs on non-fish bearing perennial streams extend 150 feet from the edge of the stream's active channel. On ponds, reservoirs, and wetlands greater than 1 acre, the RHCAs extend 150 feet from the edge of the wetland or max pool elevation. RHCAs extend 50 feet from the edge of intermittent streams, wetlands less than 1 acre, and landslides.

MA-F20 Winter Range – There are approximately 3,707 acres of Winter Range in the project area. The objective of this area is to manage for big game habitat needs (Forest Plan, p. 4-83). Currently, these areas have more forest cover than was found historically due to juniper and pine expansion into the shrub and grassland communities. Forage production is also limited by the density of young conifers.

MA-F21 General Forest Winter Range – There are approximately 13,347 acres of General Forest Winter Range in the project area. The objective of this area is to manage for timber production with management activities designed and implemented to recognize big game habitat needs (Forest Plan, p. 4-84). Currently, these areas have more forest cover than was found historically due to juniper and pine expansion into the shrub and grassland communities. Forage production is also limited by the density of young conifers.

MA-F22 General Forest – There are approximately 13,881 acres of General Forest in the project area. The objective of 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). Many stands in this land allocation are currently over stocked, especially in the understory leading to conditions that do not favor long-term vigor and resiliency of desired large diameter trees.

MA-F26 Visual Management Corridors – There are approximately 1,975 acres of Visual Management Corridors in the project area comprising Partial Retention Corridor (989 acres) and Retention Corridors (986 acres). The objective for this area 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. Forest Roads 5800, 5820, and

5840 have been allocated as visual management corridors with a visual quality objective of partial retention. The outer boundary of this management area will generally not exceed 600 feet on either side of the road. Vegetation will appear manipulated and reflect a forest setting where stands of trees exist in multiple age classes in both uneven- and even-aged conditions, set in a more subdued background of rock outcrops, aspen clones, and native grass communities (Forest Plan, p. 4-94).

Visual Management corridors consist of a variety of species compositions and structures. Mixed conifer sites are found on the northern portions of the corridors where these roads are located next to streams. Douglas-fir, ponderosa pine, and western juniper sites form a mosaic in the remaining portions of the corridors. Many stands have high tree densities in the understory with increasing competition stress occurring in the large overstory trees.

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.

Local Assessments

Upper Beaver Creek Ecosystem Analysis. In 2004, the Paulina Ranger District completed the Ecosystem Analysis of the Upper Beaver Creek Watershed. The Upper Beaver Creek Vegetation Management project falls within the watershed analysis area. The watershed analysis compared existing resource conditions with desired future conditions. Additionally, the watershed analysis provided recommendations for treatments to meet desired conditions.

The Ecosystem Analysis of the Upper Beaver Creek Watershed documents that almost all the plant communities in the area have changed due to human actions in the last 100 years. The amount of late and old structure stands have decreased, the amount of stands dominated by trees between 5-9 inches dbh has increased, and species composition has shifted from early and mid seral species such as ponderosa pine to mid and late seral species such as fir. Fire suppression has allowed understory layers to develop with a resulting increase in stand density and an increase in competition stress.

Direction Specific to Fire and Fuels Management

As a result of the substantial increase in stand-replacing wildfire occurring across the West, a number of new and revised national initiatives and policies regarding fire and fuels management have been generated. The main focus of this direction is to reduce the probability and occurrence of stand-replacing wildfire in fire-adapted ecosystems, especially near private property. This national emphasis further supports and affirms the need to address Forest Plan goals and objectives regarding fuels and fire hazard reduction to minimize the potential for catastrophic wildfire in the Upper Beaver Creek project area. Below is an overview of a number of key initiatives and policy statements that have evolved in recent years.

National Fire Plan—Managing the Impact of Wildfires on Communities and the Environment (September 2000). This plan is the result of an August 2000 directive by then-President Clinton to the Secretaries of USDA and USDI to develop a response to severe wildland fires, reduce fire impacts on rural communities, and ensure effective firefighting capacity in the future. The focus of this plan is the tactical undertaking of operational and implementation activities. A major feature of the plan is the federal and non-federal interagency cooperation in risk reduction planning and implementation.

Federal Wildland Fire Management Policy (January 2001). This is a review and update of the 1995 Federal Fire Policy. It provides the philosophical and policy foundation for federal interagency wildland fire management programs and activities, including those conducted under the National Fire Plan (such as hazardous fuel reduction). In summary, the policy states that "…federal fire management activities and programs are to provide for firefighter and public safety, protect and enhance land management objectives and human welfare, integrate programs and disciplines, require interagency collaboration, emphasize the natural ecological role of fire, and contribute to ecosystem sustainability."

A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment—10-year Comprehensive Strategy (August 2001) and Implementation Plan (May 2002). The strategy provides goals and guiding principles for implementation of the National Fire Plan. The plan establishes a collaborative, performance-based framework for achieving these goals and reducing the risks of wildland fire across the landscape. The plan represents a unified national commitment endorsed by the Secretaries of USDA and USDI, governors, tribes, local officials, and others.

Restoring Fire-Adapted Ecosystems on Federal Lands—A Cohesive Fuel Treatment Strategy for Protecting People and Sustaining Natural Resources (August 2002). A strategy for USDA and USDI agencies that aligns resource and fire programs for the common purpose of reducing risks to human communities and to restore and maintain fire-adapted ecosystems. This provides a unified approach to meeting the goals of the "10-Year Comprehensive Strategy and Plan" of May 2002. Common priorities for fuel treatment are established that provide the ability to address fuel hazards and land health. Implementation of this framework would reduce risk and consequences of unwanted wildland fire to communities and ecosystems while simultaneously providing forest products and biomass energy production opportunities.

Healthy Forests, An Initiative for Wildfire Prevention and Stronger Communities (August 2002). Presidential direction to the USDA, USDI, and CEQ to improve processes needed to reduce the risk of catastrophic wildfires by restoring forest health. The "Healthy Forest Initiative" directs agencies to implement core components of the National Fire Plan's 10-year Comprehensive Strategy and Implementation Plan. As part of this initiative, the Forest Service and BLM have developed, jointly and separately, several new categorical exclusions and guidance to streamline environmental assessments and have taken other actions to facilitate more rapid analysis and decision-making for fuel hazard reductions and insect/disease problems.

Memorandum of Understanding for the Development of a Collaborative Fuels Treatment Program (January 2003). Process for the Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service, National Park Service, National Association of State Foresters and National Association of Counties to collaborate on fuels treatment work within their respective jurisdictions to provide for community protection and enhance the health of forests and rangelands. This process is guided by the goals, performance measures and collaborative framework outlined in the 10-Year Comprehensive Strategy and Implementation Plan endorsed by these parties on May 23, 2002. Fuel treatments are to be coordinated across ownerships and jurisdictions and prioritized 1) in the wildland-urban interface and 2) outside the wildland-urban interface that are in Condition Classes Two and Three as defined in the 10-Year Plan.

Purpose and Need for Action

The purpose of the Upper Beaver Vegetation Management project is to improve the vegetative condition and restore plant communities towards a range of historic conditions. In comparing the existing condition with the desired future condition of the project area, several themes became apparent:

- There is a need to increase large diameter trees, and late and old structure stands;
- There is a need to introduce hardwood plant species and large woody debris within Riparian Habitat Conservation Areas;
- There is a need to reduce the distribution of western juniper;
- There is a need to reduce the amount of fuels to achieve and/or maintain low intensity fire conditions; and
- There is a need to provide wood products for meeting public needs and contributing to the health of local and regional economies.

The Deciding Official for the Upper Beaver project has chosen to propose resource management actions that respond to the purpose and need of the project, as well as the national emphasis on reducing the potential for stand-replacing wildfire. Associated with these goals are specific resource objectives. Certain of the objectives are key to defining the purpose and need and developing the proposed action. Objectives providing management emphasis for this project are summarized below. Note that other Forest Plan goals and objectives not mentioned below also provide guidance and are achieved to varying degrees depending on project accomplishment (see the Forest Plan, Chapter 1).

Proposed Action

To meet the purpose and need, the Paulina Ranger District proposes to implement a variety of vegetation (commercial and non-commercial) and fuels reduction treatments on about 16,500 acres. This alternative proposes 2,674 acres of commercial thinning and 6,727 acres of precommercial thinning. Activities proposed within RHCAs include 220 acres of commercial thinning and 1,037 acres of non-commercial and fuels treatments. Treatments 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). Maintenance burning is proposed across 4,233 acres in order to maintain low intensity fire conditions in stands that have been previously treated. Underburning to remove fuels generated by thinning activities is proposed over approximately 8,714 acres; grapple piling is proposed on about 2,045 acres where burning would be expected to damage the residual stand.

Additional natural fuels treatments are proposed over 1,046 acres on Wolf Ridge. The proposal includes construction of a shaded fuel break along each side of the Summit Trail (approximately 600 feet on either side of the trail, amounting to about 309 acres) to protect the historic value of the Summit Trail and to provide for firefighter safety. Alternative 2 is expected to generate 2.0 million board feet (MMBF) of timber.

Connected Actions

Approximately 2.8 miles of temporary roads would be constructed to facilitate economical timber harvest; these roads would be obliterated/subsoiled upon completion of harvest activities. No new permanent roads would be constructed and all roads that are reopened (2.2 miles) during the project would be closed after activities are completed.

Decision Framework

The Deciding Official will review the purpose and need, proposed action, issues, alternatives, environmental consequences of implementing the proposal and alternatives, and comments received from the public on this DEIS, and base his review on the following determinations:

- Whether the proposed activities and alternatives address the issues, are responsive to National policy/guidance and Forest Plan direction, and meet the purpose of and need for action in the Upper Beaver Creek project area.
- Whether the information in this analysis is sufficient to implement proposed activities.
- Which actions, if any, to approve (decide which alternative or combination of alternatives to implement).
- Whether to amend the Forest Plan to allow treatments within Allocated Old Growth.

If an action alternative is selected, project implementation could begin in mid-2009. Most actions would be accomplished within a decade. Certain actions (such as fuel break maintenance) could last longer.

Public Involvement

The proposed action was presented during the scoping period. This proposal was based on the purpose of and need for action, which contained four elements: 1) increase large diameter trees and late and old structure stands, 2) introduce large woody debris and hardwood plant species within the Riparian Habitat Conservation Areas while reducing the distribution of western juniper, 3) reduce the amount of fuels to maintain low intensity fire conditions, and 4) provide wood products for meeting public needs and contributing to the health of local and regional economies. The purpose and need has remained the same.

During the scoping period, feedback was received from the public both supporting and opposing the proposal.

Comments on the proposed action, potential concerns, and opportunities for managing the Upper Beaver Creek project area were solicited from members of the public, other public agencies, tribal governments, adjacent property owners, interest groups, and Forest Service specialists. Various methods were used to request comments including:

- The Notice of Intent (NOI) to prepare an EIS was published in the *Federal Register* on April 15, 2008. The NOI asked for public comment on the proposal through May 16, 2008.
- A scoping letter was mailed to approximately 91 interested parties, including adjacent property owners on April 15, 2008. This letter included a description of the project area, an

overview of the planning process, a general explanation of the proposed actions, and an invitation to comment.

- A press release from the Ochoco National Forest was issued to local newspapers April 21, 2008. The article introduced the project to the public readership by providing a description of the project area and an explanation of the proposal as well as soliciting comments on the project.
- Other information sharing, communication and interaction with interested parties, agencies, and individuals has occurred on a continuing basis during project planning.

Five comment letters and one phone call were received from members of the public during the scoping period. No comments were received from the Confederated Tribes of the Warm Springs, the Burns Paiute, or The Klamath Tribes. Comments received and the agency's responses to those comments are summarized in the Upper Beaver Creek Project File located at the Paulina Ranger District office.

- Several respondents urged the use of diameter limits for commercial harvest activities.
- Two respondents recommended no removal of trees larger than 12" dbh.
- Some citizens urged that a greater number of roads be decommissioned or closed than proposed.
- One person commented that ineffective road closures could affect big game security and utilization of the area.
- One person opposed commercial harvest in big game winter range or general forest winter range.
- Two respondents recommended prioritizing treatment in dry forest areas and young, dense stands.

Issues

All comments received have been assessed as to their relevance to each of the resources being addressed within the Upper Beaver Creek Vegetation planning area. Comments received during the scoping process both internal and external were used to help define issues, develop alternatives and mitigation measures, and analyze effects.

Five issues identified during scoping and through the Notice of Intent are:

1. Removal of trees would cause changes to connectivity corridors;
2. Proposed activities could cause changes to goshawk nest stands;
3. Proposed activities in Riparian Habitat Conservation Areas could increase sediment and cause a decline in water quality. Commercial harvest and noncommercial thinning could also cause a reduction in shade on streams and cause an increase in stream temperatures;
4. Equipment use during harvest activities and connected actions could change soil productivity; and
5. Prescribed fire treatments would cause changes to habitat for migratory and sensitive land birds.

The project interdisciplinary team 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.

- **Issues not Analyzed in Detail**: After further field review by district specialists three of the issues identified during preliminary scoping and Notice of Intent were resolved through project design, no treatment, mitigation, or forestwide standards and guidelines.

Key Issue

Effects of Vegetation Treatments with Riparian Habitat Conservation Areas

The proposed action includes 220 acres of commercial thinning and 1,037 acres of non-commercial and fuels treatment activities in RHCAs. Proposed activities are intended to move habitat conditions in the RHCAs toward their natural range of variability by reducing basal area and maintaining or improving habitat for shade-producing species.

There is a concern that activities within RHCAs might lead to decreased water quality due to sedimentation to the stream and reduction in riparian shade, as well as decreased soil productivitiy.

Measure Standard:

- The measuring factor would be the number of acres of Riparian Habitat Conservation Areas habitat treated by treatment type and the resulting vegetation structure and composition.

Issues not analyzed in detail

After further field review by district specialists three of the issues identified during preliminary scoping and Notice of Intent were resolved through project design, no treatment, mitigation, or forestwide standards and guidelines. The following issues will be tracked as resource concerns during analysis and documentation in the draft and final environmental impact statements.

- Proposed activities could cause changes to goshawk nest stands. Based on current field review of the goshawk nest core areas no commercial harvest treatments will be necessary to maintain the known goshawk nesting sites.
- Equipment use during harvest activities and connected actions could change soil productivity. Mitigation measures have been identified in the soils report that resolve this issue and will meet the forestwide standards and guidelines for soils. The mitigation measures for ground based harvest methods will make only 1 to 2 passes to avoid causing detrimental soil conditions by lessening compaction. If machinery is prescribed for post harvest fuels treatments (grapple piler) the machinery is limited to existing heavy disturbance areas. In addition individual unit assessments and mitigations such as tillage, or the requirement to stay on existing disturbance areas only have been addressed.
- Prescribed fire treatments could cause changes to ground nesting habitat for migratory and sensitive land birds. 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. In 2001, an Excutive Order 131186 was signed to detail the responsibilities of federal agencies to protect migratory birds. Compliance with this order is attained by using the Partners in Flight Conservation Strategy most befitting of the project area. At least 11 of the species specifically referenced in the Sharp paper are also either focal species within the Conservation Strategies or Management Indicator species within the forest plan. This issue will be addressed through mitigation (season(s) of burning and surveys).

Other issues were raised by the public that were not relevant to the Upper Beaver project:

- PACFISH issues – since the project area is not within the jurisdiction of this decision, no direction or standards and guidelines pertaining to PACFISH were utilized.
- Northwest Forest Plan – several comments were raised regarding management within Late Successional Reserves and matrix and adhering to standards and guidelines within the Northwest Forest Plan. The entire Ochoco National Forest is outside of the jurisdiction of the Northwest Forest Plan so all references to this project and adhering of managing within land allocations of the Northwest Forest Plan were irrelevant.
- Wildland Urban Interface - Issues relative to prioritizing treatments within or near homes was not analyzed in detail because of the small amount of rural interface within or adjacent to the project area. No wildland urban interface occurs within the project area.
- Inventoried Roadless Areas – Issues regarding management within Inventoried Roadless Areas were not relevant to the project because there are no Inventoried Roadless Areas within or adjacent to the project area. The nearest Inventoried Roadless area is approximately 3 miles north of the project area.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter provides a detailed description of the proposed action, an alternative to the proposed action, and the no action alternative. Maps of each alternative considered in detail are located at the end of this document.

This chapter presents and compares the alternatives, both quantitatively and qualitatively. The intent is to provide the public and the decision maker a basis for a choice among management options when considering the environmental consequences (effects) of implementing each alternative, as disclosed in Chapter 3 of this EIS.

A brief overview is provided of alternatives considered by the ID Team and the decision maker but eliminated from detailed development and study. The last section of the chapter contains a tabular summary of effects relative to the key issues presented in Chapter 1.

Alternatives Considered in Detail

The Forest Service developed three alternatives, including the No Action and Proposed Action. Alternative 3 was developed in response to the Key Issue raised by the public.

Alternative 1 - No Action

The National Environmental Policy Act (NEPA) requires study and use of the no action alternative as a basis for comparing the effects of the proposed action and other alternatives. This alternative assumes no implementation of any elements of the proposed action or other action alternatives. The no action alternative represents making no attempt to actively respond to the purpose of and need for action or the issues raised during scoping for this project. For example, there would be no effort to modify existing vegetation or related fuels and habitat conditions in the project area. Actions such as ongoing Forest protection efforts and recurring road maintenance on system roads would continue as directed by the Forest Plan.

Alternative 2 - The Proposed Action

Alternative 2 proposes a variety of commercial and non-commercial vegetation treatments along with prescribed burning to respond to the purpose of and need for action. Proposed treatments are generally intended to move stands in a multi-strata condition to or towards a single-stratum condition. Many stands would continue to be in an uneven-aged condition. Density reduction activities are intended to maintain and develop large trees on the landscape through reduction of competitive stress (see Cochran et al, 1994 and Powell, 1999). Prescribed burning activities are intended to reduce naturally occurring forest debris, seedlings and saplings to maintain low intensity fire conditions in stands that have been previously treated. Activity-generated fuels would be reduced through underburning and grapple piling. A proposed shaded fuel break around Summit Trail is intended to protect the historic value of the Summit Trail and to provide for firefighter safety.

Activities proposed in RCHAs include 220 acres of commercial thinning and 1,037 acres of non-commercial and fuels reduction activities along Class I-IV streams. Activities in RHCAs would be conducted as displayed in Figures 2-1 and 2- and summarized in Tables 2-1 and 2-2. See Appendix 4, Maps 3a and 3b for proposed activities in RHCAs under alternative 2.

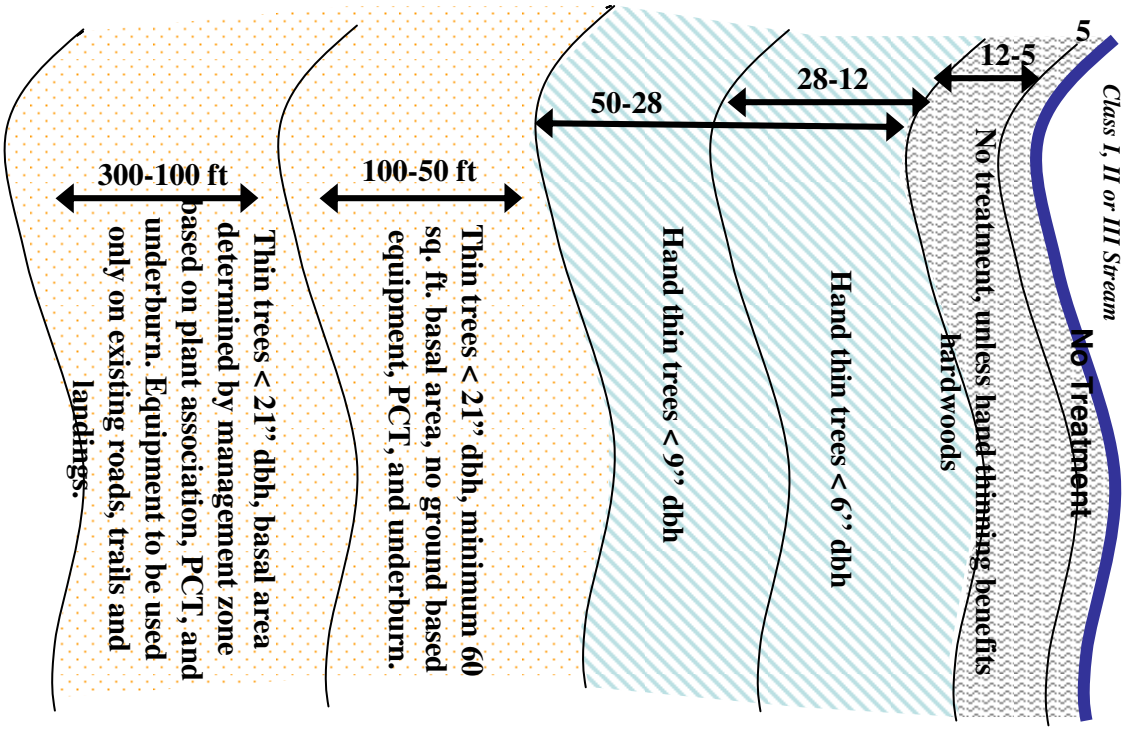


Figure 2-1. Proposed activities in Category I and II RHCAs under Alternative 2.

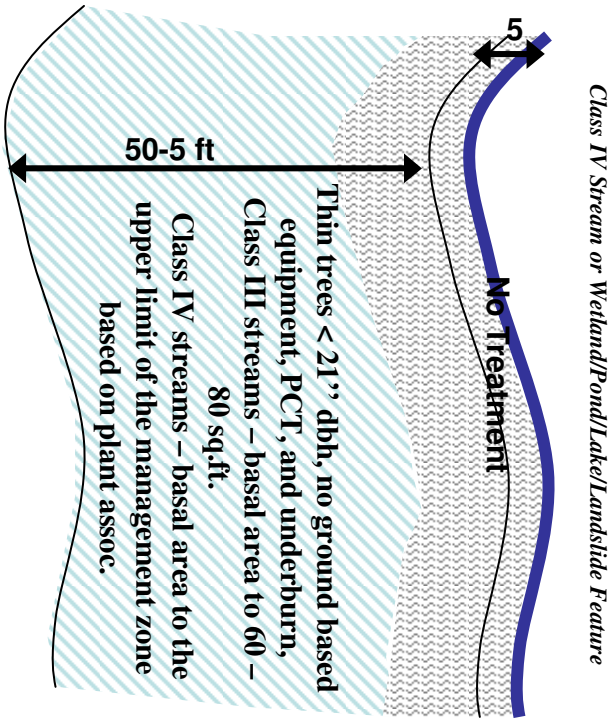


Figure 2-2. Proposed activities in Category III and IV RHCAs under Alternative 2.

Table 2-1. Proposed commercial harvest by RHCA category and stream class under Alternative 2.

Stream Name	Category I RHCA		Category II RHCA	Category IV RHCA	Total Treatment (acres)
	Stream Class I	Stream Class II	Stream Class III	Stream Class IV	
Beaverdam Creek	-	104	-		104
Bronco Creek	-	-	-	1	1
Heisler Creek	-	-	4	-	4
Bellworm Creek	-	-	3	-	3
Powell Creek	-	5	-	-	5
Rager Creek	-	9	-	3	12
Tamarack Creek	-	15	16	-	31
Sugar Creek	59	-	-	1	60
Dutchmen Creek	-	-	-	-	0
Totals	59	133	23	5	220

Table 2-2. Proposed precommercial thinning and fuels treatment by RHCA category and stream class under Alternative 2.

Stream Name	Category I RHCA		Category II RHCA	Category IV RHCA	Total Treatment (acres)
	I	II	III	IV	
Beaverdam Creek	-	193	-	-	193
Bronco Creek	-	-	16	14	30
Heisler Creek	-	-	79	6	85
Bellworm Creek	-	-	1	2	3
Powell Creek	-	124	29	4	157
Rager Creek	-	209	28	14	251
Tamarack Creek	-	133	12	12	157
Sugar Creek	141	-	6	14	161
Dutchmen Creek	-	-	-	-	0
Totals	141	659	171	66	1037

Treatments proposed under Alternative 2 are summarized in Table 2-3; all figures are approximate. Descriptions of activities and project design criteria are included in Chapter 2, Design Criteria and Mitigations. See Appendix 4, Maps 5a, 5b, 6a, 6b, 7a and 7b for activities proposed under Alternative 2.

Table 2-3. Proposed Activities – Alternative 2.

Treatment	Acres/Volume
Fuels & Vegetation Treatments (Silvicultural)	
Commercial Thinning	2,674 acres
Precommercial Thinning	6,727 acres
Juniper Thin and Underburn	2,299 acres
Hardwood Treatments	61 acres
Total	11,761 acres
Fuels & Vegetation Treatments (Fuels reduction)	
Prescribed Fire	4,233 acres
Activity Fuels Treatment	8,714 acres

Treatment	Acres/Volume
Grapple piling of activity created fuels	2,045 acres
Wolf Ridge Nature Fuels Treatment	1,046 acres
Fuel Break (Summit Trail)	309 acres
Total	16,347 acres
Timber Volume Removed	
Sawtimber (MMBF)	2.0
Sawtimber (CCF)	4,000
Transportation System (miles)	
Open System Roads	50.33 miles
* Closed System Roads to be opened	6.16 miles
Temporary Roads (decommissioned roads to be open)	3.61 miles
Temporary Roads (new for access)	2.78 miles
Closed / Temporary Road Total	**12.55 miles**
*Closed system roads will be opened during harvest activities and re-closed after these activities are complete.	

Forest Plan Amendment

Implementation of Alterantive 2 would require a site-specific Forest Plan amendment. The Forest Plan (p. 4-251) states that vegetative management (except livestock use) will not be allowed within MA-F6 Old Growth, until further research is available on the needs of the dependent species. Alternative 2 includes commercial thinning, precommercial thinning, hand piling, and underburning in the Beaverdam, Bear, and Sugar Creek OGMAs. These activities are proposed to improve the longevity of large ponderosa pine on south and west facing slopes. The activities are consistent with the emphasis for the OGMA, which is to provide habitat for wildlife species dependent on old growth stands. A Forest Plan amendment is needed because the activities are not consistent with the standard and guideline that indicates vegetative management is not allowed.

Timing – The Forest Plan has been in effect since 1989. This amendment is occurring during the second decade of the plan period and is less likely to be significant. The proposed activities are expected to be implemented within the next 5-7 years.

Location and Size – The project area contains three OGMAs. Alternative 2 includes activities on 557 acres out of 814 within OGMAs; commercial thinning would take place on 66 acres. The proposed activities would maintain existing large trees.

Goals, Objectives, and Outputs – 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 any of the action alternatives because of the low number of acres being treated and the objectives of maintaining large trees.

Management Prescription – The amendment applies only to this project and would not apply to future decisions. 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 would be treated and options for future management would be maintained.

Alternative 3

Alternative 3 was developed to respond to the Key Issue, which relates to effects to water quality from conifer thinning in RHCAs (see Chapter 1). Alternative 3 responds to this concern by reducing the amount of proposed treatments within RHCAs by 206 acres of commercial thinning and 47 acres of precommercial thinning and prescribed burning. Activities in RHCAs would be

conducted as displayed in Figures 2-3 and 2-4 and summarized in Tables 2-4 and 2-5. See Appendix 4, Maps 4a and 4b for activities proposed in RHCAs under Alternative 3.

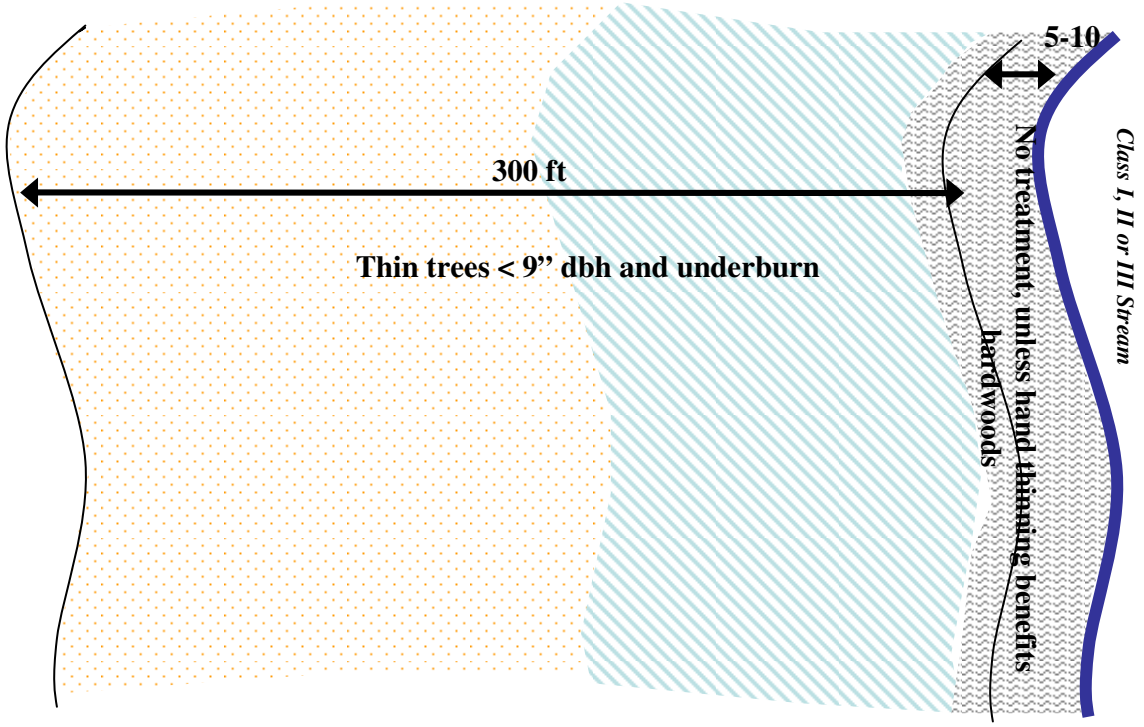
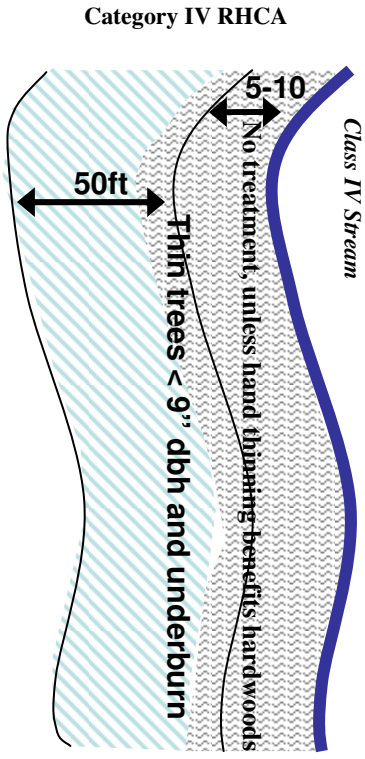


Figure 2-3. Proposed activities in Category I and II RHCAs under Alternative 3.



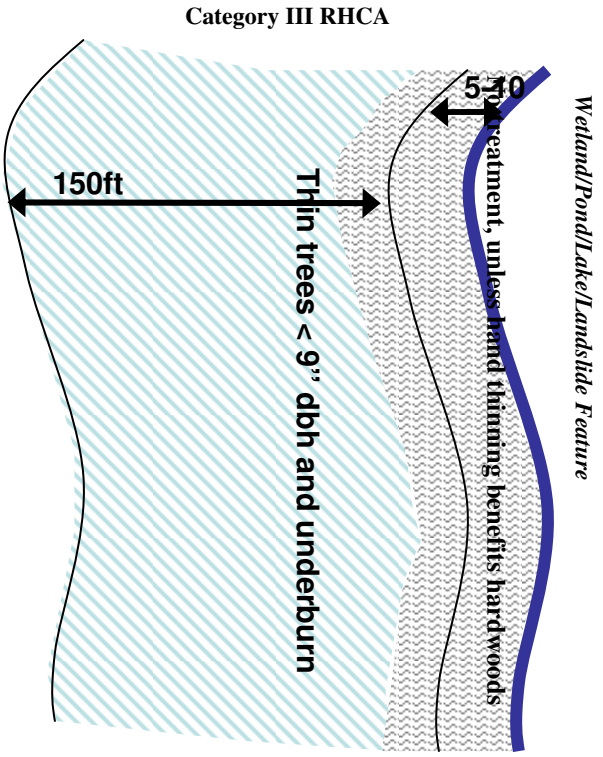


Figure 2-4. Proposed activities in Category III and IV RHCAs under Alternative 3.

Table 2-4. Proposed commercial harvest by RHCA category and stream class in Alternative 3.

Stream Name	Category I RHCA		Category II RCHA	Category IV RHCA	Total Area in RHCA
	Stream Class I	Stream Class II	Stream Class III	Stream Class IV	
Beaverdam Creek	-	7*			7
Bronco Creek	-	-	-	1-	1
Heisler Creek	-	-	-		0
Bellworm Creek	-	-	3°	-	3
Powell Creek	-	-	-		0
Rager Creek	-	-	-	-	0
Tamarack Creek	-				0
Sugar Creek	3^	-			3
Dutchmen Creek	-	-	-	-	0
Totals	3	7	3	1	14

* Commercial harvest would be in the outer 30-170 feet of RHCA in Unit 51
^ Commercial harvest would be in the outer 30-100 feet of RHCA in Unit 3.
° Commercial harvest would be in the outer 18-90 feet of RHCA in Unit 28.
\- Commercial harvest would be in the outer 12-45 feet of RHCA in Unit 11.

Table 2-5. Proposed precommercial thinning and fuels treatment by RHCA stream class under Alternative 3.

Stream Name	Category I RCHA		Category II RCHA	Category IV RCHA	Total Area in RHCA
	Stream Class I	Stream Class II	Stream Class III	Stream Class IV	
Beaverdam Creek	-	203	6	15	224
Bronco Creek	-	-	8	13	21
Heisler Creek	-	-	62	6	68
Bellworm Creek	-	-	3	-	3
Powell Creek	-	87	10	-	97
Rager Creek	-	152	28	9	189
Tamarack Creek	-	207	23	12	242
Sugar Creek	125	-	6	15	146
Dutchmen Creek	-	-	-	-	0
Totals	125	649	146	70	990

Table 2-6 summarizes all activities proposed in Alternative 3. Chapter 2, Design Criteria and Mitigations, describes the proposed activities. See Appendix 4, Maps 8a, 8b, 9a, 9b, 10a, and 10b for locations of activities proposed under Alternative 3.

Table 2-6. Proposed Activities - Alternative 3.

Treatment	Acres/Volume
Fuels & Vegetation Treatments (Silvicultural)	
Commercial Thinning	2,205 acres
Precommercial Thinning	6,867 acres
Juniper Thin and Underburn	2,279 acres
Hardwood Treatments	27 acres
Total	11,378 acres
Fuels & Vegetation Treatments (Fuels reduction)	
Prescribed Fire	3,942 acres
Activity Fuels Underburning Treatment	8,518 acres
Grapple piling of activity created fuels	1,902 acres
Wolf Ridge Nature Fuels Treatment	1,046 acres
Fuel Break (Summit Trail)	309 acres
Total	15,717 acres
Timber Volume Removed	
Sawtimber (MMBF)	1.65
Sawtimber (CCF)	3,300
Transportation System (miles)	
Open System Road	49.67 miles
* Closed System Roads to be opened	3.96 miles
Temporary Roads (decommissioned roads to be open)	3.61 miles
Temporary Roads (new for access)	2.09 miles
Closed/Temporay Road Total	9.66 miles
*Closed system roads will be opened during harvest activities and re-closed after these activities are complete.	

Project Design Criteria and Mitigations

Except where noted, the following design criteria and mitigations apply to all action alternatives.

Silvicultural Treatments

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 noncommercial thinning are 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 and reduce susceptibility to disturbance agents (insects, disease, 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, trees between 8 and 20.9 inches dbh. Most 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 generally would be thinned from below to recommended stocking levels based on site productivity. Old/mature ponderosa pine cohorts, regardless of size, would be retained. Merchantable trees up to 20.9" inches dbh removed in commercial thinning would be sold and removed from the stand. Treatment would create immediate structure and species composition shifts to larger structures and generally earlier seral conditions because some treated stands will no longer be dominated by a dense understory and trees removed will tend to be mid and late seral species. Species diversity will be retained if it was present already but the proportion of early seral species would increase. Stands would retain some irregular or uneven-aged structure and age distribution. Existing large trees will become more vigorous due to reduced competition and the increased growth rates in younger, smaller trees will eventually augment the number of large trees to help increase the amount of late and old structure. Post harvest residual basal area per acre would be approximately 30 to 50 square feet on drier sites (pine and Douglas-fir) and 50 to 70 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. The 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). These recommended levels are referred to as the "management zone" and upper and lower density levels are defined for them. Stand densities above the upper level are susceptible to mortality related to competitive stress such as insects and diseases. Stand densities below the lower level are not utilizing a substantial portion of the site resources and the site is not considered to be fully occupied. As average tree size increases the upper and lower limits of the management also increase.

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 "a" stocking conditions. Most

stands selected also contain varying amounts of large structure ranging from scattered groups to individual trees that were left during previous harvest or have grown to large size since harvest occurred.

Noncommercial (precommercial) thinning: The objective of this treatment is to reduce the amount of small nonmerchantable trees (generally less than 9" dbh). The number of small trees to be left varies by stand depending on the overall stocking objectives and the amount of existing overstory. Where the objective in the stand is to have single-storied LOS 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 precommercial thinning could retain 135 or more small trees per acre. Species selection is usually performed to retain ponderosa pine and western larch or to remove species infected with or susceptible to insects/disease. Precommercial thinning can occur either following a commercial entry or as the only treatment. Trees cut during this activity may be removed as biomass or left on site and the slash treated by a variety of fuels treatments.

Hardwood treatments: This activity is prescribed to reduce conifer competition in hardwood stands (aspen, cottonwood, alder, and various willow species) by cutting down and/or girdling conifers that have encroached into these areas. Commercial harvest would not occur in these stands. In general, conifers up to 15 inches dbh would be cut. Most, if not all, conifers within 50 feet of a hardwood would be cut down and left in place, or girdled and left standing. Slash generated from these activities would be lopped or hand piled. The slash would not be burned. To prevent browsing, fencing and/or individual tree cages may be installed. Two types of fencing may be used. In some stands, livestock fencing would be installed; livestock fencing is four-strand barbed or smooth wire approximately 4 feet in height. In some stands, buck and pole fences may be installed to discourage livestock; buck and pole fences will be created from slash. In other stands, big game fencing would be installed; big game fencing is smooth wire or plastic netting approximately 7 feet in height. Individual tree cages are constructed of hard wire mesh 2 to 4 feet in diameter and 3 to 4 feet in height. Cages are placed to protect individual or clumps of sprouts. Planting of hardwoods will occur in some units to increase hardwood density. Planted hardwoods would be caged or fenced to provide protection from browsing. Effects of the hardwood treatments have not been included in the Viable Ecosystem analysis as the scale of the treatments is too small to have any measurable effect on the landscape projections.

When hardwoods are encountered within commercial harvest or noncommercial thinning units the prescription will be modified to favor hardwoods as described above. For example, hardwoods are known to occur in units 1, 2, 10, 51, and 347.

Juniper cutting: This treatment is proposed within the juniper woodland and steppe plant associations to reduce juniper density. Junipers up to 20.9 inches dbh would be cut using hand tools and the slash lopped into smaller pieces. Juniper cutting would be followed by burning of slash concentrations. Burning would only occur in patches or on the edges of units as there will not be a continuous fuel bed. Effects of treatment on the juniper woodland and steppe plant associations have not been incorporated into the Viable Ecosystem analysis as this model was developed to predict changes on more productive sites. The effect will be to increase the abundance of the grass/forb/shrub stage which is currently deficient while retaining existing large juniper tree structure.

Activities in RHCAs

Silvicultural Activities

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

Table 2-7. Category I and II RHCA Design Elements

Distance From Channel (Feet)	Treatment
0 – 5	No Treatment
6 – 12	Hand cutting of conifers 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
28 - 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 60 sq. ft. basal area per acre. The upper limit of the management zone based on plant association (Powell, 1999).
100+	Equipment allowed only on existing roads, trails and landings. Reduce density to be within the management zone based on plant association (Powell, 1999).

- An exception would be made in Unit 28, which is south of Bellworm Creek (a Class III stream buffered by a Category II RHCA). In this unit the harvest would extend to an existing road that is in the RHCA. Harvest above the road would reduce density to be within the management zone. Bellworm Creek has abundant hardwood vegetation in this area and shade to the stream should not be affected.

Table 2-8. Category III and IV RHCA Design Elements

Distance From Channel/Feature (Feet)	Treatment
0 – 5	No Treatment
5 – 50	No ground based equipment allowed except on existing roads or crossings. Category III RHCA - reduce density to 60 – 80 sq. ft. basal area per acre. Category IV RHCA - reduce density to the upper limit of the management zone based on plant association (Powell, 1999).

- Live trees 21 inches DBH or larger will not be cut in any prescription except when necessary to provide safe working conditions. Hazardous dead trees cut down that are in Riparian Habitat Conservation Areas will be left on site, except in unit 46 which is the Rager Ranger Station Administrative site.
- No whole-tree yarding in RHCAs. Exceptions may be possible after review by Fishery Biologist and/or Hydrologist. Example area that may be under exception is Unit 3 that has RHCA on the uphill side of a main FS road ~250 feet from Class 1 stream; risk of impacting stream conditions would be negligible in this area.
- Do not mark trees on slopes greater than 35%.
- Flag existing skid trails 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 ephemeral draws and swales.
- Pull back/flatten out berms to reestablish drainage and reseed disturbed skid trails.
- Commercial and noncommercial thinning in RHCAs will 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, 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. Increase shade provided by hardwood species where possible.
5. Maintain bank stability provided by conifer and hardwood roots.

- Activities requiring work in the stream such as replacing stream crossings, 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 Upper Beaver project area, the in-water work time is July 1 through October 31.

Prescribed Fire Activities

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

- Burn plans (unit-specific prescriptions) will be developed as an on-the-ground, interdisciplinary process; team should include (at a minimum) a fuels specialist, a fisheries biologist, a hydrologist, and a wildlife biologist.
- Burn plans will incorporate the following guidelines:
    - Generally in RHCAs, there will be no intentional ignition within 100' of stream channels. Fire will 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 will be constructed within RHCAs.
        - Fireline construction will require consultation with USFWS/NOAA wherever it is not consistent with the Programmatic BA.
        - Fireline will be dug by hand or with a garden plow pulled by a four-wheeler or a small rubber-tired farm tractor.
        - Fireline will be a fuel break to mineral soil, 12-24 inches wide.

- To prevent soil erosion into streams, fireline in RHCAs will not be constructed within 25' of streambanks.
- To avoid sediment flow down the fireline, the end of the line will fishhook away from the stream channel and stop on the contour.
- Fireline will be rehabilitated following completion of activities; waterbars will be constructed on hand line, and sod will be replaced on plow line.

- Sensitive areas within each RHCA will be identified and site-specific plans to protect each area during burn operations will be developed; site-specific plans will become part of each burn plan, and will 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 will be conducted whenever site-specific plans are implemented.

Wildlife

Goshawk

- A nest core area and post fledging area have been established within each known goshawk territory. No commercial harvest activities will occur within nest core areas. Although, management activities, including precommercial thinning and underburning will occur in both nest core areas and post fledging areas.
- All Prescriptions within nest core and post fledging areas will retain large diameter trees.
- Commercial harvest prescriptions within PFAs will be developed to leave variable tree densities throughout selected units. (Unit 16, 19)
- Precommercial thinning will leave 15% of the treatment area in un-thinned patches unevenly distributed.

Nest Core

- Unit 17 – Precommercial thinning will be hand piled/seasonal restriction.
- Unit 266- Precommercial thinning will be pulled back from large diameter trees within nest core (where necessary)seasonal restriction..
- Unit 354- Precommercial thinning will be pulled back from large diameter trees within nest core (where necessary)/seasonal restriction.
- Unit 76, 79 – Underburn portion within nest core area will be evaluated prior to burning.
- There would be a seasonal restriction (March 1 to August 31) on commercial harvest, precommercial 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 thatbreeding is not active.
- **Seasonal Restriction (March 1 – August 31):** Units 17, 266, 354, 76, 79, 154, 271, 243, 266, 267, 312, 109, 146, 82, 76, 77, 78, 79, 21, 122, 241, 314.

- Combined treatment activities, including commercial thinning, precommercial thinning, and prescribed burning will be limited to 50% of the PFA within a three year time period.
- A seasonal restriction (March 1 to August 31) would also apply (within 0.25 mile of nests) to new road construction on roads. **(Will not affect proposed activities)**
- 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. **(Will not affect proposed activities).**

Bald Eagle, Golden Eagle and Osprey Nests

- Activities would be restricted within 0.5 mile from March 1 to August 15 for golden eagles. **(No known golden eagle nests).**
- Activities would be restricted within 0.25 mile (0.5 mile line of sight, 1 mile for blasting) from **January 1 to August 31** for bald eagles.
- **Seasonal Restrictions (January 1 to August 31):** Units – 31 and 32
- Harvest activities will be designed to avoid large diameter snags in Units 31 and 32.
- Excessive fuel accumulations around the base of large diameter dead or live trees will be reduced prior to burning activities in Units 31 and 32.

Bald Eagle (Winter Roost)

- Activities would be restricted within .25mi. of winter roosting areas from November 1 to April 30.
- **Seasonal Restrictions (November 1 to April 30):** Units – 1, 2, 33, 35, 304, 316, 317. Seasonal restrictions may be waived if no roosting activity is occurring.
- Prescriptions will follow recommendations within the Sugar Creek Winter Roost Management Plan (1991), unless a changed condition is documented.

Other Raptors

- No management activities (including underburning) would occur within 330 feet of nest site (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.

Deer and Elk

- Seasonal restriction on harvest, thinning, fuels and related activities will be implemented between December 1 and May 1 in General Forest Winter Range and in Winter Range allocations.
- Within winter range, road construction, reconstruction and inactivation will be restricted between December 1 and May 1 of each year.
- Within General Forest, road work will not be restricted except on roads that are accessed through winter range on roads that are not designated open during the seasonal closure.
- **Seasonal restrictions (December 1 – May 1):**

- Winter Range: Unit – 75, 76, 61, 309, 143, 307, 99, 140, 139, 100, 135, 159, 157, 158, 134, 102, 334, 331, 333, 332, 335, 336, 306, 308, 347, 289, 133, 53,52,69
- General Forest Winter Range: Unit – 24, 234, 25, 27, 28, 46, 30, 44, 39, 40, 41, 10, 38, 315, 9, 42, 33, 1, 31, 32, 35, 36, 303, 2, 3, 8, 237,29, 310, 25, 238, 236, 70, 71, 69, 311, 240, 250, 245, 299, 248, 249, 298, 351, 247, 250, 295, 296, 354, 314, 294, 118, 256, 264, 320, 321, 37, 4, 319, 317, 300, 301, 302, 304, 33, 318, 4, 337, 335, 338, 340, 324, 330, 326, 341, 68, 15, 152, 151, 26, 45, 290, 145, 72, 342, 343, 120, 344, 122, 121, 345, 114, 113, 82, 117, 119, 91, 81, 84, 86, 349, 33. 348, 108

- Activities within elk calving areas will be seasonally restricted from May 15 to June 30. (No specific elk calving areas have been identified)

Snags/Down Logs

- Snags that pose a safety hazard will be felled.
- Harvest activities would not remove existing down logs. Fuel reduction activities will be designed to minimize loss of large down wood. This includes no direct ignition of large down wood, briefing of burn crews to emphasize burn objectives, and burning under conditions which make large fuels unavailable for consumption. 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 will be designed to minimize impacts to mid and overstory cover, snags and large down wood. These activities will be coordinated with the wildlife biologist.

Aspen

- Burning activities within Aspen will be coordinated with wildlife biologist prior to burning.

Precommercial Thinning

- Precommercial thinning will leave 15% of the treatment area in un-thinned patches unevenly distributed

Sensitive Plants

Adhere to management requirements in Conservation Strategy for the longbeard mariposa lily, particularly requirement #1 and #5 which are restated here:

- #1 - In all projects including or adjacent to populations of *Calochortus longebarbatus* var. *peckii*, take measures to reduce risk of introduction or spread of non-native invasive plants. Preventative measures should include insuring use of weed-free off-road equipment, consulting current weed maps to avoid or minimize entry to weed sites and treatment of weed sites within or immediately adjacent to project areas prior to initiation of project.
- #5 - Tree-cutting operations, including commercial logging, pre-commercial thinning and firewood cutting near occurrences of *Calochortus longebarbatus* var. *peckii* should observe the following measures: no machinery crossing within 100 feet of the population boundaries; establishment of no-treatment buffers within 50 feet of population boundaries; no new roads within 100 feet of population boundaries. These measures should preclude any skidding, yarding, decking or slash piling on known populations.

Tree-cutting or other vegetation management operations conducted over frozen ground or snow are permitted. **Tree-cutting or other vegetation management operations identified by botany staff as expected to improve *Calochortus longebarbatus* var. *peckii* habitat are also permitted.**

- Note management considerations in Conservation Assessment for Henderson's needlegrass, particularly consideration #2: Develop and implement a plan for weed prevention and treatment within occupied scab lands. Such a plan should exclude non-emergency vehicular traffic through occupied habitat, and restrict weed-promoting, ground-disturbing activities such as temporary road construction, fire-line construction, and placement of landings, slash piles and fence lines.
- Adhere to Ochoco NF Land and Resource Management Plan direction (USFS - USDA Forest Service, 1989, pp. 4-209, 4-227) that, ordinarily, landings, skid trails, temporary or short-term roads or trails will not be constructed on scablands
- Do not underburn meadow associated with mapped *Botrychium crenulatum* site (#200092) in Activity Unit #162 (see TES layer in project GIS folder).
- Complete the project during periods when the soils are completely dry or are frozen.
- Limit the amount of new disturbance as much as possible. Keep equipment on existing skid trails, and re-use old landings areas. Provide for on-site review of unanticipated disturbances by district botanist or weed coordinator when TES or invasive plant issues are likely to exist.
- Follow the noxious weed prevention measures included among the Invasive Plant Species Design Elements. Noxious weed introduction and spread can be a threat to Sensitive plants and their habitat.

Invasive Plants

Required by Forest Plan Standards:

- Actions conducted or authorized by written permit by the Forest Service that will operate outside the limits of the road prism (including public works and ser ice contracts), require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands.
- Use weed-free straw and mulch for all projects, conducted or authorized by the Forest Service, on National Forest System Lands. If State certified straw and/or mulch is not available, individual Forests should require sources certified to he weed-free using the North American Weed Free Forage Program standards or a similar certification process.
- Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material.
- Use only gravel, fill, sand, and rock that is judged to he weed free by District or Forest weed specialists.
- Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with District or Forest-level invasive plant specialists, incorporate invasive plant prevention practices as appropriate.

Prevention Guidelines: The following prevention guidelines are largely taken from the Deschutes and Ochoco National Forests and Crooked River National Grassland Invasive Plant Prevention Practices guide (2006).

- Minimize soil disturbance and conserve existing topsoil (A and B soil horizons) for replacement whenever possible in situations where ground-disturbing activities are unavoidable.
- Avoid weed-infested areas for skid trails, landings, camps, helispots and staging or parking areas; consult District Weed Specialist to locate areas if needed.
- Relating to a general practice of reducing disturbance of soil, duff and existing native vegetation, that favors the introduction and/or spread of invasive plants, attempt to limit the incursion of underburns in forested areas into the transitional zones between forest and adjacent scablands.
- Reduce disturbance when doing road maintenance. Limit the amount of ditch pulling only to the amount necessary to assure proper drainage. Limit blading to running surfaces and the minimum necessary on road shoulders.
- Maintain desirable roadside vegetation, if desirable vegetation is removed during blading or other ground disturbing activities revegetate the area.
- Minimize skid trails and the number and size of landings.
- Project or contract maps will show known invasive plant infestations as a means to aiding avoidance or monitoring.
- Conduct post-project monitoring for noxious weed for all activities that have the potential to introduce or spread invasive plants on Forest Service Lands, including but not limited to activities such as prescribed burning, timber harvest, road maintenance, and stream restoration projects.
- Incorporate timber sale provisions C(T)6.6# (weed free seed) and B(T)6.35 (Equipment Cleaning)in all timber sale contracts. C(T)5. I 2# (Use of Roads by Purchaser), B(T)5.3 (Road Maintenance) and C(T)6.3 I (Sale Operation Schedule) will be used as necessary to keep contract vehicles out of high-risk infestations during peak weed seed dispersal periods. These types of requirements will also be incorporated in Federal Acquisition Regulation (FAR) contracts in Section H — Special Contract Requirements as deemed necessary.

Range

- Prescribed activities (such as harvest, thinning, and prescribed fire) will not damage or negatively impact existing range improvements (ie. fences, spring developments, ponds, etc.) or if unable to avoid damage/negative impacts, activity operators will repair/replace impacted improvements. Cattleguards filled in by prescribed activities will 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.
- Prescribed activities will be designed to not negatively influence livestock management on the allotment; the following activities will not occur:
    - Leaving gates open while cattle are in the vicinity of activities.
    - Cutting fences to do activities where cattle are not going to be in the area, coordinate with range specialist prior to cutting fences if during grazing season.
    - Impeding cattle movement by falling trees over cattle trails or piling brush on cattle trails.
- If barriers other than fence such as placing trees or brush could be placed to discourage livestock use on riparian species such barriers will be considered. Consult with range

specialist to design barriers to livestock movement such as strategic falling of trees or brush fence placement.

- 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 implemented. 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.
- Exclosure fencing will be planned with range management specialists and permitees prior to implementation. Alternate water developments will be provided if significant stock water sources are fenced off.
- Exclosure fence maintenance will 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 will have a removal plan for once riparian objectives have been met in place prior to implementation. The removal plan will be designed by the team lead for any riparian species planting efforts with consultation from the range specialist and other interested biologists.

Summit National Historic Road Corridor

- Unit 58: Tractor Harvest Unit: follow guidelines for Partial Foreground Retention
- Unit 59: Tractor Harvest Unit: follow guidelines for Partial Foreground Retention.
- Unit 61: Tractor Harvest Unit: no Ochoco NF LRMP guidelines are in place for this piece of land. In this case, follow guidelines for Cultural Resource Objectives/Low Value as outlined in the Summit Road Management Plan:
    - retain location of trail
    - preserve any remaining physical evidence
- Unit 67: Precommercial-thinning unit: follow guidelines for Partial Foreground Retention.

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.

Based on public comment, a “no commercial harvest” or “restoration only” alternative was considered for the Upper Beaver Vegetation Management project. A “no commercial harvest” alternative would remove trees up to 9 inches in diameter and would not construct any new roads. Such an alternative has been considered during several previous environmental analyses 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. This alternative also would do little to increase 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 and would not meet the Purpose and Need of the project.

Treatment Timing (All Action Alternatives)

The NFMA generally prohibits the harvest of stands before they reach their maximum growth rate [16 U.S.C. 1604(m)]. Exceptions in this law allow the harvest of individual trees, or even parts or whole stands of trees, before this time to thin and improve timber stands and salvage damaged stands of trees [16 U.S.C. 1604(m1)]. Further exceptions are allowed in order to achieve multiple-use objectives other than timber harvest [16 U.S.C. 1604(m2)].

Alternatives 2 and 3 would harvest some stands before their maximum potential growth rate has been reached. These harvest treatments are consistent with the exceptions provided in 16 U.S.C. 1604(m2), and include the following:

- Precommercial thinning
- Commercial thinning
- Fuel break construction
- Fuel treatments.

These treatments are proposed to meet the Forest Plan multiple-use objectives stated in Chapter 1.

Comparison of Alternatives

This section presents a brief comparison of the four alternatives analyzed in detail in this EIS. A comparative overview of proposed activities is provided in Table 2-9. Alternatives are compared in Table 2-10 in terms of effects on the key issues and analysis issues described in Chapter 1. Environmental consequences are described further in Chapter 3 of this EIS and also in the resource specialists' reports held in the project file.

Table 2-9. Comparison of Alternatives 1, 2, and 3 of the Upper Beaver project.

Treatment (acres)	**1**	**2**	**3**
Fuels & Vegetation Treatment (acres)			
Commercial Thinning	0	2,674	2,205
Precommercial Thinning	0	6,727	6,867
Juniper Thin and Underburn	0	2,299	2,279
Hardwood Treatments	0	61	27
TOTAL	0	11,761	11,378
Fuels & Vegetation Treatment (acres)			
Prescribed Fire	0	4,233	3,942
Activity Fuels Treatments	0	8,714	8,518
Grapple Piling	0	2,045	1,902
Wolf Ridge Natural Fuels Treatment	0	1,046	1,046
Summit Trail Shaded Fuel Break	0	309	309
TOTAL	0	16,347	15,717
Volume Removed			
Sawtimber (MMBF)	0	2.0	1.65
Sawtimber (CCF)	0	4,000	3,300
Transportation System (miles)			
Temporary road construction	0	2.78	2.09
Closed roads opened (reclosed following implementation)	0	6.16	3.96
Decommissioned roads opened	0	3.61	3.61
TOTAL	0	12.55	9.66

Table 2-10. Response to the Key Issue and analysis points by alternative.

Analysis Point	**Alternative 1. No Action**	**Alternative 2. Proposed Action**	**Alternative 3**
Key Issue: Proposed treatments in RCHAs	0 acres	Prescribes commercial harvest and associated treatments on 220 acres, additional noncommercial thinning and fuels treatment on 1,037 acres.	Prescribes commercial harvest and associated treatments on 14 acres, additional noncommercial thinning and fuels treatment on 990 acres.
Departure from historic range of variation	Departure from HRV increases.	Departure from HRV decreases.	Departure from HRV decreases at lower rate than alternative 2.

Analysis Point	Alternative 1. No Action	Alternative 2. Proposed Action	Alternative 3
Restoration of LOS (% of PAG): DGF PAG, min. HRV 26%, 4% exist. DF PAG, min. HRV 44%, 6% exist. PP PAG, min HRV 44%, 2% exist.	In 20 years, amount of LOS compared to HRV DGF PAG, 23% DF PAG, 18% PP PAG, 5% Increased risk of mortality not included	In 20 years, % increase over alternative 1 DGF PAG, increases 23% DF PAG, increases 33% PP PAG, increases 16% Lowered risk of mortality	In 20 years, % increase over alternative 1 DGF PAG, increases 21% DF PAG, increases 33% PP PAG, increases 16% Lowered risk of mortality
Treatment in LOS stands	No treatments in LOS.	Precommercial thinning and underburning on 941 acres.	Precommercial thinning and underburning on 810 acres.
Risk of mortality due to insect and disease	No treatment proposed. There are 5,426 acres at high risk to disease and insects.	Harvest and precommercial thinning would reduce acres of high risk to disease and insects to approximately 4,454 acres.	Harvest and precommercial thinning would reduce acres of high risk to disease and insects to approximately 4,630 acres.
Harvest in connective corridors	0 acres	155 acres harvest.	65 acres harvest.
Hardwoods treatments	No hardwoods treatment proposed. Some aspen stands would continue to decline as conifer encroachment continues.	Treatment on 61 acres of hardwoods. Objective is to reduce conifer competition in hardwood stands (aspen, cottonwood, alder, and various willow species).	Treatment on 27 acres of hardwoods. Objective is to reduce conifer competition in hardwood stands (aspen, cottonwood, alder, and various willow species).
Temporary road construction/ reopening of closed roads	0 miles	This alternative would construct 2.78 miles of temporary road. Approximately 6.16 miles of closed roads would be reopened (and would be closed again following implementation). Approximately 3.61 miles of road would be decommissioned.	This alternative would construct 2.09 miles of temporary road. Approximately 3.96 miles of closed roads would be reopened (and would be closed again following implementation). Approximately 3.61 miles of road would be decommissioned.
Grass and shrub community restoration	0 acres	Juniper thinning and underburning would occur on 2,299 acres to increase the abundance of the grass/forb/shrub stage while retaining existing large juniper tree structure.	Juniper thinning and underburning would occur on 2,279 acres to increase the abundance of the grass/forb/shrub stage while retaining existing large juniper tree structure.

Analysis Point	Alternative 1. No Action	Alternative 2. Proposed Action	Alternative 3
Fuel reduction	No fuels treatments are proposed. About 5,875 low fire intensity stands would move to mixed or high intensity fire within 5-10 years. 7,936 acres of mixed fire intensity would move to high fire intensity.	Proposed treatments would move 6,859 acres from mixed and high fire intensity to low fire intensity. 3,330 acres of low fire intensity would be maintained.	Proposed treatments would move 5,661 acres from mixed and high fire intensity to low fire intensity. 3,176 acres of low fire intensity would be maintained.
Sensitive plants	No impacts to sensitive plants.	Populations or potential habitat for Silverskin lichen (*Dermatocarpon meiophyllizum*) occurs downstream from six activity units.	Same as Alternative 2.
Noxious weeds	Noxious weeds occur throughout the project area. Treatment strategies will continue.	Most potential to risk to further spread noxious weeds from management activities.	Slightly less potential to risk further spread of noxious weeds than Alternative 2 because 700 less acres would be treated.
Soil disturbance	No ground disturbing activities would occur. Existing detrimental soils would not be further disturbed or tilled.	2,674 acres of commercial harvest and 6,727 acres of precommercial thinning using ground based equipment. An additional 5 acres of detrimental soil disturbance from road construction.	2,205 acres of commercial harvest and 6,867 acres of precommercial thinning using ground based equipment. An additional 4 acres of detrimental soil disturbance from road construction.
Water yield	The EHA values for the no action alternative range from 7.8-12.5 for sixth order watersheds (Beaverdam, Powell, Sugar, Wolf and North Wolf Creek) s and 10.1-12.5 for the fifth order watersheds (Upper and Lower Beaver). These EHA values are below the 25% level and represent a low risk threshold value	All of the EHA values are below the 25 EHA low risk value. The highest EHA values in the fifth order watersheds range from 10.1-15.3. These are found in 2012 after the 3 years of harvest has been completed. The sixth order watersheds also show values below the 25% low risk EHA threshold values. The highest values seen are 2012 for Lower Beaver 10.3 and in 2013 for Upper Beaver 13.6. These low EHA values indicate that there will be low risk to increased stream bank instability and water quality from the management activities proposed.	All of the EHA values are below the 25 EHA low risk threshold value in both the fifth order and sixth order watersheds. The highest EHA values in the fifth order watershed range from 11.6-15.9 while in the sixth order watershed they range from 12.6-13.5. These low EHA values indicate that there will be low risk to stream bank stability and water quality from the management activities proposed.

Analysis Point	Alternative 1. No Action	Alternative 2. Proposed Action	Alternative 3
Temperature	There would be no reduction in shading from this alternative and no increase in temperatures.	There would be about 1,037 acres of precommercial and hardwood thinning and 220 acres of commercial thinning in Class I, II, and III RHCAs. Using the RHCA treatment prescriptions as proposed, the primary shade zone would be unaffected. There is a risk of conifer thinning in aspen stands reducing shade for a short time (up to 6 months). Temperatures should still meet State standards.	There would be about 990 acres of precommercial and hardwood thinning and 14 acres of commercial thinning in Class I, II, and III RHCAs. Using the RHCA treatment prescriptions as proposed, the primary shade zone would be unaffected. There is a risk of conifer thinning in aspen stands reducing shade for a short time (up to 6 months). Temperatures should still meet State standards.
Sediment and turbidity	Sediment and turbidity levels would not change.	A total of 10% of the area will be harvested within the Upper Beaver Planning Area. A total of 8% of the area will be within 400 feet of a stream. A total of 220 acres would be harvested within the RHCAs. The Total Sediment Potential value is 1039 with 36% coming from harvest activities, 43% coming from roads reconstruction and the remaining 21% coming from fuels activities	A total of 8% ground based harvesting will be done within the Upper Beaver planning area. There is 6% of the area within 400 feet of a stream that will be harvest which delivers 90 percent of the sediment. A total of 14 acres of RHCA will be harvested. The total RER value for this alternative is 872 with 33% coming from harvest activities, 43% coming from roads reconstruction and the remaining 24% coming from fuels activities
Sensitive aquatic species habitat	High densities of conifers within the RHCAs would continue to inhibit the growth of deciduous, broadleaf species such as alder, willow, aspen, and cottonwood, resulting in a continuation of the undesirable riparian and depressed habitat features for sensitive aquatic species.	This project would be done at a time of year that would avoid effects to spawning fish, incubating embryos and fry as well as breeding and juvenile frogs. Therefore, survival of fish or Columbia spotted frogs would not be reduced.	Less than alternative 2 because fewer acres would be treated.

Analysis Point	Alternative 1. No Action	Alternative 2. Proposed Action	Alternative 3
Goshawk habitat	Suitability of the existing habitat would change over time, both positively and negatively. Open understory conditions that is preferred by foraging goshawks is expected to decrease over time as trees continue to develop in the understory. This alternative would not result in displacement of goshawk from existing occupied territories.	Alters stand densities on 1,142 acres of currently suitable goshawk habitat within the project area. Stand densities would be reduced on 297 acres within PFAs. Timber harvest within PFAs would be designed to meet silvicultural as well as habitat objectives. The majority of commercial harvest acres within PFAs would currently be considered marginal for nesting because of the lack of large tree structure and locations in relationship to streams.	Alters stand densities on 974 acres of currently suitable goshawk. Treats 168 acres less suitable habitat than in Alternative 2. The majority of the 168 acres would remain susceptible to insects and disease because of the high tree densities that are present. No under burning within the Bear Creek PFA or nest core areas. The Bear Creek PFA would remain susceptible to high intensity wildfires under this alternative.
Pileated woodpecker habitat	Maintains suitability of existing habitat for pileated woodpeckers in the short term. Nesting suitability 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 tree mortality becomes extensive and live canopy closure is lost, affected areas would become less suitable for nesting sites.	Reduces suitability of 161 acres of reproductive habitat across the project area. Retains 982 acres of reproductive habitat. Defers 389 acres in upper Powell Creek from any treatment. Under this alternative pileated reproductive habitat would remain within the historic range.	Reduces 141 acres of suitable reproductive. Retains 1002 acres of suitable reproductive habitat. Defers 389 acres in upper Powell Creek from any treatment. Pileated reproductive habitat would remain within the historic range.
Primary cavity excavator habitat	Maintains existing acres of fir-dominated understories and trends towards fir dominated habitats. This alternative would not accelerate development of habitat for white-headed woodpeckers.	Restores habitat on 1.653 acres, and bring the habitat to within HRV. This alternative would have the greatest potential for creating habitat for the white-headed woodpecker and its habitat associates.	Restores habitat on 1,057 acres, and bring the habitat to within HRV. This alternative would accelerate development of habitat for white-headed woodpeckers.

Analysis Point	Alternative 1. No Action	Alternative 2. Proposed Action	Alternative 3
Elk habitat	No satisfactory cover or marginal cover would be treated and no additional roads closed. There would be no initial change in HEI value in any allocation. Over time HEI is expected to increase in all management areas.	This alternative would reduce thermal cover, although the percentage of cover reduced is small and will likely have limited impacts on the overall quality of habitat within the project area. Road densities, which can have a high impact on the quality of elk habitat would not change. Current road densities are within goals established within the forest plan. Forage conditions would improve.	The effects of alternative 3 are similar to alternative 2, but there would be less acres of thermal cover treated and less temp roads constructed. Activity associated with temp road construction and harvest activities is expected to have a short term effect on the distribution of elk within the project, although all temp roads would be closed following harvest activities. The quality of forage would improve.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

This section provides the scientific and analytical basis for alternative comparison. This section describes the beneficial or adverse impacts to the environment that would occur if the various alternatives were implemented. Probable effects are discussed in terms of environmental changes from the current condition and include qualitative as well as quantitative assessments of direct, indirect, and cumulative effects.

Effects (or impacts) are defined as follows:

Direct effects: Those that occur at the same time and in the same general location as the activity causing the effects.

Indirect effects: Those that occur at a different time or different location than the activity to which the effects are related.

Cumulative effects: – Those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Unless otherwise noted, the boundary for the area for cumulative effects for all resources is generally the planning area boundary. Depending on the resource area, there may be multiple analysis area boundaries of differing sizes and include areas within and outside of the planning area boundaries.

The information contained in this section regarding the effects of the proposed actions under each alternative is summarized from the following specialist reports: Wildlife (including Threatened, Endangered, and Sensitive species), Range, Recreation, Silviculture, Fire and Fuels, Heritage Resources, Soils, Botany including noxious weeds. Additional and more detailed information regarding the existing condition and supporting documentation can be found in those reports or the project file at the Paulina Ranger District office. All quantities, including but not limited to acreages, distances, and volumes, are approximate.

This chapter summarizes the physical, biological, social, and economic environments of the project area and the anticipated effects of implementing each alternative on that environment.

"Existing Condition" refers to the existing biological, physical and social conditions of an area that are subject to change directly, indirectly, or cumulatively as a result of a proposed human action. Information on the existing condition is found in each resource section under "Existing Condition."

The following discussion of effects follows CEQ guidance for scope (40 CFR 1508.25(c)) by categorizing them as direct, indirect, and cumulative. The focus is on cause and consequences. Effects exist in a chain of consequences and thus may be labeled "indirect" (occurring later in time or farther in distance, 40 CFR 1508.8(b)), rather than cumulative. For this analysis, in general, direct and indirect effects have been discussed in the context that most readers are accustomed to: those consequences which are caused by the action and either occur at the same time and place, or are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR 1508.8). Cumulative effects are discussed where there is an Effect to the environment, which results from the incremental effect of the action when added to other past, present, or reasonably foreseeable future actions (40 CFR 1508.7).

There are basically 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 may 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 will be formulated to provide the most relevant, useful, helpful, necessary and informative format for the public and deciding official.

Measures to mitigate or reduce adverse effects caused by the implementation of any of the actions proposed are addressed in Chapter 2, Mitigation Measures. Effective mitigation avoids, minimizes, rectifies, reduces, or compensates for potential effects of actions.

The temporal and spatial scale of the analysis is variable depending upon the resource concern being evaluated, particularly for cumulative effects. The landscape within the Upper Beaver project area boundary is the focus of this EIS, but adjacent lands are considered in this analysis process. Neither of the two action alternatives is related to any other actions with cumulatively significant impacts; neither is a component part of any larger action.

Forested Vegetation

This section discusses the existing condition of forest vegetation and the anticipated effects of implementing the alternatives analyzed in the Upper Beaver Creek Project Area. Background information can be found in the Ecosystem Analysis of the Upper Beaver Creek Watershed (2004).

Introduction

Plant Association Groups

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 Clausnitzer1992). The mapping was based on 1:12000 aerial photography and intensive fieldwork.

The forested vegetation in the project area has been characterized using plant association groups (PAGs), which contain plant associations of similar biophysical environments, productivity, and disturbance regimes. The Ochoco National Forest has defined eight PAGs for upland forest, woodland, and steppe sites. Seven PAGs occur within the project area (see Figure 3-1). Acre totals for each PAG are somewhat different in this analysis than those disclosed in the Upper Beaver Creek WA, most likely due to differences in satellite data interpretation and GIS mapping. Table 3-1 summarizes acres of each PAG in the Upper Beaver project area.

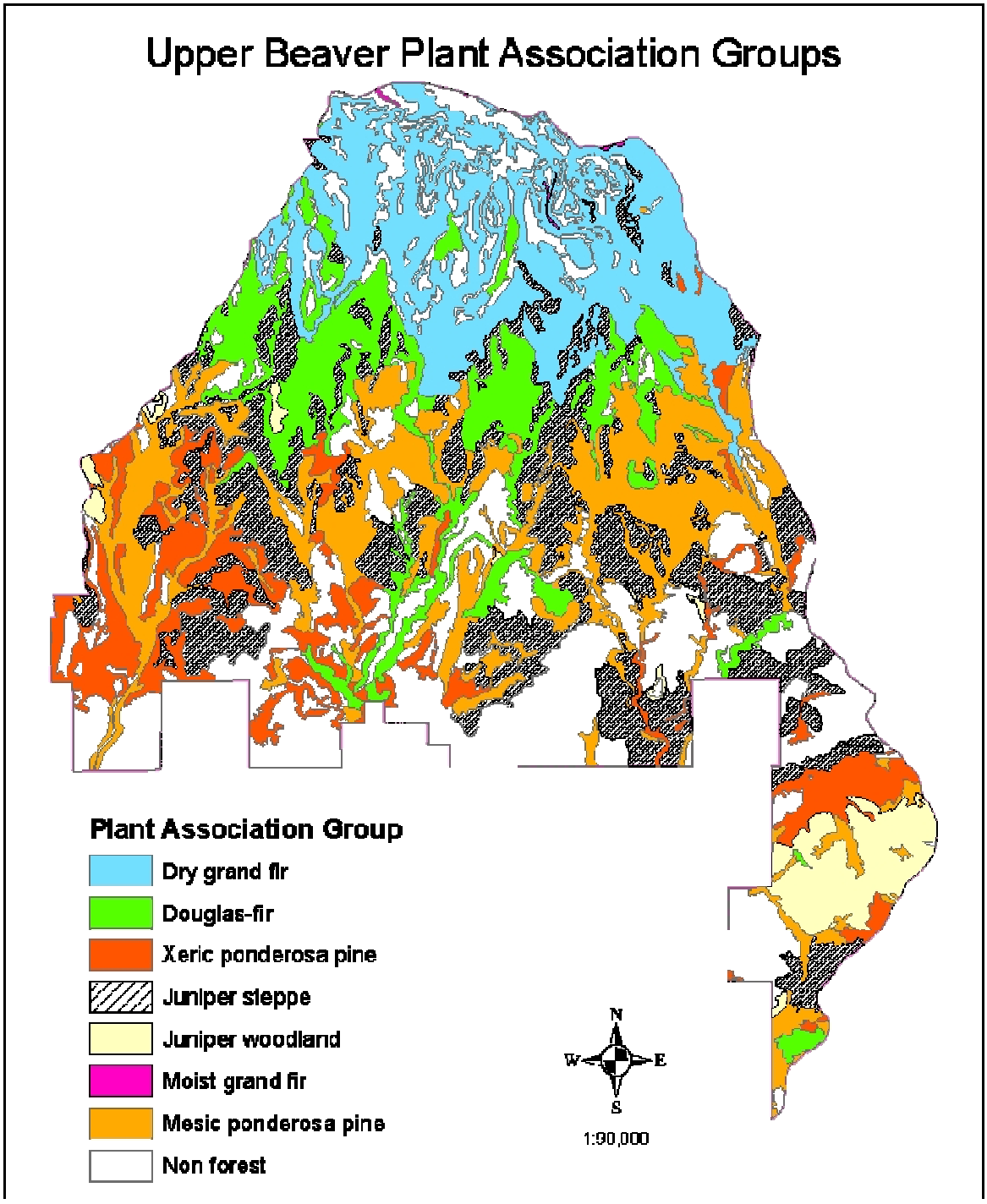


Figure 3-1. Upper Beaver Plant Association Groups.

Table 3-1. Acres by Plant Association Group for the Upper Beaver Planning Area.

Plant Association Group	Acres*
Moist Grand fir	24
Dry Grand fir	5,542
Douglas-fir	3,923
Mesic Ponderosa Pine	6,126
Xeric Ponderosa Pine	3,421
Western Juniper Woodland	1,349
Western Juniper Steppe	6,353
Total	**26,738**

* PAG acres have been updated and vary from those listed in the Watershed Analysis. Non-forest acres are not shown.

Viable Ecosystem Seral/Structural Matrix

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). 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. Thus, the matrix can accommodate up to 25 cells, each representing a different seral (E, M, L), size/structural (1-5), and density (a, b) condition. An example matrix is shown in Table 3-2.

Table 3-2. 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), high density	E2a	M2a	L2a
Seedling/sapling, low density	E3b	M3b	L3b
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 that may exist within each matrix cell, as well as descriptions of predominant natural processes such as insects, diseases and wildfire. The seral/structural matrix is applied to each PAG for analysis of existing condition and allows for comparison to 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 in growth and expanded conifer dominance on sites identified as grass, shrub and forb (E1). They would also include mortality due to insects and disease, resulting in an increase in the E1

condition. The amount of change since 2004 is judged to be so small that its affect would not meaningfully alter this analysis.

The effects of past timber sales are included in the analysis of the existing condition. Past sales within the project area include a variety of harvest prescriptions. Records from the Paulina Ranger District indicate the following amount of past harvest treatments within the area since 1985:

- Regeneration Harvest Total – 639 acres
- Clearcut/Clearcut with Reserve Trees – 414 acres
- Shelterwood – 225 acres
- Overstory Removal – 3,176 acres.
- Partial Removal Cutting (thinning, selection cutting) – 2,727

These sales include Dusty Well, Sugar, Hat Springs, Hog Wallow, Willow, Butte, Tower, Robin, TNT, and Aqua.

Additional harvest prior to 1985 is known to have occurred in the area, but details are not recorded in the district GIS records. Historical records indicate that harvest was likely occurring within the planning area as early as 1950 and covered much of the forested lands within the planning area. This older harvest was primarily focused on individual tree harvest, often removing large high value trees which were deemed at risk to insect mortality. Older sales noted in district records include Buckhorn (1982 – 1983), Powell Creek (1972), and Snow Course (1976 – 1977).

In 2002 the 747 Fire burned approximately 89 acres within the planning area. The majority of the area burned at a low intensity with little effect on tree species and structure.

Two timber sales, Sugar Creek and Runway, have occurred since 2004. These two sales included approximately 90 acres of commercial thinning in stands of primarily young ponderosa pine. These sales reduced stand density (moved stands from ‘a’ to ‘b’) but did not change overall species composition or structure class.

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

Projection of Future Vegetative Conditions

Seral 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 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 influence the model predictions.

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 percent 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 15-25% depending on stand density and little gains were realized when canopy closure was not reduced below 50 to 60 percent.

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 development over time. The projections do not include future disturbance events such as widespread insect and disease occurrences, fire, or management activities other than continued fire suppression.

Assumptions Common to all Action Alternatives

The analysis of effects to forested vegetation is based upon the following assumptions, which are derived from scientific literature.

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, and decreases potential fire severity and size (Peterson et al. 2005).

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).

Some literature indicates that commercial thinning, especially in the absence of post-harvest fuels treatments, is not effective in reducing the risk of large-scale wildfire. It should be noted that commercial thinning proposed in the Upper Beaver project is intended to manage density to meet ecological objectives, including improved tree growth and moving stands toward historic composition and structure. Reduced fire risk is not a primary goal of commercial thinning; however, some studies indicate that moderated fire hazard and lower crown fire potential can result from thinning and fuel treatment (Omi and Martinson 2002, Pollet and Omi 2002). All commercial thinning proposed in the Upper Beaver project has associated post-harvest fuels reduction.

Departure from Historic Conditions

The Viable Ecosystem model has been used to characterize the existing landscape and to provide a means of comparison to historical conditions. In general, fire exclusion and past harvest practices have changed forested vegetation across the landscape. Some of the more important departures from the historic condition are listed below:

1. **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. **Large tree component.** Overall, stands dominated by large trees (size class 5) are deficient on the landscape. Many stands that 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. **Stand structure.** Increases in stand densities have created more multi-storied stands than occurred historically. 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 scarce. Multi-story dense stands dominated by large trees are overall within their historic levels of abundance, although many stands that were once dominated by large trees have been replaced by stands in which pole and/or small sized trees are the dominant feature.

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 at a larger scale than typically 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, however, and with careful management can support most historic vegetative conditions.

Current Departure from Historic Range of Variability

The following is a discussion of the current condition of forested vegetation in the Upper Beaver project area in terms of HRV. The total acre departure from HRV has been determined for the existing landscape by calculating the acres outside HRV for each seral/structural stage. For example: the HRV for a particular stage is 20 to 100 acres. There are currently 8 acres existing. The acreage outside HRV is equal to 12 (20 minus 8). Conversely, if there were 185 acres existing, the departure from HRV would be 85 acres (185 – 100). Summing the acres outside HRV for all stages yields the total acre departure for the landscape. Tables 3-3 through 3-8 summarize the historic range of acres of each seral and structure stage, the current acreage of each stage, and the acreage outside of HRV. The moist grand fir PAG is not included because its area within the Upper Beaver project area is small (24 acres, less than one tenth of one percent of the project area), and no activities are proposed that would alter the current condition of these acres.

Dry grand fir PAG

The largest surplus stages within this PAG are those dominated by small-sized trees (E4b, L4b, and E4a), conversely the most deficit stages are those dominated by large-sized trees (E5b, L5a, and M5b). See Table 3-3 and the Silvicultural Specialist's Report (project file, Paulina Ranger District) for more information.

Table 3-3. Existing condition compared to HRV in the Dry Grand Fir PAG in the Upper Beaver project area.

S/S Stage	Low (Acres)	High (Acres)	Existing Condition (Acres)	Acres outside HRV	Existing Condition in Relation to HRV		
					Below	Within	Above
E1	111	389	537	148			X
E2a	0	0	22	22			X
E2b	167	444	249	0		X	
E3a	56	167	11	45	X		
E3b	222	666	145	77	X		
E4a	133	222	392	170			X
E4b	533	888	2452	1564			X
E5a	133	222	100	33	X		
E5b	533	888	96	437	X		
M2a	0	56	33	0		X	
M2b	167	444	67	100	X		
M3a	0	111	37	0		X	
M3b	167	444	185	0		X	
M4a	167	311	130	37	X		
M4b	666	1243	349	317	X		
M5a	111	278	203	0		X	
M5b	444	1110	224	220	X		
L2a	0	111	0	0		X	
L2b	0	0	2	2			X
L3a	0	111	8	0		X	
L3b	0	0	3	3			X
L4a	89	222	22	67	X		
L4b	22	56	230	174			X
L5a	178	355	48	130	X		
L5b	44	89	6	38	X		
TOTALS			5551	3584			

Douglas-fir PAG

Open stands of predominantly large ponderosa pine (E5b) would historically been the most common stage in this PAG. Currently this is the most deficit stage in the PAG, while stages of smaller structure (E4a/b and L4a/b) are over-abundant. See Table 3-4 and the Silvicultural Specialist's Report (project file, Paulina Ranger District) for more information.

Table 3-4. Existing condition compared to HRV in the Douglas-fir PAG in the Upper Beaver project area.

S/S Stage	Low (Acres)	High (Acres)	Existing Condition (Acres)	Acres outside HRV	Existing Condition in Relation to HRV		
					Below	Within	Above
E1	196	786	135	61	X		
E2a	0	0	11	11			X
E2b	0	393	141	0		X	
E3a	0	79	90	11			X
E3b	0	314	13	0		X	
E4a	157	314	489	175			X
E4b	629	1257	1398	141			X

S/S Stage	Low (Acres)	High (Acres)	Existing Condition (Acres)	Acres outside HRV	Existing Condition in Relation to HRV		
					Below	Within	Above
E5a	275	393	74	201	X		
E5b	1100	1572	4	1096	X		
M2a	0	0	0	0		X	
M2b	0	393	5	0		X	
M3a	0	0	100	100			X
M3b	0	196	0	0		X	
M4a	39	157	40	0		X	
M4b	157	629	376	0		X	
M5a	39	118	140	22			X
M5b	157	471	0	157	X		
L2a	0	39	48	9			X
L2b	0	157	10	0		X	
L3a	0	157	26	0		X	
L3b	0	39	9	0		X	
L4a	126	251	361	110			X
L4b	31	63	323	260			X
L5a	126	251	136	0		X	
L5b	31	63	0	31	X		
TOTALS			3929	2385			

Mesic ponderosa pine PAG

By far the most deficit stage in this PAG is open large diameter ponderosa pine (L5b), accounting for 65% of the departure from HRV. Smaller-sized ponderosa pine (L4a/b) is above historic abundance. See Table 3-5 and the Silvicultural Specialist's Report (project file, Paulina Ranger District) for more information.

Table 3-5. Existing condition compared to HRV in the Mesic Ponderosa Pine PAG in the Upper Beaver project area.

S/S Stage	Low (Acres)	High (Acres)	Existing Condition (Acres)	Acres outside HRV	Existing Condition in Relation to HRV		
					Below	Within	Above
E1	308	1540	275	33	X		
E2a	0	0	1	1			X
E2b	0	308	114	0		X	
E3a	0	62	2	0		X	
E3b	0	246	36	0		X	
E4a	0	123	52	0		X	
E4b	0	493	396	0		X	
E5a	0	123	0	0		X	
E5b	0	493	1	0		X	
M2a	0	0	0	0		X	
M2b	0	308	19	0		X	
M3a	0	62	66	0		X	
M3b	0	246	10	0		X	
M4a	0	123	43	0		X	
M4b	0	493	532	39			X

S/S Stage	Low (Acres)	High (Acres)	Existing Condition (Acres)	Acres outside HRV	Existing Condition in Relation to HRV		
					Below	Within	Above
M5a	0	185	66	0		X	
M5b	0	739	0	0		X	
L2a	0	0	80	80			X
L2b	0	616	189	0		X	
L3a	62	185	165	0		X	
L3b	246	739	100	146	X		
L4a	0	246	1247	1001			X
L4b	1232	2217	2540	323			X
L5a	0	246	223	0		X	
L5b	3080	4065	2	3078	X		
TOTALS			6159	4701			

Xeric ponderosa pine PAG

Similar to the mesic ponderosa pine PAG, open large-size ponderosa pine (L5b) is the most deficit stage in this PAG followed by open large pine with a minor component of juniper (M5b). The smaller-sized and more dense condition (L4a) is well above historic abundance accounting for almost half of the departure from HRV. In this PAG there are also deficits of area dominated by open sapling and pole sized ponderosa pine (L2b and L3b). See Table 3-6 and the Silvicultural Specialist's Report (project file, Paulina Ranger District) for more information.

Table 3-6. Existing condition compared to HRV in the Xeric Ponderosa Pine PAG in the Upper Beaver project area.

S/S Stage	Low (Acres)	High (Acres)	Existing Condition (Acres)	Acres outside HRV	Existing Condition in Relation to HRV		
					Below	Within	Above
E1	170	849	186	0		X	
E2a	0	0	9	9			X
E2b	0	170	113	0		X	
E3a	0	17	8	0		X	
E3b	0	153	73	0		X	
E4a	0	34	93	59			X
E4b	170	305	320	15			X
E5a	0	34	1	0		X	
E5b	170	305	3	167	X		
M2a	0	0	2	2			X
M2b	0	170	4	0		X	
M3a	0	17	7	0		X	
M3b	0	153	14	0		X	
M4a	0	68	94	26			X
M4b	170	611	346	0		X	
M5a	0	51	6	0		X	
M5b	170	458	0	170	X		
L2a	0	0	36	36			X
L2b	170	339	45	135	X		
L3a	0	68	87	19			X
L3b	170	611	23	147	X		

L4a	0	119	1400	1281			X
L4b	509	1103	484	25	X		
L5a	0	136	40	0		X	
L5b	509	1222	0	509	X		
TOTALS			3394	2600			

Western juniper woodland and steppe

These PAGs both contain much more area dominated by small-sized juniper (L4a/b) than what occurred historically. The grass/forb/shrub stage (E1) is below HRV in the juniper steppe PAG and in the middle of the range for juniper woodland. Both PAGs are deficient in the amount of open large sized juniper. See Tables 3-7 and 3-8 and the Silvicultural Specialist's Report (project file, Paulina Ranger District) for more information.

Table 3-7. Existing condition compared to HRV in the Western Juniper Woodland PAG in the Upper Beaver project area.

S/S Stage	Low (Acres)	High (Acres)	Existing Condition (Acres)	Acres outside HRV	Existing Condition in Relation to HRV		
					Below	Within	Above
E1	676	946	826	0		X	
L2a	0	0	4	4			X
L2b	68	135	86	0		X	
L3a	0	0	8	8			X
L3b	68	135	20	48	X		
L4a	0	0	110	110			X
L4b	203	406	296	0		X	
L5a	0	0	1	1			X
L5b	68	162	1	67	X		
TOTALS			1352	238			

Table 3-8. Existing condition compared to HRV in the Western Juniper Steppe PAG in the Upper Beaver project area.

S/S Stage	Low (Acres)	High (Acres)	Existing (Acres)	Acres outside HRV	Existing Condition in Relation to HRV		
					Below	Within	Above
E1	3184	4457	2332	852	X		
L2a	0	0	33	33			X
L2b	318	637	376	0		X	
L3a	0	0	56	56			X
L3b	318	637	165	153	X		
L4a	0	0	917	917			X
L4b	955	1910	2453	543			X
L5a	0	0	23	23			X
L5b	318	764	12	306	X		
TOTALS			6367	2883			

Effects

Alternative 1

Currently, there are 16,410 acres of departure from the HRV ranges (Table 3-9). No treatments would occur under this alternative. 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. Many of these conditions are already within or above HRV. Development of large tree character in many stands would be hampered by overstocked conditions. 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.

Dense structural stages, already above historic acreage, 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 decrease.

Alternative 2

This alternative proposes 2,674 acres of commercial thinning and 6,727 acres of precommercial thinning.

Thinning 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). Thinning would result in more large trees being maintained over time, and would 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 in the overstory as well as in the understory, but the density of each species would be reduced.

Alternative 2 would implement thinning activities in single-strata conditions where stocking density is too high. Treatment would target smaller diameter and/or less vigorous trees for removal, while maintaining the generally single strata characteristics. Species selection would favor ponderosa pine where historically it was more abundant. 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 overall departure from historic condition would increase by about 320 acres immediately following project implementation, due to treatments designed to increase the amount of open stands of small (9 to 20.9” dbh) ponderosa pine that can develop into large sized trees. The long-term result would be to increase the acreage of open stands of large sized ponderosa pine, which historically were the most abundant stage within the Upper Beaver project area.

Acreage of dense structural stages would be reduced to within the historic range; Alternative 2 would result in the lowest levels of dense structural stage among all alternatives. By 20 years post-implementation and beyond, and in the absence of any other disturbance, the amount of dense conditions would again exceed the historic level. Acres dominated by grand and Douglas-fir would be reduced the most of any alternative, but would remain within HRV. Acres dominated by ponderosa pine and western larch would be increased by about 500 acres due to treatment, and increase by an additional 250 acres over the next 20 years.

Alternative 3

This alternative proposes 2,205 acres of commercial harvest and 6,867 acres of precommercial thinning.

Treatment generally would 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 above recommended levels. Treatment would target smaller diameter and/or less vigorous trees for removal, while maintaining the generally single strata characteristics. Species selection would also be performed to favor ponderosa pine where it was more abundant historically. 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 overall departure from historic condition would increase by about 380 acres immediately following project implementation. This increase is largely due to treatments designed to increase the amount of open stands of small (9 to 20.9" dbh) ponderosa pine that can develop into large sized trees. Open stands of large sized ponderosa pine historically were the most abundant stage within the Upper Beaver project area.

The amount of dense structural stages would be reduced to within the historic range. After 20 years and beyond, the amount of dense conditions again exceeds the historic level as succession and growth continue in the absence of additional disturbance. Acres dominated by grand and Douglas-fir would be reduced by about 200 acres. Acres dominated by ponderosa pine and western larch would be increased by about 450 acres due to treatment, and increase by an additional 250 acres over the next 20 years.

Tables 3-9 through 3-12 and Figures 3-2 through 3-5 compare the anticipated results of alternatives on a variety of forested vegetation conditions.

Table 3-9. Existing and post-treatment (by alternative) departure from HRV.

	Acres outside HRV
Alternative 1	16,410
Alternative 2	16,735
Alternative 3	16,793
"Acres" refers to the existing condition (alternative 1) and the condition immediately following treatment (alternatives 2 and 3).	

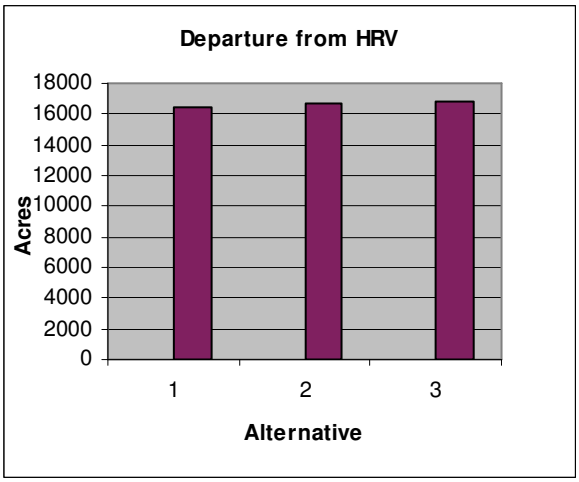


Figure 3-2. Overall departure from Historic Range by alternative.

Table 3-10. Acres of dense structural stages.

	0 years	20 years	30 years	50 years
Alt 1	5,517	9,038	10,362	12,376
Alt 2	4,535	8,015	9,364	10,292
Alt 3	4,712	8,162	9,496	11,580

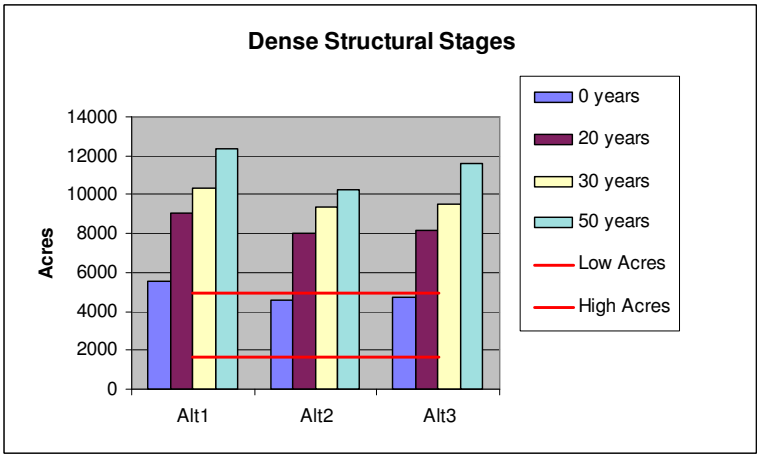


Figure 3-3. Dense Stages by Alternative and Historic Range.

Table 3-11. Acres Dominated by Grand and Douglas-fir.

	0 years	20 years	30 years	50 years
Alt 1	1,227	1,403	1,470	1,625
Alt 2	981	1,146	1,200	1,323
Alt 3	1,019	1,170	1,224	1,348

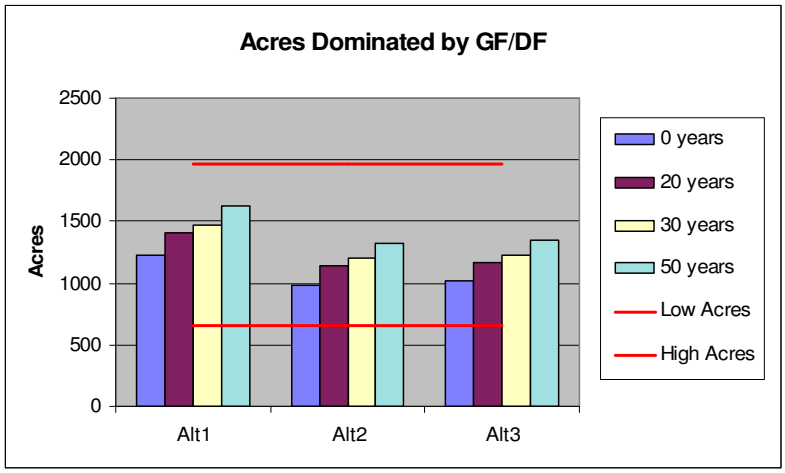


Figure 3-4. Grand and Douglas-fir Dominated Acres by Alternative and Historic Range

Table 3-12. Acres Dominated by Ponderosa Pine and Western Larch

	0 years	20 years	30 years	50 years
Alt 1	12,897	12,607	12,531	12,265
Alt 2	13,393	13,651	13,568	13,273
Alt 3	13,349	13,604	13,519	13,224

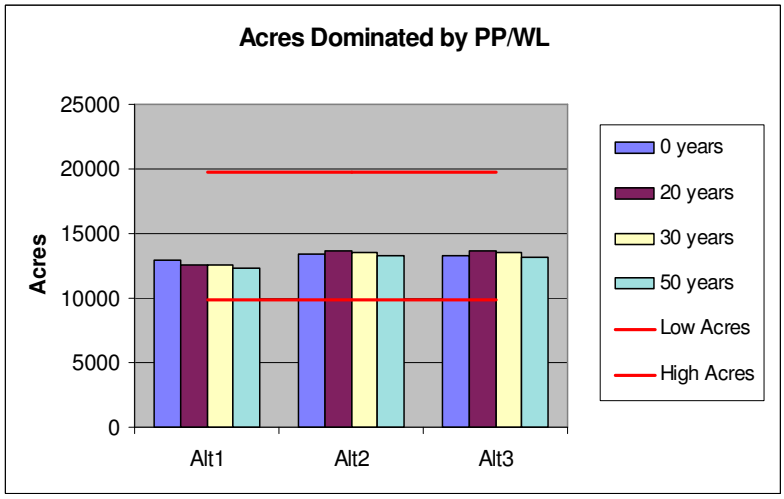


Figure 3-5. Ponderosa Pine/Western Larch Dominated Stages by Alternative and Historic Range

Cumulative Effects

The effects of past harvest and other activities have been included in the description of the existing condition as described previously.

There is one planned timber sale unit, Wheeler Aspen #1, within the project area. This is a 9-acre commercial harvest unit utilizing ground-based equipment to remove conifers <21" dbh from an aspen stand on the upper slope of Wolf Mountain adjacent to road 5840. Harvest is proposed to occur in 2009. Noncommercial thinning of conifers less than 9" dbh would follow harvest along with construction of a fence to protect the aspen from browsing. The unit is within the dry grand

fir PAG, and the conifer component of the stand is composed of grand fir with a mixture of Douglas-fir and a few ponderosa pines. The stand is multi-storied and is within an area mapped as late and old structure (LOS) stand due to the abundance of large trees. The effect of this treatment will be to decrease density, convert portions of the stand from multi- to single-strata, maintain and enhance the existing aspen, and maintain the existing large tree component. This treatment is so small in scale (9 acres within the 5,542 acre of dry grand fir PAG) that its effect is not meaningful from a landscape perspective.

Natural Disturbance Agents – Insects and Disease

Existing Condition

The natural disturbance agents found in the planning area have always been present; however, the degree to which they now affect the area can be considered to be a reflection of the ecosystem's health and resiliency. The major natural disturbance agents of concern are listed below.

Bark Beetles: Aerial insect and disease surveys for years 1996 through 2006 show numerous active mortality centers due to bark beetle feeding. Stand exams and field reconnaissance also identified bark beetle activity and susceptible stand conditions.

Mountain pine beetle (*Dendroctonus ponderosae*) and western pine beetle (*Dendroctonus brevicomis*) occur in the project area. Ponderosa pine is a susceptible host in overstocked stands. Bark beetle mortality is symptomatic of overstocked stand conditions that create competition stress and reduce tree vigor (Schmid 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). Often western pine beetle attacks and kills the larger diameter trees since they have the most suitable habitat for raising broods, especially when stressed due to competition.

Also occurring in the project area are bark beetles such as Douglas-fir beetle (*Dentroctonus 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.

Defoliating Insects: From approximately 1987 to 1992, this area, along with the rest of the Ochoco Mountains, experienced an outbreak of western spruce budworm which caused large amounts of trees damage and/or mortality in nearly all stands in which grand fir and Douglas-fir are major components. Attributes that contribute to high susceptibility to defoliating insects are: 1) increased amount of later seral host species, 2) increased stand densities, and 3) the development of multi-storied stand structures (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.

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*) causes growth loss, reduced wood quality, topkill and mortality.

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 edge 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 infections, dwarf mistletoe moves more quickly into the higher tree crown. Brooming branches contribute to ladder fuels that allow wild fire to reach tree crowns increasing the risk of crown fire initiation.

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 precommercial thinning do, however, reduce stocking and can effectively reduce some growth loss, improve vigor and reduce re-infection (Roth and Barrett 1985).

Root disease: Armillaria root disease and laminated root rot are two diseases of concern within the area. They are most evident within stands of high density and those with a major component of grand and Douglas-fir. Vigorously growing trees can be infected but can often confine the fungi and limit the extent of the infection (Hadfield et al. 1986). The dry grand fir PAG is where the most of the 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 within stand diversity. With the changes over time in species composition, the incidence of and susceptibility to root disease infection is increasing. The tendency, without disturbance, is for infection centers to be repopulated with host tree species and for infections to perpetuate and intensify.

Effects

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 3-13 summarizes stages that are considered to be at high risk to insects and disease:

Table 3-13. High 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 5,400 acres within the project area that are in stages rated as high risk. This is currently above the amount of this condition that existed historically by about 430 acres. 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 by an additional 2,200 acres under this alternative.

Alternative 2

The actions proposed in this alternative reduce the high-risk stages by about 1,000 acres, and bring the amount of area into 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 more than alternative 3. This trend continues through the 50 year projection period.

Alternative 3

The actions proposed in this alternative reduce the high-risk stages by about 800 acres, and bring the amount of area into the range at which it historically occurred. This alternative is predicted to have less risk reduction than alternative 2.

Table 3-14 and Figure 3-6 compare anticipated effects of alternatives on insects and disease in the project area.

Table 3-14. Acres in a Condition of High-Risk to Insects and Disease.

	0 years	20 years	30 years	50 years
Alt 1	5,426	8,641	9,807	11,544
Alt 2	4,454	7,616	8,802	10,620
Alt 3	4,630	7,763	8,934	10,727

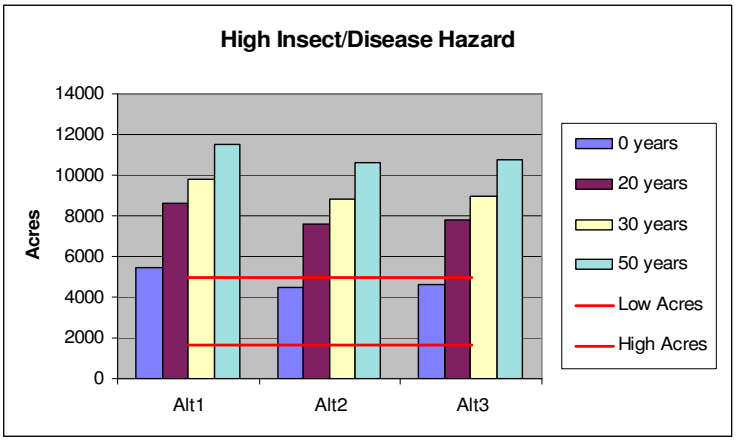


Figure 3-6. High Risk to Insects and Disease and Historic Range

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.

Late and Old Structure

Late and old structure (LOS) is a 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 at the landscape scale. 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 this project.

Existing Condition

There currently are an estimated 1,375 acres of LOS within the project area. The majority (1,039 acres) of the LOS is in a multi-strata condition. Historically, the overall amount of LOS would have ranged between 7,104 and 13,875 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 the ponderosa pine PAGs are within the historic range for the multi-strata condition while the grand fir and Douglas-fir PAGs are below. All PAGs are below the historic range for single strata LOS. Across all PAGs, the total amount of multi-strata LOS is within the combined historic ranges, while single strata LOS is below.

Tables 3-15 and 3-16 summarize existing and historic amounts of LOS by PAG.

Table 3-15. Existing LOS and Historic Ranges by PAG

PAG	LOS Type	Existing Acres	HRV Low Acres	HRV High Acres
MGF	multi	2	3	6
	single	0	1	2
	Total	2	4	8
DGF	multi	351	422	855
	single	326	1021	2087
	Total	677	1443	2942
DF	multi	350	440	762
	single	4	1289	2106
	Total	354	1729	2868
M Pine	multi	289	0	554
	single	3	3080	5297
	Total	292	3080	5851
X Pine	multi	47	0	221
	single	3	849	1985
	Total	50	849	2206
Total	multi	1039	865	2398
	single	336	6239	11477
	Total	1375	7104	13875

Table 3-16. Summary of Existing LOS Status by PAG.

Plant Assoc. Group	Multi-strata LOS	Single-strata LOS	RF Amend. #2
Moist Grand Fir	Below Historic	Below Historic	Scenario A
Dry Grand Fir	Below 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 within the project area, 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 mapping of LOS stands was conducted. Using this approach 1,235 acres of LOS stands have been identified. All stands are classified as multi-strata LOS although they may have small patches of single strata conditions within them. In the Upper Beaver Project Area most LOS stands are located in the northern

quarter of the area in the headwaters of Powell, Sugar, Rager, and Beaverdam creeks (Figure 3-7).

Up to about 1995, most timber sales within these drainages 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 patches 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 and that no trees larger than 21 inches DBH will be cut. Silvicultural treatments outside late and old structural stands should maintain or enhance late and old structure. Ponderosa pine stands will be maintained in an open, park-like condition. A memo from the Regional Forester dated June 11, 2003 encourages site-specific Forest plan amendments treating 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 non harvest treatment 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 will not require a Forest Plan Amendment to implement as they do not include commercial harvest within mapped LOS stands.

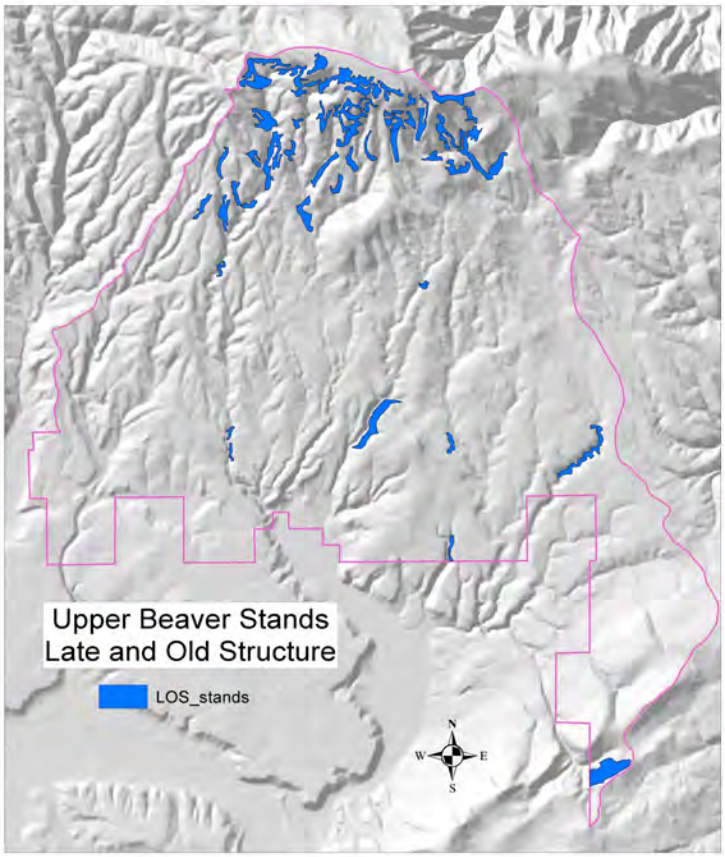


Figure 3-7. Upper Beaver Late and Old Structure Stands.

Effects

Alternatives 2 and 3 include non-harvest treatments (precommercial thinning, slash piling, and prescribed fire) within LOS stands. Alternative 1 does not propose any treatment in LOS stands. Tables 3-17 and 3-18 show the amount of mapped LOS stands treated by alternative and by plant association group.

Tables 3-19 through 3-22 and Figures 3-8 through 3-10 display anticipated future amounts of LOS occurring within the planning area at 20, 30, and 50 years under each alternative. 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.

Table 3-17. Acres of LOS treatment by Alternative

	Alternative 1 No Action	Alternative 2	Alternative 3
Acres LOS stands treated	0	941	810
Precommercial thinning and fuel treatment	0	330	283
Prescribed burning only	0	611	527

Table 3-18. Acres LOS Stands Treated by Alternative and Plant Association Group (PAG)

Alternative	Moist Grand Fir	Dry Grand Fir	Douglas-fir	Mesic Pine
1	0	0	0	0
2	5	707	171	55
3	5	707	72	22

Alternative 1

No treatments would occur. LOS stands 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 insect bark beetle activity. LOS stands would remain at high risk of severe wildfire due to high canopy closure and existing ladder and ground fuels.

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. Overall these conditions are already within the HRV overall while single-strata conditions are below HRV. Within 20 years the total amount of multi-strata LOS is projected to exceed the overall historic range for the project area. 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.

Effects Common to Alternatives 2 and 3

Precommercial thinning would help maintain large trees by reducing understory canopy layers, 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 reduce risk from wildfire. These treatments reduce the risk of losing LOS stands to wildfire or insects/disease.

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

Alternative 2

Treatments would focus on the removal of 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.

The overall amount of LOS would not change immediately due to treatment, although about 170 acres of multi-strata LOS would be converted to single strata LOS. The overall amount of multi-strata LOS would not be reduced below historic levels; however, the amount of multi-strata LOS within the Douglas-fir and Grand fir PAGs would continue to be below their historic ranges. By year 20 the amount of multi-strata LOS in all PAGs increases to be within or above the historic ranges. This alternative results in the greatest amount of single strata LOS in both the short and longer term, although the overall amount of single strata does not reach the historic range.

Alternative 3

Treatments would be similar to and have effects similar to Alternative 2 but fewer acres would be treated. The overall amount or distribution of LOS would not change immediately due to treatment, although about 140 acres of multi-strata LOS would be converted to single strata LOS. The overall amount of multi-strata LOS would not be reduced below historic levels; however, the amount of multi-strata LOS within the Douglas-fir and Grand fir PAGs would continue to be below their historic ranges. By year 20 the amount of multi-strata LOS in all PAGs increases to be within or above the historic ranges. This alternative results in a lesser amount of single strata LOS in both the short and longer term than Alternative 2.

Post Treatment LOS Conditions (acres)

Overall, the planning area is within HRV for multi-strata LOS and below for single-strata LOS. The following tables display the immediate effect of each action alternative on the amount of LOS within each PAG and the total for the entire planning area.

Table 3-19. Existing and Post-treatment LOS by PAG.

PAG	LOS Type	Existing	Alt 2	Alt 3
MGF	multi	2	2	2
	single	0		0
DGF	multi	351	297	305
	single	326	381	373
DF	multi	350	290	299
	single	4	62	53
M Pine	multi	289	231	247
	single	3	61	45
X Pine	multi	47	47	47
	single	3	3	3
Total	multi	1039	867	899
	single	336	507	474
	Total	1375	1375	1375

Table 3-20. Projected Acres of LOS by PAG (Year 20).

PAG	LOS Type	Alt 1	Alt 2	Alt 3
MGF	multi	4	4	4
	single	0	1	1
DGF	multi	701	664	671
	single	565	643	635
DF	multi	593	536	543
	single	157	255	244
M Pine	multi	886	841	857
	single	138	204	187
X Pine	multi	416	422	421
	single	61	65	65
Total	multi	2600	2467	2496
	single	922	1167	1131
	Total	3521	3634	3627

Table 3-21. Projected Acres of LOS by PAG (Year 30).

		Alt1	Alt2	Alt3
MGF	multi	5	5	5
	single	1	1	1
DGF	multi	867	839	845
	single	642	728	721
DF	multi	703	649	655
	single	207	319	307
M Pine	multi	1133	1093	1108
	single	181	250	233
X Pine	multi	566	573	573
	single	79	85	85
Total	multi	3274	3159	3186
	single	1110	1383	1347
	Total	4384	4542	4533

Table 3-22. Projected Acres of LOS by PAG (Year 50).

		Alt1	Alt2	Alt3
MGF	multi	7	7	7
	single	1	1	1
DGF	multi	1184	1170	1175
	single	733	829	822
DF	multi	903	862	866
	single	269	401	388
M Pine	multi	1542	1507	1520
	single	237	309	292
X Pine	multi	814	819	819
	single	102	111	111
Total	multi	4450	4365	4387
	single	1341	1651	1614
	Total	5791	6015	6001

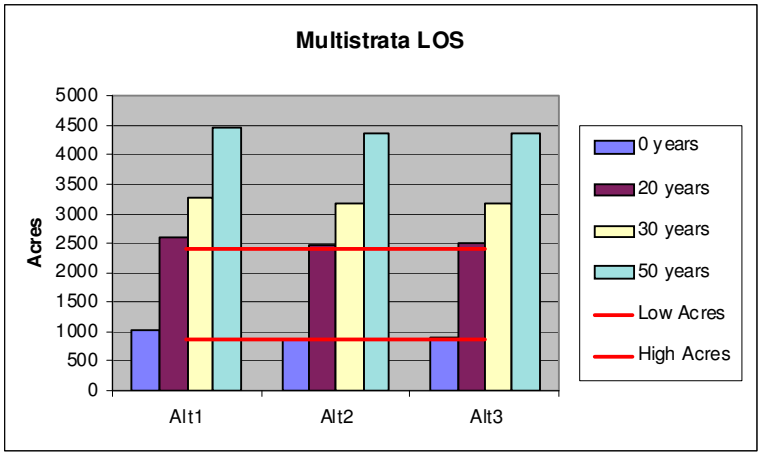


Figure 3-8. Projected Acres of Multi-strata LOS by Alternative.

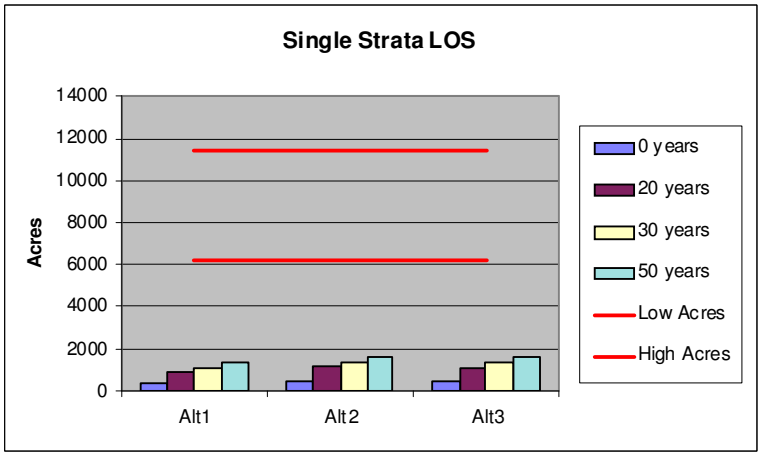


Figure 3-9. Projected Acres of Single Strata LOS by Alternative.

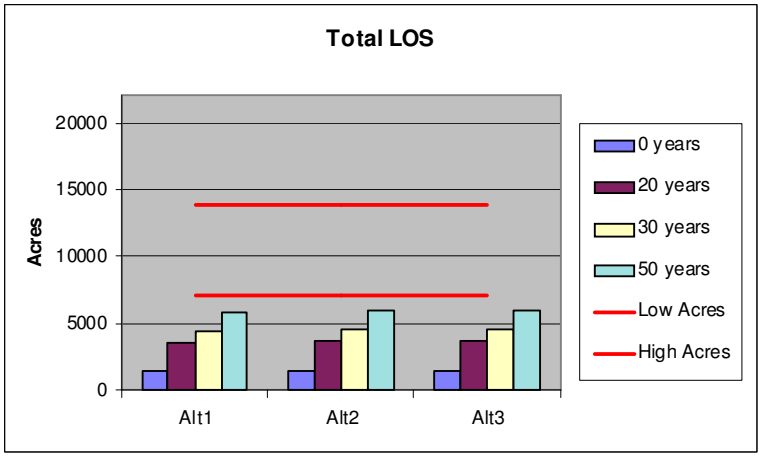


Figure 3-10. Projected Total Acres of LOS by Alternative.

Cumulative Effects

There is one planned timber sale unit, Wheeler Aspen #1, within the project area. As discussed previously this nine acre unit occurs within a mapped multi-strata dry grand fir LOS stand on the upper slope of Wolf Mountain. Harvest and follow-up non commercial thinning is proposed to begin in 2009. The effect of this treatment will be to convert portions of the stand from multi- to single-strata LOS, maintain and enhance existing aspen, and maintain the existing large tree component. This treatment will result in a small increase in single strata LOS and a corresponding decrease in multi-strata LOS. The amount of change, however, is so small in scale (9 acres within the 5,542 acres of dry grand fir PAG) that its effect is not meaningful from a landscape perspective.

There are no other active or planned timber sales within the planning area. The effects of past harvest and other activities have been included in the description of the existing condition as described previously. There are no other vegetation projects currently ongoing or planned within the area.

The projections for alternatives 2 and 3 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 that could occur in the future. Thus, the predicted amounts of LOS tend to increase with time as succession and stand growth continue without further management activities other than continued fire suppression. Multi-strata LOS increases at a higher rate than single strata. It is reasonably foreseeable that, with future emphasis on fuels reduction and management towards historic conditions, this trend would be altered to some extent and the amount of single strata LOS would increase at a rate faster than multi-strata.

Accelerated mortality from bark beetles, other insects, and disease has also not been included in the projections for any alternative. It is reasonable to expect that as the amount of high risk acres increase (see previous discussion on insects and disease), the likelihood of insect/disease related mortality will also increase. Multi-strata LOS is considered at high risk due to overstocking. Often it is the large diameter trees which are attacked and killed during an insect outbreak. Should mortality increase beyond background levels the amount of multi-strata LOS will decline over the amount projected, especially in Alternative 1 (no action).

Old Growth Management Allocations

Existing Condition

There are three areas designated as Old Growth Management Allocations (OGMAs) within the Upper Beaver planning area: Sugar Creek, Beaverdam Creek, and Bear Creek. These areas have been designated in the Forest Land and Resource Management Plan as MA-F6 Old Growth with an emphasis to provide habitat for wildlife species dependent on old growth stands (LRMP p. 4-58). The LRMP prohibits timber harvest in Old Growth allocations (LRMP, p. 4-210), and other forms of vegetation management are not allowed until further research is available on the needs of dependent species (LRMP, p. 4-251).

Beaverdam Creek OGMA

This OGMA encompasses about 291 acres in 3 pieces of timbered stringer along Beaverdam and Heisler creeks. The area is a mixture of mesic ponderosa pine and Douglas-fir PAGs with a minor amount of xeric ponderosa pine and juniper woodland. The stands within the OGMA are primarily multi-strata with scattered groups and individual overstory trees. Field surveys indicated that many of the large pines in Beaverdam Creek OGMA are at risk of attack from bark beetles due to overcrowding from understory trees. There is also a lack of large wood in and along the stream channels.

Bear Creek OGMA

This OGMA is approximately 295 acres in size (2 pieces) and is located in the southeast portion of the planning area. A fork of Bear Creek bisects the area. The area is a mixture of mesic ponderosa pine and Douglas-fir PAGs with lesser amounts of xeric ponderosa pine and juniper PAGs.

Sugar Creek OGMA

This OGMA encompasses approximately 276 acres in the southwest portion of the planning area. Sugar Creek and a fork of Sugar Creek run through the area. The area is predominately within the mesic ponderosa pine PAG (ponderosa pine/common snowberry plant association) with minor inclusions of xeric ponderosa pine. The area is multi-strata ponderosa pine with a very minor component of other species (less than one percent of the stand basal area per acre). There has been selective harvest in the past (estimated 40 years ago) that removed individual large diameter trees. The area has developed a dense understory layer ranging in size from saplings to small trees. Table 3-23 summarizes stand statistics that were derived from a stand examination conducted in 2008.

Table 3-23. Stand Table for Sugar Creek OGMA – Current Condition.

Diameter Class (inches)	Trees/Acre	Basal Area/Acre (Sq. ft)	Avg. Diameter (inches)
0 – 4.9	405.6	2.8	1.1
5 – 8.9	21.3	6.7	7.6
9 – 16.9	56	46.7	12.3
17 – 20.9	15.1	27.8	18.3
21+	12.0	47.6	27.1
Total Live	510	131.7	6.9

The Forest Vegetation Simulator (FVS) (Wykoff et al. 1984), a stand growth and yield model, has been used to simulate changes in stand structure and density for the Sugar Creek OGMA. The model allows for comparison of the no action alternative to simulated treatments proposed in the action alternatives. Projections were run for a 30 year time frame for comparison purposes.

The Stand Visualization System (SVS) (McGaughey, 2000) was used to create visual representations of the FVS model predictions (see Figure 3-11 for a depiction of the existing condition). The FVS base model tree mortality predictions are intended to reflect background or normal mortality rates. Increases in mortality due to insects or other pathogens are not accounted for in the base model.

The management zone for ponderosa pine in this plant association for a stand of this average diameter ranges from 63 to 94 sq. ft. of basal area per acre (Powell, 1999). The Sugar Creek OGMA area is currently above the management zone and at risk of insect attack. Field reconnaissance has verified that individual large trees are beginning to be killed by bark beetles and the 2006, 2007, and 2008 aerial surveys conducted by Forest Pest Management have detected ongoing bark beetle activity and resulting tree mortality. At this level of stocking continued mortality of the large trees is expected to continue and potentially increase. Tree vigor overall at this level of density is low and not only is susceptibility to insect attack increased, but individual tree growth is reduced. The rate at which large trees would be replaced by growth of smaller trees is hampered by high density conditions. Increment borings taken from dominant large trees yielded an average diameter growth rate of $9/20^{th}$ inch per decade. Growth rates below $15/20^{th}$ inch have been correlated to increased susceptibility to bark beetle attack (Eglitis, 2008).

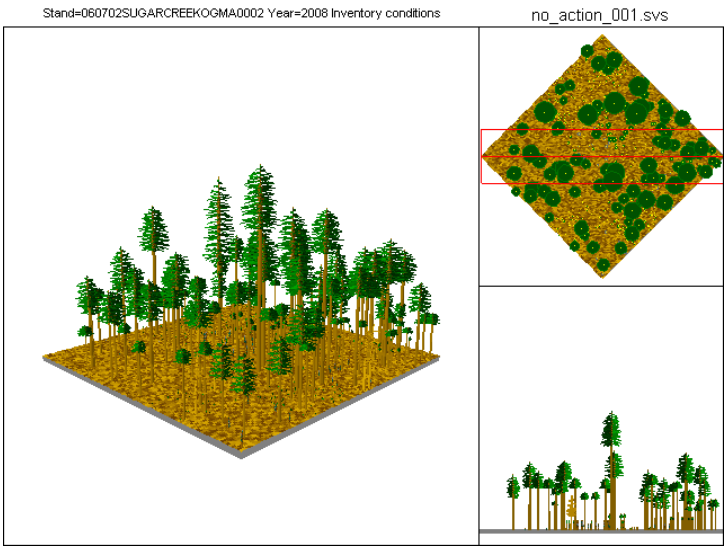


Figure 3-11. Sugar Creek OGMA – Existing Condition.

Effects

Effects Common to Alternatives 1 and 3

No activities are proposed in any OGMA in Alternatives 1 and 3. Because stand response to no treatment was modeled using FVS, effects to Sugar Creek OGMA will be summarized. The assumption is that effects to Beaverdam Creek and Bear Creek OGMAs would be similar.

As described previously, the Sugar Creek OGMA is currently above the upper level of the management zone and is experiencing large tree mortality due to overstocking. The stand is currently at 140 percent of the upper management zone. Without density reduction treatment the FVS model indicates that the area will remain well above the upper management zone for the next 30 years and will continue to be highly susceptible to insect attack (see Table 3-24 and Figures 3-12 and 3-13). The predicted stand characteristics do not include the loss of large tree structure due to elevated risk of insect attack. Loss of large tree structure would reduce the habitat qualities for which this area was designated.

Table 3-24. Stand Table for Sugar Creek OGMA in 30 years – Alternatives 1 and 3

Diameter Class (inches)	Trees/Acre	Basal Area/Acre (Sq. ft)	Avg. Diameter (inches)
0 – 4.9	**317.2**	**9.9**	**2.4**
5 – 8.9	**23.7**	**5.1**	**6.3**
9 – 16.9	**60.6**	**54.6**	**12.9**
17 – 20.9	**15.9**	**32.0**	**19.2**
21+	**14.4**	**56.8**	**26.9**
Total Live	442	157.8	8.1

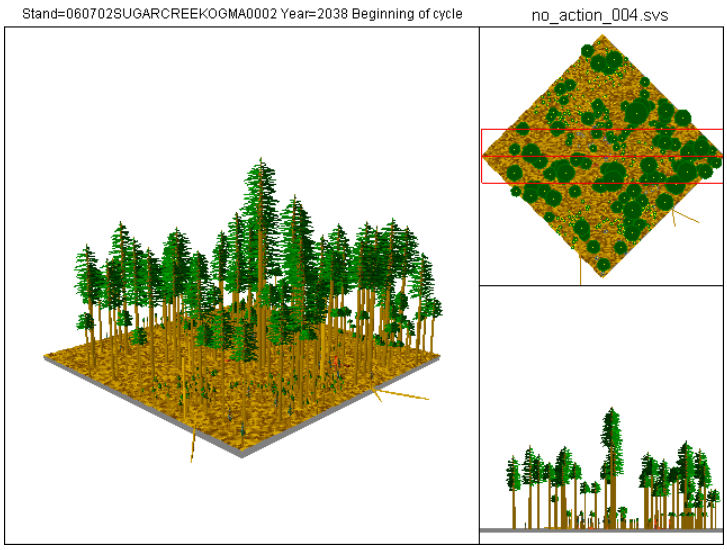


Figure 3-12. Sugar Creek OGMA in 30 years – Alternatives 1 and 3.

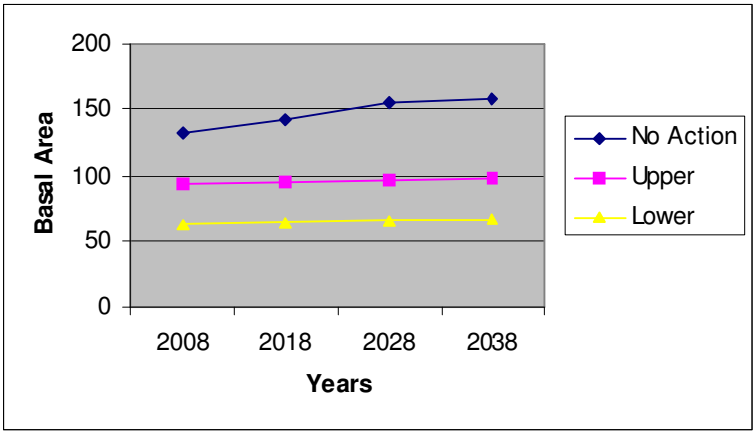


Figure 3-13. Sugar Creek OGMA Stand Density and Management Zone – Alternatives 1 and 3.

Alternative 2

Alternative 2 proposes a variety of management activities in the three OGMAs in the project area (Table 3-25). Effects to each OGMA are summarized in this section.

Table 3-25. OGMA Proposed Treatment Acres in Alternative 2.

Proposed Treatment	Sugar Creek	Beaverdam Creek	Bear Creek
Commercial Harvest with precommercial thinning and fuels treatment	65	0	0
Precommercial thinning and fuels treatment	20	182	0
Juniper cutting	4	0	24
Hardwood treatment	32	0	0
Underburning only	13	0	218

Beaverdam Creek

Alternative 2 proposes precommercial thinning to reduce competition with the overstory in Beaverdam Creek OGMA. The treatment would involve felling of selected trees up to 16 inches dbh that are within 50 feet of a large overstory ponderosa pine. Trees would be felled toward or

into the stream channel to provide additional woody structure to the stream. Slash would be lopped or left intact depending on the amount created. No trees would be removed and no follow-up slash treatment such as underburning is prescribed. Treatment would occur in patches rather than over the entire 182 acres. It is expected that where thinning is implemented, individual overstory trees would maintain or increase in vigor, reducing the risk that they would be killed by insect attack.

Bear Creek

Alternative 2 proposes 218 acres of underburning within Bear Creek OGMA to reduce surface fuels, remove small understory trees, and maintain the dominance of ponderosa pine. An additional 24 acres of juniper cutting is proposed to remove encroaching juniper.

Sugar Creek

Alternative 2 proposes approximately 65 acres of commercial thinning of trees less than 21" dbh, non commercial thinning of trees not large enough to be harvested and prescribed fuels treatment (see Table 3-25). Thirty-two acres of hardwood treatment (cutting of conifers less than 12 inches dbh adjacent to existing hardwoods) and twenty acres of precommercial thinning without harvest are also proposed. Commercial harvest would not occur within fifty feet of the stream channel. The commercial harvest and follow-up precommercial thinning was modeled to occur between the years of 2008 and 2018.

The proposed harvest would retain all 21"+ dbh trees and approximately 35 sq. ft. of basal area per acre in trees less than 21" dbh. This treatment would reduce the overall stand density from 132 sq. ft. of basal area to 88 sq. ft. of basal area. The number of trees per acre would drop from 510 to 64 and the average diameter of the trees would increase from 6.9 inches to 15.8 inches (because thinning would be from below and smaller trees would be removed). The resulting stand density would be within the management zone and is predicted to stay there through the 30 year projection. At this density, risk of insect attack and resulting loss of large tree structure is low. Tree growth would be enhanced and in the long term more large trees would be available for habitat or for recruitment as large wood into the stream channel.

Table 3-26. Projected stand conditions in Sugar Creek OGMA immediately following treatment under Alternative 2.

Diameter Class (inches)	Trees/Acre	Basal Area/Acre (Sq. ft)	Avg. Diameter (inches)
0 – 4.9	**14.2**	**0.1**	**1.1**
5 – 8.9	**4.1**	**1.6**	**8.5**
9 – 16.9	**26.4**	**23.0**	**12.6**
17 – 20.9	**6.5**	**12.5**	**18.8**
21+	**12.0**	**47.6**	**27.0**
Total Live	64	88.2	15.8

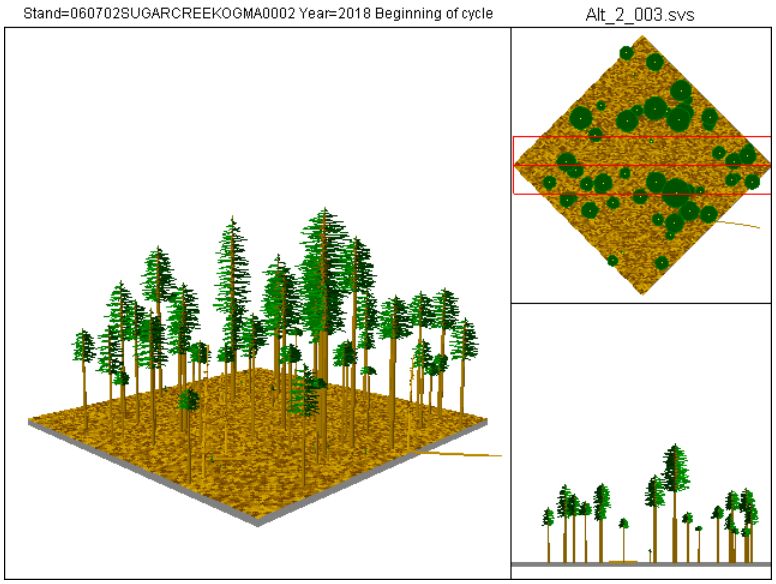


Figure 3-14. Sugar Creek OGMA – Alternative 2 Post Treatment.

Table 3-27. Projected stand conditions in Sugar Creek OGMA 30 years post-treatment under Alternative 2.

Diameter Class (inches)	Trees/Acre	Basal Area/Acre (Sq. ft)	Avg. Diameter (inches)
0 – 4.9	**11.9**	**1.0**	**3.9**
5 – 8.9	**2.1**	**0.4**	**5.9**
9 – 16.9	**26.6**	**25.3**	**13.2**
17 – 20.9	**7.3**	**14.5**	**19.0**
21+	**13.1**	**55.8**	**27.9**
Total Live	61	97.1	17.1

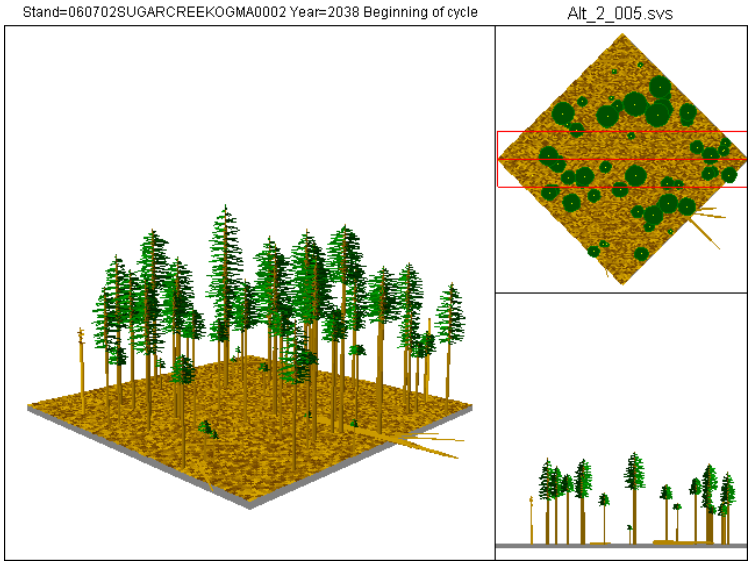


Figure 3-15. Sugar Creek OGMA – Alternative 2 in 30 years.

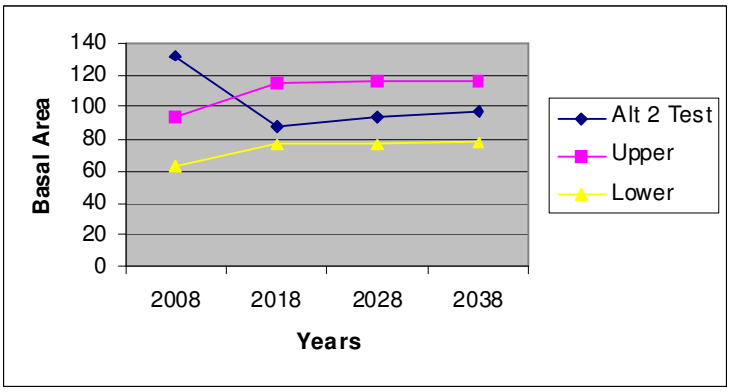


Figure 3-16. Sugar Creek OGMA Stand Density and Management Zone – Alternative 2.

Cumulative Effects

There are no other activities ongoing or planned within the OGMAs that would affect forest vegetation, other than continued fire suppression. Continued fire suppression has the effect of allowing surface fuels to increase, which can result in the development of ladder fuels. As fuels increase, the likelihood of undesired wildfire effects can increase. As ladder fuels (understory trees) increase, the likelihood of overstory crown fire also increases. As stands become denser, inter-tree competition also increases and overall tree vigor is reduced.

Connective Corridors

Existing Condition

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 Upper Beaver project area and various treatments, including timber harvest, have been proposed within them.

Table 3-28. Proposed Activities within Connective Habitat by Alternative (acres)

	Alternative 1	Alternative 2	Alternative 3
Commercial Harvest with precommercial thinning and fuels treatment	**0**	**155**	**65**
Precommercial thinning and fuels treatment (no harvest)	**0**	**261**	**347**
Juniper cutting	**0**	**15**	**2**
Hardwood treatment	**0**	**5**	**5**
Underburning only	**0**	**195**	**166**

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 that are not timber sales, such as precommercial thinning and fuels reduction. 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 criteria. 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 occurs) be left in patches or scattered to assist in supporting stand density and 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 precommercial thinning will add to the amount of canopy closure retained. These understory trees may be retained in clumps or scattered as mentioned previously. Table 3-29 displays representative canopy closures that 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 3-29. 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**

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 the understory that would be retained during precommercial 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 would require a Forest Plan amendment.

Effects

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. 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 will be reduced below the top third of site potential since insects and wildfire 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.

Alternative 2

The 155 acres of commercial harvest proposed within the Alternative 2 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). Alternative 2 includes portions of four harvest units that are within connective corridors, encompassing approximately 155 acres. Prescriptions in the connective corridor would be modified to retain density in the upper half of the management zone. 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.

Table 3-30. Alternative 2 Harvest within Connective Corridors

Unit Number	Acres within Connective	Comments
22	**76**	**Stand composed of predominately small trees, with minor overstory.**
27	**48**	**Stand composed of predominately small trees, with patches of larger trees.**
40	**6**	**Stand composed of predominately small trees, with minor overstory.**
51	**22**	**The portion of the unit within the connective corridor has an abundance of large trees which would be retained. Presence of large trees would increase canopy close to top third of site potential.**

Alternative 2 proposes 476 acres of noncommercial treatments (see Table 3-28). Noncommercial treatments would reduce 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. The noncommercial treatments would 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 a loss of tree structure. The Interim Wildlife standards do not apply to these non-harvest treatments; however, the effects of the noncommercial activities would meet the intent of the Interim Wildlife standards.

Alternative 3

Alternative 3 includes a total of 65 acres of commercial thinning in two harvest units (Units 27 and 51) that are within connective corridors. Unit 51 has an abundance of large trees within the connective corridor and proposed harvest would retain canopy cover in the top third of site potential because so many large trees are already present. The harvest prescription in unit 27 would be modified to retain densities in the upper half of the management zone. This level of density, in addition to the retained understory, would maintain canopy closure in the top one third of site potential. The proposed harvest in Alternative 3 would meet the Interim Wildlife Standard.

Alternative 3 proposes 520 acres of noncommercial treatments (see Table 3-28). Effects would be the same as those described under Alternative 2; noncommercial activities proposed under Alternative 3 would meet the intent of the Interim Wildlife standards.

Cumulative Effects

The effects of Upper Beaver project activities to connectivity corridors would not be additive to the effects of any current or proposed project.

Fire and Fuels

Existing Condition

The most common natural disturbance that has had an effect on vegetation in the project area is lightning-caused fire. Fire exclusion over the last 90-100 years has reduced the acres burned in naturally occurring, low-intensity fires. Frequent, low-intensity fires removed both surface and ladder fuels resulting in more open forest stands than what occur today. When fire is kept out of forest stands, both surface and ladder fuels increase and stands become denser, which increases the likelihood of high-intensity wildfire. As a result of fire exclusion, the amount of fuel loadings and the density of forest stands have increased.

In the Upper Beaver project area, open ponderosa pine-dominated forests were maintained by frequent, low-intensity surface fire. According to the Upper Beaver Watershed Analysis:

More of the Eastern Ochoco Mountains are covered by dense stands of small trees than were historically, and there are fewer large fire-adapted pines. The risk of crown fire in these stands is high.

Stands that were thinned and burned in the 1980s and 1990s are in need of thinning and burning to maintain low surface fuels and ladder fuels, or the risk of crown fire will increase.

Fire Regimes and Condition Class

Fire Regime Condition Class is used to describe the existing condition and measure the difference between alternatives.

Fire Regimes[1] describe the role that fire plays in an ecosystem in terms of fire frequency (how often a forest burns) and fire intensity (how hot it burns). Fire regimes are identified by species composition. In the Upper Beaver watershed,

50% of Upper Beaver is in Fire Regime I, a dry, low-elevation forest dominated by ponderosa pine. Frequent, low intensity surface fires kept these stands mostly open, and fuels light. The fire frequency is 5-35 years.

29% is in Fire Regime II, grassland, sage steppe, juniper steppe or rock scab. Much of the Upper Beaver watershed is “scab/stringer country”, alternating stringers of timbered draws and rock scabs.

21% is in Fire Regime IIIa, dry mixed conifer (grand fir, Doug fir, ponderosa pine), with a fire frequency of less than 50 years. Most of the Upper Beaver watershed in Fire Regime IIIa lies north of Tamarack Butte.

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 the Historic Range of Variability (HRV). The Historic Range of Variability is the amount of change that could have happened in an ecosystem. HRV describes historic patterns and abundance of vegetation using pre-European settlement conditions as a reference point. Table 3-31 describes characteristics of the three Condition Classes.

[1]Fire Regime Condition Class Guide. Hann, Wendel, Havline,Doug, Shlisky, Ayn, et al. 2003 . Also Agee 1993

Table 3-31. Characteristics of Condition Classes for Fire Regime I.

Condition Class I	Condition Class 2	Condition Class 3
Low intensity fire has occurred within 0-15 years Fuel models[2] 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 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[3] tree growth is reduced tree mortality increases

Table 3-32 lists some of the fire effects in each Condition Class.

Table 3-32. Burn severity classification.

	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. diam	Partly consumed - charred	Consumed	Consumed
Woody Debris – large, > 3 in. diam	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.			

Changes in Condition Class would result from reductions in surface fuels, ladder fuels and stand density. The Proposed Action would reduce the potential for high intensity fire by 1) reducing surface fuels, which would shorten the flame lengths of surface fires, 2) by 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) by decreasing crown density, making it harder for fire to travel from tree to tree.

In the Upper Beaver project, stands in which prescribed fire alone will be used to reduce surface fuels and seedlings and saplings are in Condition Class 1. Stands in which noncommercial thinning of trees under 9" dbh is prescribed are in Condition Class 2. Stands in which commercial thinning of trees between 9" and 21" dbh is prescribed are in Condition Class 2 and 3. Also, the Wolf Ridge and Summit Trail parts of the project are in Condition Class 3.

The Upper Beaver Project Fuels Report contains additional information concerning fire effects on broadleaf shrub species. These effects are discussed, where appropriate, in the other resource sections. Generally, plant species found in this project area are adapted to recurring fires either through sprouting capabilities or by a preference for bare mineral soil for seedling establishment.

Additional information in the report includes an analysis of fire suppression costs. Fire suppression cost can be reduced by approximately one third in treated stands.

[2] see Anderson 1982
[3] See table 12 under Air Quality

Environmental Consequences

Alternative 1, No-Action

Selection of Alternative 1 would authorize no fuels treatments in the project area. Stands that are in Condition Class 1 as a result of being thinned and burned in the 1980s and 90s will not be maintained, and will transition into Condition Class 2 within the next 5 - 10 years. Figure 3-17 shows the surface and ladder fuels that have accumulated in Upper Beaver unit 4 since it was commercially harvested, thinned, and burned in 1989.

Figure 3-17. Accumulation of fuels in Upper Beaver project area since 1989 activities.

Table 3-33 shows the probability of mortality from a wildfire in a representative condition class 1 stand, (East Maurys unit 40), under fire conditions similar to those during the 18,000 acre Hash Rock Fire in 2000 and the 9000 acre Maxwell Fire in 2006.

Table 3-33. Mortality from Wildfire in Condition Class 1.

Diameter	Species	Height	Crown Ratio	Trees Per Acre	Crown Scorched (%)	Probability of Mortality (%)
4	Douglas-fir	12	0.55	9	100	100
8	Douglas-fir	40	0.35	8	0	36
16	Douglas-fir	65	0.40	30	0	11
21	Pine, Ponderosa	100	0.35	4	0	6
Fuels Management Analyst, Carlton 2005. Data from stand exam.						

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 fuel accumulating 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 habitat cover, and large woody debris in riparian areas. Figure 3-18 displays a stand that's in Condition Class 3.

Figure 3-18. Ponderosa pine stand that is currently in Condition Class 3.

Table 3-34 shows the probability of mortality from a wildfire in a representative condition class 3 stand, under the same fire conditions.

Table 3-34. Mortality from Wildfire in Condition Class 3.

Diameter	Species	Ht	Crown Ratio	Trees Per Acre	Crown Scorched (%)	Probability of Mortality (%)
1	Pine, Ponderosa	4	0.35	177	100	100
4	Pine, Ponderosa	12	0.55	394	100	100
8	Pine, Ponderosa	35	0.40	106	100	99
16	Pine, Ponderosa	75	0.55	156	100	96
21	Pine, Ponderosa	100	0.35	10	100	93

Fire effects on specific components of the forest ecosystem have been described and assigned to each condition class (Hungerford 1996, Agee 1993). These effects in turn affect soil condition, water quality, habitats for aquatic, wildlife and plant species and other ecosystem components.

Severe fire effects can increase the potential for noxious weed establishment and damage cultural resources. Some of the fire effects on forest floor components in each Condition Class are shown in Table 3-35.

Table 3-35. Burn Severity Classification.

Forest floor Component	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. diam.	Partly consumed - charred	Consumed	Consumed
Woody Debris – large, > 3 in. diam	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

Alternatives 2 and 3

These alternatives include several types of fuel reduction activities including activity-fuels underburning, natural fuels underburning, and piling. The amount of each fuel reduction activity varies by alternative as displayed in Table 3-36.

Table 3-36. Acres of Fuel Reduction Activities.

Activity	Alternative 2	Alternative 3
Commercial harvest, precommercial thinning and underburning	2,105	1,649
Noncommercial and underburn	4,248	4,528
Juniper thin and underburn	2,299	2,279
Precommercial thinning and handpile/burn	62	62
Grapple Pile and burn or sell	2,045	1,902
Natural fuels(Maintenance), underburn	4,233	3,942
Summit Trail, pct, limbing, handpile/burn	309	309
Wolf Ridge Natural Fuel Burn	1,046	1,046

Prescriptions and Anticipated Changes in Condition Class

Condition Class 3 to Condition Class 1
Prescription: Commercial Thinning - Noncommercial Thinning – Underburn
Effects: Opens canopy - reduces ladder fuels - reduces surface fuels

Condition Class 3 to Condition Class 2
Prescription: Noncommercial Thinning – Underburn
Effects: Reduces ladder fuels - reduces surface fuels

Condition Class 2 to Condition Class 1
Prescription: Commercial Thinning - Noncommercial Thinning – Underburn
Effects: Opens canopy - reduces ladder fuels – reduces surface fuels

Condition Class 2 to Condition Class 1
Prescription: Noncommercial Thinning – Underburn
Effects: Reduces ladder fuels - reduces surface fuels

Condition Class 1 Maintenance
Prescription: Underburn
Effects: Reduces ladder fuels (seedlings and saplings) and surface fuels

In general, stands in which prescribed fire alone will be used to reduce surface fuels and seedlings and saplings are in Condition Class 1. Stands in which noncommercial thinning of trees under 9”

dbh is prescribed are in Condition Class 2. Stands in which commercial thinning of trees between 9" and 21" dbh is prescribed are in Condition Class 2 and 3. Also, the Wolf Ridge and Summit Trail parts of the project are in Condition Class 3. Table 3-37 summarizes acres that would be converted from one condition class to another by alternative.

Table 3-37. Change in Condition Class at the Stand Level.

Change in Condition Class	Proposed Action, acres treated	Alternative 3, acres treated
CC 3 to CC 1	453	333
CC 3 to CC 2	1518	1540
CC 2 to CC 1	10,762	10,250
CC 1 Maintenance	3903	3698

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 windspead would increase, and average humidity decrease. This would lower fine fuel moisture, the amount of moisture in dried grass and timber litter (pine needles and small sticks).

The average windspead 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[4] .

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

Flame Length[5]

Overstory thinning, ladder fuel reduction and surface fuel reduction would reduce flame lengths under Alt 2 and 3 (see Table 3-38, Figures 3-19, 3-20 and 3-21). Weather and fuel conditions typical for large fire development were used to predict potential flame lengths under the existing condition and the proposed action. (In this prediction there is no visual difference between maps showing Alt 2 and Alt 3.)

Table 3-38. Summary of changes in flame length by alternative.

Flame length (ft)	Alt 1 - Existing	Alt 2	Alt 3
<2	9121	13614	13290
2-4	4996	4433	4541
4-8	9153	6904	7005
8-11	5451	6356	6396
11+	6501	3915	3989

Changes in Fire Spread

Figures 3-22 and 3-23 display the difference in fire spread through the Upper Beaver watershed under the existing condition, and fire spread after implementing the proposed action, under weather and fuel conditions typical for large fire development. The ignition line is the black line running east/west at the south end of the watershed; the ignition line has 100 points of ignition on it, one every 500 feet. Fire duration is 12 hours, color-coded in 2-hour segments; for example, the area in red shows how far fire would travel in 2 hours. Table 3-39 compares the number of acres burned per 2-hour segment.

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

Table 3-39. Comparison of acres burned per 2-hour segment by alternative.

Hours	Alternative 1 Acres	Alternatives 2/3 Acres
<2	7446	4480
2 – 4	6741	3773
4 – 6	6471	3821
6 – 8	9484	4728
8 – 10	12442	4353
10 - 12	11247	4400

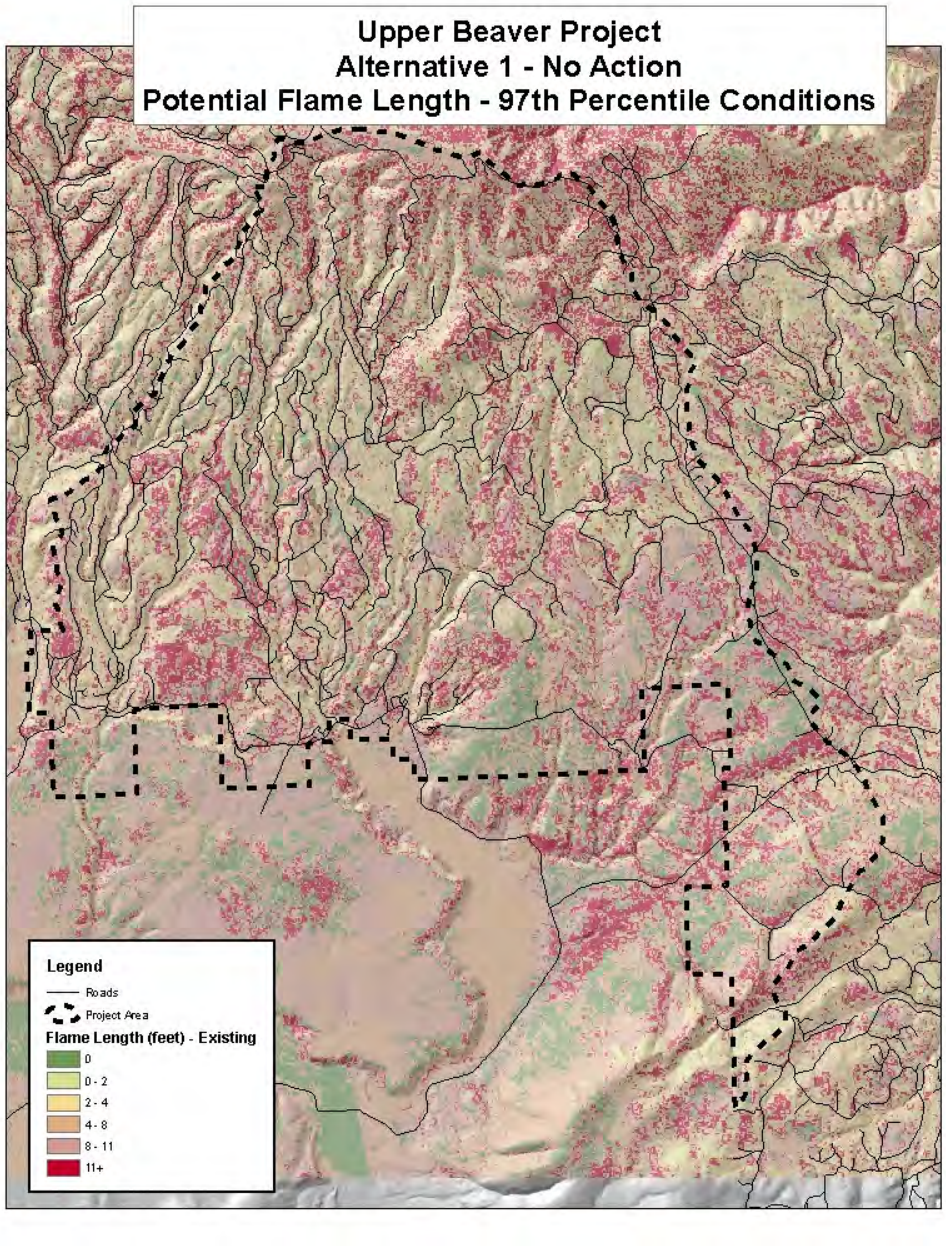


Figure 3-19. Existing Flame Length Potential (Current Condition).

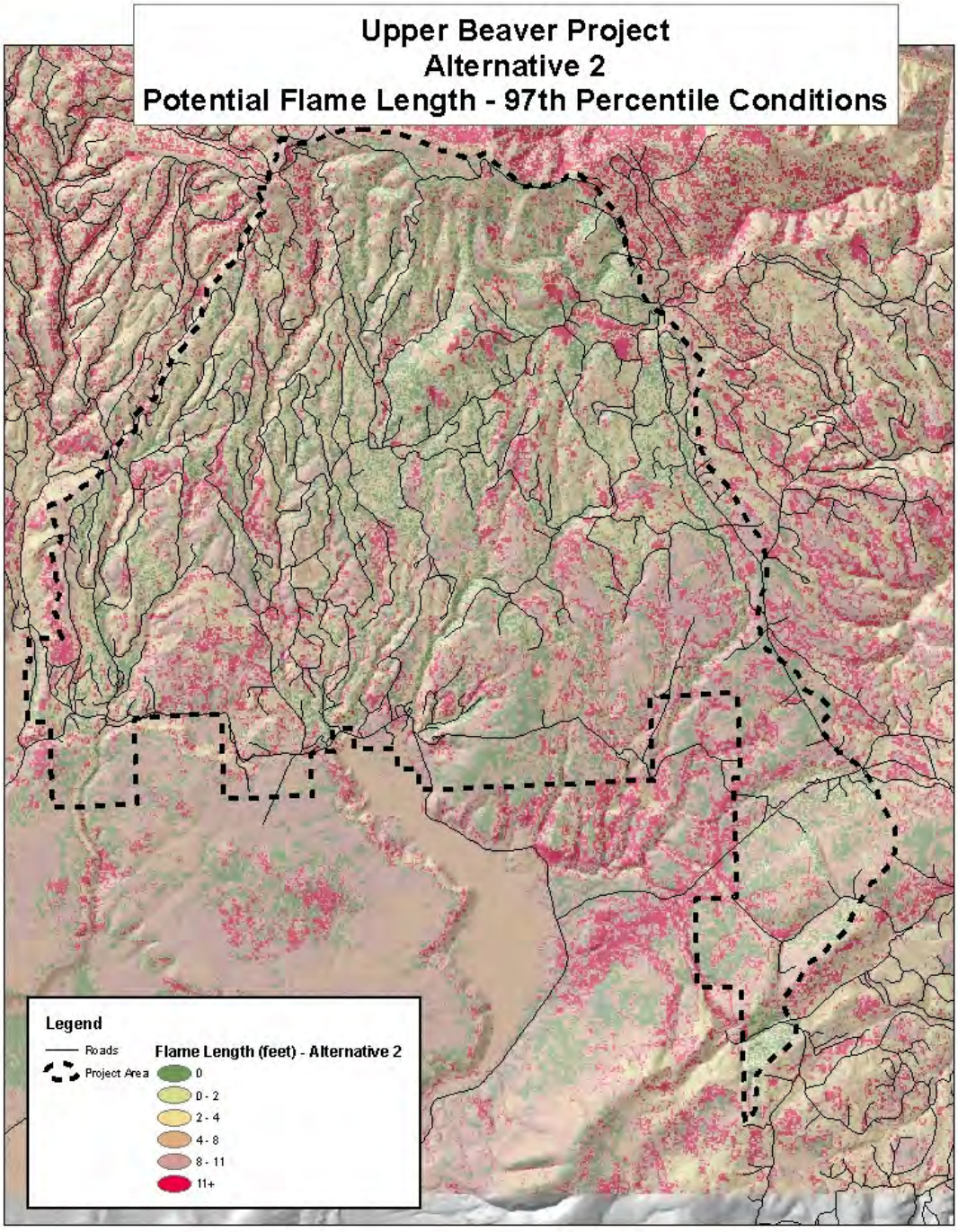


Figure 3-20. Flame Length Potential after implementing Alternative 2.

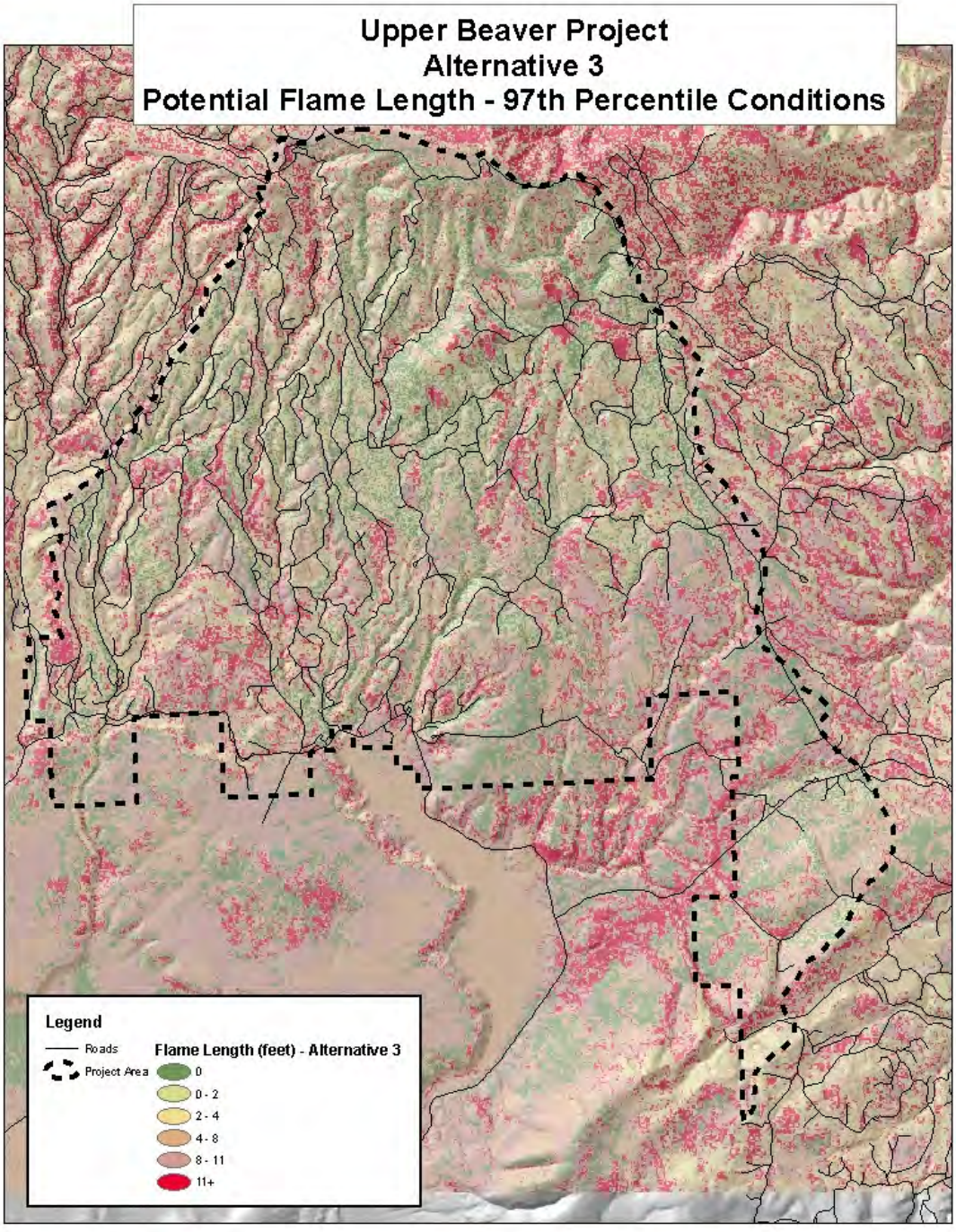


Figure 3-21. Flame Length Potential after implementing Alternative 3.

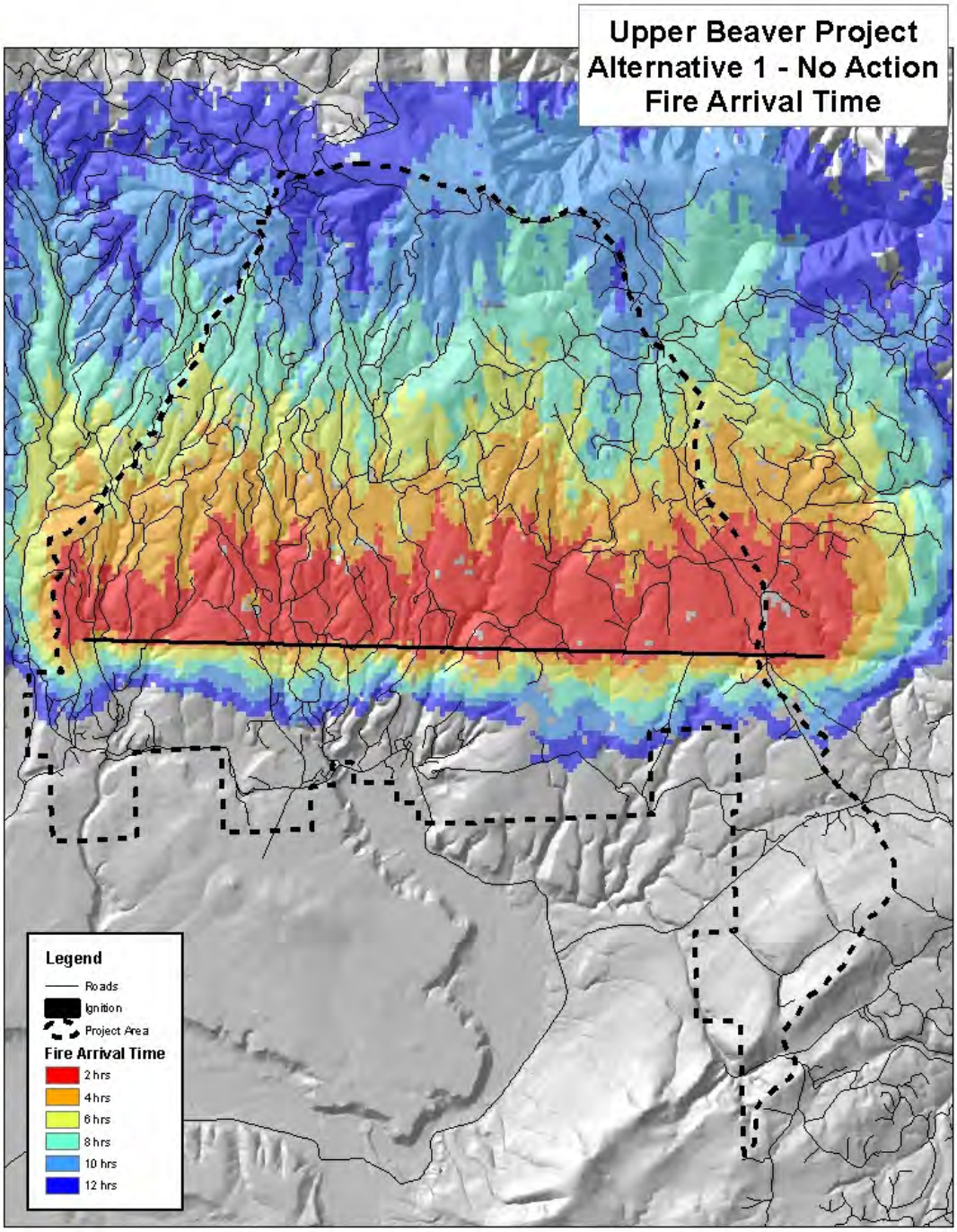


Figure 3-22. Fire arrival time, current condition.

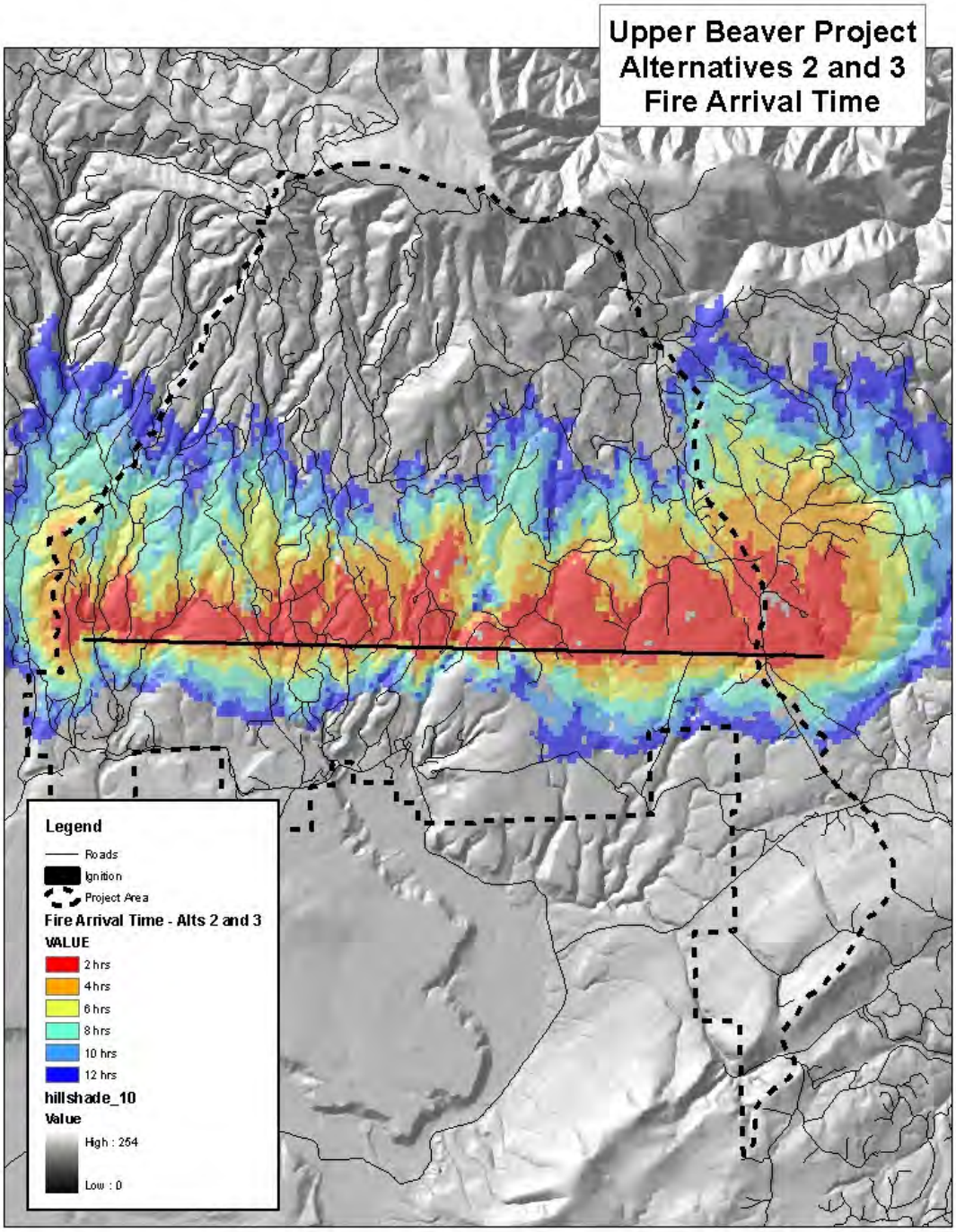


Figure 3-23. Fire arrival time, Alternatives 2 and 3.

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 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 under 12 inches and can be burned with a low intensity underburn.

Cumulative Effects

The effects of past harvest, precommercial thinning, slash piling and prescribed fire have been taken into account when describing the affected environment and the number of acres currently in each condition class, and have reduced stand susceptibility to damages from wildfire. There are no other activities proposed in the project area that would reduce fuels and result in changes in condition class. Determining specific potential of wildfire is not possible, due to so many unknown variables, such as fuels conditions during a wildfire event, weather, suppression forces available, and other factors. However, from 1995 thru 2005 there were 8608 acres of fuels reduction projects in the project area. From 1970 to 2003, the project area averaged 8 wildfires per year. Lightning started 90% of those fires. The average fire size was 2.5 acres, with 86% of those fires contained at less than .1 acres. This is due to the proximity of fire suppression resources, which are stationed at the Rager Ranger Station at the south end of the project area, and to the thinning and burning that has occurred in the project area. However, there other activities in the project area that would modify fire behavior.

The project area contains all or parts of the Bearskull/Cottonwood, Heisler, Wind Creek, and Wolf Creek Allotments. Livestock grazing 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 and how productive the grass is in any given year. The Wind, Wolf and Heisler Creek Allotments should implement new allotment Plans in 2010 that have the expressed objective of increasing the utilization in upland forests. Livestock grazing does not affect fire intensity in closed canopy, multi-storied stands with heavy surface fuel loading. Livestock grazing does not effect the distribution of condition classes because grazing does not alter stand structure and density.

Geology

Existing Condition

The Upper Beaver project area is located on the southwestern corner of the Blue Mountains physiographic province, which also includes the Wallowa, Elkhorn and Strawberry mountains. The shaping of the landforms in the watershed is a reflection of the past geologic history of the area. The tectonic movements, uplift of the Blue Mountain anticline, and mass wasting processes have combined to create the broad ridges and steep draws typical of the Ochoco mountains. Mass wasting, and sheet and rill erosion are some of the physical processes still currently in action. For more detailed discussion on geologic resources and potential impacts refer to the Geology Report, located in the Upper Beaver project file, Paulina Ranger District.

The development of the scenic cliffs and prominent escarpment on the north rim of the Ochoco Mountains has been due to the rise of the Blue Mountain Anticline. The related tectonic fault traces, visible on the aerial photographs, have influenced the development of drainage patterns. The mass wasting process includes the formation of talus slopes, deep seated dormant landslides, slope creep and rock topple. The wet areas adjacent to dormant landslides and tectonic faults identify interrupted drainage flow.

The dormant landslides which shape the analysis area were probably active through the past 100,000 years. They were probably triggered by combined tectonic activity and high precipitation. They naturally adjust as the streams cut the toes of the landslide debris and as natural fires, insect and disease infestations removed vegetation, allowing increased precipitation to saturate the soils. When the dormant landslides were more active 100,000 years ago, they contributed a portion of the existing sediment currently occupying the floodplains of the stream courses.

Seventy-four (74) percent of the underlying formations within the Upper Beaver analysis area are predominantly resistant to chemical and mechanical weathering processes, 17% have an intermediate susceptibility and 9% are highly susceptible to mechanical and chemical weathering processes.

Sheet and rill erosion are the current dominant erosion processes across the analysis area under the current climatic conditions. A discussion of the condition and trend can be found in the hydrology and soils reports.

Although Central Oregon is no longer affected by the past moist climate, which contributed to the generation of the landslide features shaping the mountains today, there is the potential to reactivate the dormant landslides. Road construction and machine compaction due to management activities across landslide debris could change the water flow through the soil pores, potentially affecting the stability of the slope. When the toeslopes of the deep seated landslides abut live streams, they are prone to active erosion. Through time, the landslide debris has reached equilibrium on the hill slopes. As the stream erodes the toeslopes, the natural balance is upset. Accelerated erosion can occur, causing a decrease in water quality as additional sediment is introduced into the system.

The project area is underlain by 84 acres of dormant landslide terrain. The visible landslides and related debris areas, depending on slope and aspect, are in a low to moderate risk for reactivation by management activities such as road construction or harvest, or by the continued weather pattern of higher precipitation.

Effects

Alternative 1

Alternative 1 would allow the dormant landslide terrain to continue the natural process of erosion under the current precipitation pattern. There would be no change in direct, indirect or cumulative effects to dormant landslide terrain from this alternative.

Alternatives 2 and 3

Portions of the project area 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. The current road system was developed across the project area on all the lithologies. In general, roads on dormant landslide forms are at a slightly increased risk for potential mass wasting (cut and fill failures) when the soil and underlying landslide debris are saturated. However, there are only about .36 miles in Alternative 2 and .19 miles in Alternative 3

that are located on dormant landslide terrain and will be used as part of the timber harvesting activities.

For the harvest units in Alternatives 2 and 3, primary concern from a mass wasting standpoint is for those units on dormant landslide terrain and underlain by mapped landslide debris. 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

The proposed harvest treatments do not generally alter groundwater movement measurably, except in the vicinity of seeps and springs. The design elements to protect the streambanks, riparian corridors, seeps and springs will reduce the risk for increasing sediment production. The riparian vegetation will maintain the stability of the landslide debris toeslopes. The treatments should not substantially reduce the amount of water taken up by the trees through evapotranspiration. Reducing the amount of evapotranspiration would leave more groundwater in the slope, which has the potential to decrease slope stability. Potential risk for an increase in sediment transport due to mass wasting is low for both alternatives. Alternative 2 proposes to commercially treat 12.3 acres and Alternative 3 proposes treatment on .2 acres of land underlain by dormant landslide. With this small amount of harvest, and incorporation of the project design criteria (see Chapter 2), no change in sediment or slope stability is expected.

Cumulative Effects

There are no past, ongoing, or reasonably foreseeable activities that would reduce slope stability or increase mass wasting.

Soils

Existing Condition

The Eastern Ochoco Mountains contain a variety of soils. Soils are categorized by landtype. Landtypes delineate and identify naturally occurring bodies on the landscape consisting of unique characteristic features that are significant to management use and interpretations. Features include soil mantle, bedrock, vegetation, climate, hydrology, and landform (Paulson et al. 1977). For more detailed discussion on soil resources and the potential impacts to soils, refer to the Soils Report in the Upper Beaver project file (Paulina Ranger District).

Over most of the Upper Beaver project area (90%), slopes are less than 35%, which is fairly typical of Picture Gorge Basalt Formation terrain in the southwest Blue Mountain area.

Much of the land area in the watershed is scab stringer terrain. This terrain typically has an average of 30 percent scabland plateaus dissected by timbered stringers. Approximately 946 acres (3%) within the project area have deeper ash soils. Approximately 24,017 acres (70%) of the area is in non-forestlands. These include scablands (41%), meadows and shrublands. Scabland soils range from shallow to very shallow (<20 inches to bedrock). Shrubland soils range from moderately deep to deep (from >20 to 60 inches). Most meadow soils range from deep to very deep (greater than 40 inches). The remaining land area, approximately 9,428 acres (27%), are shallower ash soils or residual soils derived from basalt parent material.

The project area comprises scab stringer country with lithic scabland soils on the plateau uplands. The old basalt flow surfaces are incised with deep steep-sided drainways. Soils on these steep to very steep plateau drainages and lava flow scarps are moderately deep to deep on the northerly aspects and shallow to moderately deep on the southerly aspects. These drainway soils are derived from ash overlying or mixed with colluvium. The drain areas have collected wind- and water-eroded ash from the scablands, which have lithic soils derived from basalt. These are very sensitive areas especially along the interface between scablands and forested stringer drainways.

Infiltration in the deep ash soils is rapid but is very slow on the scablands. These edge areas provide critical buffers that help slow down and dissipate the rapid runoff from the scablands.

Scabland soils are usually clayey and rocky, and are resistant to detrimental compaction. However they are susceptible to detrimental puddling and post-holing by equipment and large herbivores. Scabland soils are classified as sensitive soils (resistant to damage when dry, susceptible when saturated).

The existing condition of the soils resource in the Upper Beaver 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 interpretation was used to determine existing soil disturbance for each unit. This unit-by-unit evaluation of existing soils condition was completed and is contained in Appendix 2 of this EIS. This unit-by-unit evaluation includes an assessment of harvest units and grapple piling units. Other non-harvest activities were not included because they are not expected to cause detrimental soil disturbance. Existing disturbance was quantified as a percentage of the total area in each activity unit.

General Description of Potential Effects

Detailed information on the impacts of project activities on soils is contained in the Soils Report. Refer to that document for in-depth discussion on potential impacts of various treatments and associated actions on soil resources.

Detrimental Soil Conditions

Detrimental soil conditions can result from compaction, displacement, and charring. Soil compaction happens when soil particles are packed together by force exerted at the soil surface; compaction increases soil density. Roads, log landings, and skid trails are areas that can be compacted during commercial timber harvest activities. Displacement is the movement or rearrangement of the soil so that normal processes are affected. Displaced soils are often loosened and are more susceptible to erosion. Soil charring can occur when concentrations of fuels are burned and the soil becomes superheated. This causes loss of organic matter and may result in hydrophobic soil conditions if waxes and resins in the surface ash layer are heated sufficiently. Typically, charring occurs on landings where large piles of slash are burned. Burning of hand and grapple piles does not typically result in enough charring to be classed as detrimental charring because of the small pile size.

The LRMP includes a standard for soil compaction and displacement in order to maintain site productivity. At a minimum, 80 percent of an activity area should be in a non-compacted/non-displaced condition within 1 year of any management activity; the standard is applied at an individual scale such as a unit of a timber sale (see the Upper Beaver Soils Report located in the project file for detailed information on soil standards).

Detrimental compaction is defined as a 15 percent increase in bulk density for residual soils and a 20 percent increase for ashy soils. Three to four passes with crawler tractors or rubber-tired skidders commonly produce this effect. The primary effect of soil compaction is reduction in porosity, which results in reduced water and air availability to tree roots. There is also increased mechanical resistance to tree root growth. Mychorrizal symbiosis has also been shown to be decreased. For these reasons, soil compaction has a negative effect on site productivity and associated resources.

The reduction in infiltration caused by soil compaction results in increased overland water flow and higher peak stream flows, which can lead to increased erosion and transport of sediment. Overland flow occurs when the infiltration rate or capacity of a soil has been exceeded by the amount of incoming precipitation or by the rate of snowmelt. Independent variables include all the soil and plant factors that influence infiltration rate, intensity and duration of precipitation, steepness of slope and whether or not the soil is frozen.

Displaced soil has an altered hydrographic function and often does not allow normal growth to occur. Displaced soils are often channelized and loosened so than they are more susceptible to erosion.

Puddling results from the breakdown of soil structure under wet conditions. Logging operations, fuels treatment and recreational activities can all puddle soils causing channelization and loss of permeability.

The volcanic ash soils of the Blue Mountains have several properties which can make erosion hazard assessment difficult. In an uncompacted state, these soils have infiltration rates often exceeding 10 inches per hour. Permeability of applied water through the ash layers is also rapid. However, because of their lack of structural development (weak granular to singular grain), they are easily susceptible to erosion in situations where water is channeled on the soil surface such as skidroads, waterbar outlets, and near road drainage structures.

Soil Tillage

Tillage is often used to decompact the soil improve infiltration, percolation, aeration and lessened bulk density. Resistance to root growth is lessened also. There are potential short term and long term effects of tillage. Short term effects may include increases in localized erosion potential before effective vegetative ground cover is established. This short term hazard can be reduced by the use of water bars and slash placement.

Tillage effectiveness varies widely with soil texture, rock content, depth, water content and type of tillage implement used. Research indicates that some mechanical method to consistently ameliorate the compacted condition is desirable and feasible especially on coarse textured soils such as ash capped soils (Geist and Froehlich, 1994). For landings constructed on coarse and medium textured soils, decompaction and decompaction plus topsoil recovery appear to be sufficient to restore productivity (Sanborn et al, 1999). Local monitoring in the past 15 years on tillage operations on the Ochoco National Forest has shown that for the average tillage implement, such as a forest cultivator or tractor mounted subsoiler, effectiveness is about 70 percent for a single pass.

Up to 20 percent of a harvest unit is composed of a dedicated framework of roads, landings and main skid trails. The area above this 20 percent is targeted for tillage treatment to mitigate for compacted soils. Estimates of tilling potential were based on soil type and slope. Unit-specific mitigations were identified where needed to ensure compliance with the soil standard. The Upper Beaver project area has a large percentage of low tillage suitability due to slope, shallow soil, or too much rock.

Harvest Activities

Ground based harvest systems have the highest potential for soil impacts and can result in exceeding soil protection standards if not carefully designed and actively monitored. Classic rubber-tired skidders and skidding crawler-type tractors are used to skid logs to landings, which are accessed by roads. Main skid trails contribute to the majority of the detrimental soil disturbance, which is largely compaction and displacement. Construction of landings creates compaction and displacement as well, and adds soil puddling and charring from landing piles. Skid trails that are placed at an average spacing of 100 feet contribute roughly 10 to 15 percent disturbance in an average unit; landings and roads add an additional 5 and 2 percent, respectively. Overall, potential for detrimental soil conditions is 17 to 22 percent for a designated ground harvest system which includes landings, skid trails and roads. This does not include any mitigation or other measures to reduce potential impacts, nor does it include existing levels of detrimental disturbance. For instance, if the disturbance for the current entry is confined to existing skid trails, landings and roads then there would be no net increase in detrimental soil conditions.

Mechanized harvest systems using feller/buncher machinery are limited to one or two passes; monitoring indicates that this level of use does not result in detrimental compaction. Based on site specific evaluations and implementation of project design elements (see Chapter 2), the net detrimental impacts would be less than 20%.

Mechanized harvest systems can increase landing size when bunched whole trees are yarded to the landing. Instead of the majority of slash being left on-site, the majority of the needles and branches on harvested trees are taken to the landing. With the larger volumes of slash, landing piles are larger.

Whole-tree yarding may increase detrimental displacement of topsoil on skid trails and increase trail width due to the sweeping action of the crowns. Whole-tree yarding can also result in a lack of roughness in the trails themselves, because few branches are left to protect the surface of the trail. On ash capped soils with heavy clay subsoils, the clay is left exposed and puddled, which has the potential to direct runoff at an accelerated rate; this effect can be mitigated by waterbarring. Whole-tree yarding eliminates the need for grapple piling after harvest and reduces incrementally the potential amount of soil disturbance when harvest and piling are considered together. Whole-tree yarding is not allowed in some sensitive areas in order to maintain higher ground cover.

No measureable detrimental effects to the soil resource are expected from commercial harvest in RHCAs. Soil disturbance that may occur is limited in scale, and of such a light intensity, that detrimental compaction or displacement is expected to be well below the Forest Plan Guideline.

Ectomycorrhizae are an important fungal component of temperate forests. These mostly symbiotic fungi species infect host species of pines and firs. The trees provide nutrients to the fungus and the fungus provides nutrients and minerals to the tree. The fine mycelial strands increase the surface area of nutrient collection and provide an important soil link for forest trees. The commercial thinning would have very little effect on these fungal associations because there would be live host tree species throughout the stand (Richards, 1987; Ingram, 1997).

Burning

Prescribed burning removes some protective organic matter, volatilizes some elements, transforms elements to soluble forms, and alters the physical, chemical, and biological properties of soils (Wells and others 1978). Until effective ground cover is re-established there is a short term hazard of additional erosion by wind and water. Fires usually create a flush of nutrients such as nitrogen, phosphorous and potassium; some carbon is retained in the form of charcoal. This flush of nutrients supports early-successional species of grass, forbs and shrubs, as well as noxious weeds and annual grass species. Fire changes the surface soil microclimate. There is additional surface heating with more convection (i.e., dust devils); which results in a drier surface condition that is often more susceptible to wind and water erosion.

Detrimental soil charring may occur when large concentrations of fuel are ignited. Detrimental charring has a negative effect on soil productivity; effects may include development of a hydrophobic layer, loss of organic material, and higher runoff rate, which can increase sediment delivery to streams.

For units with grapple piling specified, only small (less than 12 inches) diameter material would be piled, and the piles would be small in size. These factors, combined with burning under cool conditions, would result in less intense and shorter duration fires. The resulting small area of soil charring would not be considered detrimental. For grapple piling, estimated piles per acre are 5 to 6 (with an average size of 10 feet by 10 feet or 100 square feet); these are largely piled and burned on existing skid trails and landings. Since only piles are burned, soil impacts are not continuous. Piling from existing skid trails would reduce additional soil disturbance.

Landing piles are seeded after burning with an appropriately competitive grass and/or forb seed mix to reduce the potential for noxious weed establishment. In addition, there is increasing potential for utilization of landing piles. This material may be removed to fuel biomass power plants in which case the piles would not be burned on site.

Underburning has fewer effects on soils due to shorter duration and less consumption of organic material and the dispersed nature of the burn itself. These types of burns most closely emulate natural processes as to nutrient volatilization and dispersal. Very few, if any, detrimental soil impacts are expected with this treatment.

No measurable detrimental effects to the soil resource are expected from the proposed fuels treatments. Grapple piling confined to existing disturbance as specified would result in no net contribution to detrimental soil conditions. The amount of soil disturbance that may occur is limited in scale or light in intensity so fuel treatments will comply with the soil standards.

Effects

Alternative 1

Under this alternative no management actions would occur, therefore there would not be any direct effects to the soil resource. 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 activity 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 1 to 2 years due to shrinking and swelling actions of the smectitic clay.

Fuels reduction activities would not occur, thereby increasing the risk of severe fire over time. Higher fire intensities may result in increased oxidation and mineralization of nutrients such as nitrogen and potassium and ultimately may reduce site productivity (Harvey, 1991).

Effects Common to Alternatives 2 and 3

Alternatives 2 and 3 would maintain long-term site productivity. The primary impacts to soils would occur where soil is compacted, which is anticipated to occur only on designated skid trails, temporary roads and landings. Maintenance of the soil organic layer would be achieved in both alternatives. Tractor harvest operations will be on designated skid trails and landings, which are largely pre-existing due to multiple entries from prior harvest. Based on the design of the alternatives and the project design criteria (see chapter 2), soil organics, including coarse woody material (CWD), would be at levels which maintain site productivity (see soils report for specifics). Coarse woody material is defined as woody residue larger than 3 inches in diameter. Prescribed fire is an excellent method for managing CWD, charring does not interfere substantially with the decomposition or function of CWD (Graham et al, 1994).

Changes in microsite lead to changes in microbial populations as well (Page-Dumroese et al.,1991). When the forest floor is exposed through harvesting there is a sharp increase in solar radiation and an associated reduction of transpiration. The previously stable microclimate below the organic layer becomes subject to large temperature, moisture, and nutrient fluctuations.

Presrcibed burning impacts soil environments by oxidizing and mineralizing accumulated litter and soil organic matter. Timber harvest and commercial thinning cause soil compaction, which causes a decrease in soil aeration and restricts root growth and microbial activities. Ma et al. (2003) found that prescribed burning and thinning treatments changed soil respiration rate and soil environment variables, such as soil temperature, moisture, litter depth, soil total carbon and nitrogen. Microbial activities may be stimulated with an increase in N availability.

Microbiotic crusts are formed by living organisms and their byproducts creating a crust of soil particles bound together by organic materials. Chemical and physical crusts are inorganic

features, such as a salt crust or platy (vesicular) surface crusts. These crusts are more prevalent on the scabland soils and on interspaces between rocks along the edges of timbered stringers. These crusts can be disturbed by vehicle and animal hoof action. Fire can have detrimental effects on this crust but is usually not severe enough in scab areas to be of much concern (Belnap, 1997). About 41 percent of the Upper Beaver project area is scabland; existing skid trails and roads will be used in these areas to avoid creating new disturbance.

Alternative 2

Alternative 2 proposes the most harvest of the two action alternatives. This alternative has the greatest potential to increase the amount of detrimental soil compaction, displacement, and charring. This alternative has unit specific design elements identified which would ensure that all activity units meet the soil standards. Table 3-40 shows a comparison of soil disturbing activities by alternative. This alternative would create approximately 5.1 acres of additional soil disturbance due to construction of 2.8 miles of temporary roads. Implementation of this alternative would include approximately 25 to 45 acres of tillage to alleviate detrimental soil compaction. Tentative tillage is proposed in units 1, 2, 5, 9, 16, 18, 22, 27, 33, 51, 56, 58, 59, and 265. Implementation of this alternative would comply with the regional soil standards.

Table 3-40. Soil disturbing activities by alternative.

	Alt 1	Alt 2	Alt 3
Acres of Commercial Ground Based Harvest	0	2,674	2,205
Acres of Road Impacts	0	5.1	3.8
Acres of Juniper Thinning	0	2,299	2,279
Acres of Restoration Soil Tillage	0	25 to 45	25 to 45
Acres of Hardwood Treatments	0	61	27

Restoration soil tillage acres in Table 3-40 reflect an estimate of acres on which soil tillage would help to meet the soil standards on a unit-by-unit basis and reduce some of the legacy compaction in the project area. Appendix D of the Soils Resource Report identifies specific areas within units that are suited for tillage. Additional restoration work would be accomplished through road decommissioning, and scarification of log landings.

Alternative 3

Alternative 3 proposes 18 percent less harvest compared to Alternative 2. This alternative has unit specific mitigations and practices identified that would ensure that all activity units meet soil standards. This alternative would create approximately 3.8 acres of lost soil productivity due to construction of 2.1 miles of temporary road; implementation of this alternative would include approximately 25 to 45 acres of tillage to alleviate detrimental soil compaction (Table 3-40). Tentative tillage is proposed in units 1, 2, 5, 9, 16, 18, 22, 27, 33, 51, 56, 58, 59, and 265. Implementation of this alternative would comply with the regional soil standards.

Cumulative Effects

Existing detrimental soil conditions are primarily related to past harvest activities, associated fuel treatments and road building. As a whole, total detrimental soil disturbance in the project area is at approximately 10 percent. Approximately 17,000 acres in the project area have had harvest and fuel treatments conducted with ground-based equipment since 1970. It is estimated that detrimental soil disturbance ranges from 15 to 35 percent in stands treated since 1970. Additional disturbance occurred before 1970 but is not included in the above estimate. Soil compaction that occurred before 1970 has been partially restored (especially on thinner soils) through annual freeze/thaw cycles and natural soil processes. Soil disturbance resulting from past activities has been incorporated into the existing condition analysis of the soil resource discussed previously. Recent Forest monitoring results (see Appendix D of the Soil Resource Report) show that detrimental soil conditions can be kept within Forest Plan Sandards using ground-based

equipment with the incorporated design elements (see Chapter 2, Design Criteria) and utilizing tillage opportunities.

Historic over-grazing by livestock resulted in impacts to effective ground cover, bank stability and infiltration, resulting in high levels of sheet/rill erosion and channel erosion in some locations. As documented by Buckley (1992), most of the impacts occurred in the 20 to 30 years before 1900. The main stems of Wolf, Heisler and Whitney creeks have been impacted also. Formerly hydric soils have been drained and the creek drainages have been channelized. Large amounts of sediment have moved and are moving from these areas, making these areas more vulnerable to soil impacts from project activities. Detrimental soil conditions occur in areas where livestock congregate, such as around water sources, bedding areas, salting areas, trails along fences, and at pasture corners. Soils in these areas are less productive because of detrimental compaction, displacement, post holing, bank sloughing and trampling.

Recent revised timing and rotation of grazing in the Wind, Heisler and Wolf Allotments will increase the recovery rate of soil productivity in these areas. Changes to be included in new allotment management plans are intended to improve livestock management and should improve upland range conditions and promote recovery of riparian vegetation. These changes in vegetative cover should result in reduced surface erosion in the uplands and improved ability of riparian areas to filter and store sediment. Refer to the Aquatics Species and Water Quality sections for more information on the interaction between soil, turbidity and aquatic habitat.

Historic road development has added an estimated 1 percent to overall soil disturbance. Road Maintenance has short term effects to soils but helps prevent the magnitude of long term impacts.

American beavers historically helped maintain the functional nature of riparian systems by slowing the flow, increasing roughness, trapping sediment, storing water, providing pool habitat and maintaining riparian hardwood associations. They have been trapped for their fur and to drain the boggy areas. Their absence has allowed increased access to riparian areas by large ungulates, and has reduced extent of floodplains associated with riparian areas. There is currently a trapping moratorium on beavers on the Ochoco National Forest which has been in effect for more than a decade. This has helped populations re-establish in a few areas, but the limited abundance of riparian hardwoods in the area limits potential for population expansion.

Treatment of noxious weed populations helps reduce invasion and colonization of undesirable weed species, many of which limit the re-colonization of disturbed sites by desirable natives or native cultivars. Noxious weed control may help to reduce soil erosion, thus promoting recovery on sites that sustain soil disturbance as a result of project activities.

Numerous headcuts have been repaired with some short term increase in soil disturbance, but have reduced long term bank erosion and loss of site productivity.

Hydrology

Stream Shading and Water Temperature

Topography and vegetation are the primary factors that regulate the amount of solar radiation that reaches a stream. A stream that is situated in a narrow valley bottom with adequate riparian vegetation adjacent would be adequately shaded and would have relatively low stream temperatures compared to one that is situated in a wide valley bottom with sparse vegetation.

Reductions in solar input resulting from shading are a primary factor affecting stream temperature. Shade functions generally occur within 100-200 feet of the channel (Beschta et al. 1987). Changes in channel geomorphology and the resultant effects to the adjacent riparian habitat that provides the shade can have a profound effect on stream temperatures. The loss of bank stability and riparian vegetation from stream erosion and disturbance by livestock can cause

many of the stream reaches to widen thus increasing the width to depth ratio. A high width to depth ratio spreads water out over a larger surface area; allowing stream water to heat up more readily during the summer and freeze more easily during the winter.

Down cutting and entrenchment of streams has an effect on stream temperature. The entrenchment causes the wetted perimeter to shrink which in turn results in the lowering of the existing water table. A lowered water table can affect the timing and duration of the lower summer flows and lead to increased water temperatures. It can also make it difficult or impossible for established riparian vegetation to acquire water from this new depth. Consequently, entrenchment can alter riparian hardwood shrub communities and promote the encroachment of conifers and other dry-site-adapted plants (Leenhouts, 2006). A reduction in riparian vegetation can reduce the shade that normally would help to keep stream temperatures low during the warm summer months. In addition the disconnection to the natural floodplain increases the energy of flows with increased opportunity for changes to the channel morphology.

Historically, cool groundwater was a major component for base flow during summer months. Lowering of the water table can reduce the amount of groundwater that can be stored during the spring recharge. When the total amount of groundwater available for base flows has been reduced, streams tend to dry out and temperatures increase earlier than before the entrenchment occurred.

The Clean Water Act of 1972 (CWA) requires that each state develop water quality standards. The State standard for stream temperature is defined as the average daily maximum during seven consecutive days that exceed 64.4 degrees Fahrenheit (ODEQ, 2008).

Section 303(d) of the CWA requires that a list be developed of all impaired or threatened waters within each state. The ODEQ is responsible for compiling the 303(d) list for the State of Oregon, assessing data, and submitting the 303(d) list to the Environmental Protection Agency (EPA) for federal approval. The state standard (Oregon Water Quality Standards (OAR) 340-041-0002(56) and 340-041-0028(4)(c)) indicates the 7-day-average maximum temperature of streams identified as having salmon and trout rearing and migration should not exceed 18.0 degrees C (64.4 degrees F). No measurable increase in water temperatures, except in accordance with water quality standards, may result from management practices in the Upper Beaver project area on streams over the state water temperature standard threshold.

The LRMP uses shade along streams as a surrogate for stream temperature. The requirement for shade along stream will generally correspond to providing more than 80% of the surface shaded. Where this can not be attained, 100% of the potential for shade is the standard (USDA 1989). INFISH later set a Riparian Management Objective (RMO) that states “No measurable increase in maximum water temperature (7- day moving average of daily maximum temperatures measured as the average of the maximum daily of the warmest consecutive 7-day period)” and “Maximum water temperatures below 59 degrees Fahrenheit within adult holding and below 48 degrees within spawning and rearing habitats” (USDA 1995).

Shade and width to depth ratio correlate with stream temperatures. The LRMP standards say that shade values are not met when the percentage of shaded surface is below 80% (or 100% of the potential when 80% shaded surface is not attainable). The INFISH RMO is exceeded when the width to depth ratio is greater than 10 (USDA 1995).

Existing Condition

The Upper Beaver Creek project is located on the east end of the Ochoco Mountains on the Paulina Ranger District. There are two 5th field watersheds located within the project area, Upper Beaver Creek and Lower Beaver Creek. The watersheds are part of Deschutes Basin.

Upper Beaver Creek Watershed drains approximately 62,252 acres. It contains four 6th field subwatersheds, North Fork Beaver Creek (14,918 acres), Beaverdam Creek (16,885 acres),

Powell Creek (20,097 acres), and Sugar Creek (10,352 acres). North Fork Beaver Creek is not located on National Forest System lands and will only be discussed briefly. There are 261 miles of streams in the Upper Beaver Creek Watershed. Of this total, 141.8 miles (54%) are located on the Ochoco National Forest, 105.2 miles (40%) are on private lands and the remaining 14 miles (6%) are located on BLM land. The percentages of the total length of perennial stream in the three watersheds within National Forest Lands are:

- Sugar Creek -- 47%,
- Beaverdam -- 46%, and
- Powell Creek -- 42%.

The upper reaches of Upper Beaver Watershed are entrenched (Rosgen A) or moderately entrenched (Rosgen B) channels. The Rosgen A channels are characterized by a steep confined channel, gradients ranging from 4-10%, with low sinuosity, and have little to no flood plain present. The Rosgen B channels are less steep (2-4%) but still have low sinuosity, and little or no floodplain. Sediment transport potential of these types of streams is high. These channel types are seen as typical steep headwater channels. The mid to lower reaches are typified by Rosgen B and C Type channels. The Rosgen C channels are characterized by shallow slope (<.2%) an increase in sinuosity and a well developed flood plain. These channel types are seen as typical broad valley reaches (USDA 2004). Downstream, on private and BLM lands, the sinuosity increases with narrow and deeper channels. On private lands these channels have been altered by farming and ranching activities.

Lower Beaver Creek Watershed drains approximately 81,413 acres of land and contains four 6th field subwatersheds, Alkali (26718 acres), Drift Canyon (20,759 acres), North Wolf (12,411 acres) and Wolf Creek (21,525 acres). Wolf Creek has a limited amount of activity proposed. It amounts to only 379 acres (about 2% of the watershed) and would have no activities within RHCAs. Alkali and Drift Canyon are not located on National Forest System lands and will only be discussed briefly.

The major source of water to the yearly stream flow regime in the project area is winter snow pack. Over 95% of the total precipitation that falls during the year is in the form of snow. The peak flows and recharge of the aquifers occur from springtime snowmelt runoff (April to early June). The duration and amount of runoff and recharge is highly variable. It is determined by the rate of melt and the depth of the upper elevation snow pack. During the summer, the base flow is primarily from groundwater discharge. Since the soils are shallow and do not store a lot of water, by the end of summer most of this flow is depleted. This causes some of the lower reaches to become intermittent or completely dry up. Occasionally there are localized, short-duration high-flow events during the summer caused by thunderstorms.

Stream temperature monitoring has occurred throughout the project area. Table 3-41 displays the shade for all class one through three streams, while Table 3-42 lists stream temperatures. Table 7, under the sediment delivery sections, lists the width to depth ratios. In general, streams that have more than one years worth of shade data collected have had an increase in the amount of total shade; the exception is Wolf Creek, where shade was reduced. This is most likely due to conifer encroachment in riparian areas that have dried out due to the lowering of the water table. All of the major streams (Sugar, Powell, Wolf and Beaver Dam Creeks) within the project area are 303(d) listed for exceeding the temperature standard.

Table 3-41. Percentage of shade for Upper Beaver watersheds.

Stream Name	Average Shade	Miles surveyed	% Hardwood Shade Min	% Hardwood Shade Max	Average % Hardwood Shade	% of total Shade measurements greater than zero	Year
Bellworm	41	.57	-	-	7.4	23	2008
Beaverdam	24	2.5	-	-	-	-	1976
Beaverdam	20	9.5	-	-	-	-	1979
Beaverdam	45-53	7.16	-	-	-	-	2005
Beaverdam	58	-	-	-	-	58	2008
Heisler	30	1.5	-	-	-	-	1976
Heisler	28	6.35	-	-	-	-	1993
Heisler	52	5.6	0	35	0.4	3	2008
Powell	13	4.2					1979
Powell	55	6.9					1993
Powell	60		0	5	0.2	7	2008
Rager	13	2.5	-	-	-	-	1979
Rager	55	6.9	-	-	-	-	1993
Rager	58		0	74	10	35	2008
Sugar	19	8.3	-	-	-	-	1979
Sugar	19	unknown	-	-	-	-	2005
Sugar	79	4.2	0	100	16	47	2008
Tamarack	14	-	-	-	-	-	1979
Tamarack	56-64	3.9	-	-	-	-	1993
Tamarack	70	-	0	87	13	32	2008
Wolf	39-59	2.8					1989
Wolf	28-35	3.6					2005

Table 3-42. Maximum 7-day average stream temperatures.

Stream	Maximum 7-Day Average Temperature (°F)								
	1995	1996	1997	1998	1999	2000	2001	2002	2003
Beaverdam	64.22	66.38	-	-	81.86	-	-	74.66	-
Powell	76.64	71.96	63.86	-	-	-	-	87.98	-
Rager	-	71.24	68.18	70.88	67.82	70.52	-	71.78	73.03
Sugar	-	65.12	63.68	65.48	-	-	-	-	71.96
Tamarack	68.36	69.98	67.64	-	67.64	-	-	-	-
NOTE: As reflected in the following narrative, some of these streams are intermittent during the summer low flow periods and the high temperatures might be a reflection of isolated pools with very little groundwater influence (i.e. cool water).									

The following discusses individual streams by sixth order subwatersheds in more detail.

Sugar Creek Subwatershed

Dutchman Creek

Dutchman is an intermittent creek that flows during the spring snow melt; it runs along the Forest Road 58 until it converges with Sugar Creek by the Sugar Creek campground. Temperature is not a concern because Dutchman Creek does not flow during the summer.

Sugar Creek

In 1989, the average width to depth ratio was greater than the RMO of 10. No values for width to depth were taken in 2000 but it was noted that the stream was narrower and deeper in the lower reaches and wider and shallower in the upper reaches.

In 2005 a Proper Functioning Condition Assessment was done on 5 reaches (BLM 2003). The results were that four (80%) of the reaches were Functional-At Risk. The remaining reach was in a Proper Functioning Condition (USDA 2009).

Shade data were collected in 2008; the average shade value for Sugar Creek was 79%, which is just below the RMO value of 80%. There were pockets of hardwood ranging in percentage from 10%-100% (average 28%) scattered through the second reach. Sugar Creek is currently on the 303(d) list for temperature.

Powell Creek Subwatershed

Bellworm Creek

Bellworm Creek is a small tributary to Rager Creek near the Rager Ranger Station. The first 1.1 miles of the stream were surveyed in 2002, determining that the creek is a Rosgen A type confined channel. The stream flows through a canyon that is well armored, which eliminates lateral scour and keeps the width to depth ratio low and close to the threshold value found in the RMO. Cut banks also fall within the acceptable range due to the armoring of the banks. Shade is the only value that does not meet LRMP standards. No temperature monitoring has been done because the stream is dry or intermittent during the summer months. Riparian vegetation is not abundant, but the fairly low width to depth ratio and the presence of several springs may reduce water temperatures.

Powell Creek

Powell Creek was surveyed in 1993, 2001, and only for shade in 2008. Shade and width to depth ratio RMOs were not met during this time period; Powell Creek is currently on the 303(d) list for temperature.

Rager Creek

Rager Creek was surveyed in 1993, 2000 and for shade in 2008. In 1993 the lower reach did not meet the RMO for shade but did meet the width to depth ratio. In 2000 the width to depth ratio was met and shade had improved but was still below the RMO. In 2008, shade had again improved but still did not meet RMO. Existing shade is primarily provided by conifers rather than hardwoods. Rager Creek is currently on the 303(d) list for temperature.

Tamarack Creek

Tamarack Creek was surveyed in 1993, 2001, and 2007 and for shade in 2008. Percent shade was below the RMOs (60% in 1993, 64% in 2008). A Proper Functioning Condition assessment was done in 2005. Six reaches were surveyed; two were Proper Functioning Condition, three were Functional –At Risk, and one was Nonfunctional.

The width to depth ratio was > 10 in 1993 and 2007. Elevated temperatures within these reaches are a concern because of the lack of shade and the widening of the stream channel. Tamarack Creek has not been 303(d) listed but temperature monitoring indicates that listing might be warranted.

Beaverdam Creek Subwatershed

Beaverdam Creek

In 2005, Beaverdam Creek had six miles of survey and a PFC assessment completed. The results of the survey indicated that all three (shade, width to depth, cut banks) of the major habitat features listed in the RMO that contribute to increased stream temperature were exceeded. Proper Functioning Condition was assessed on three reaches. One reach was in a Proper Functioning Condition, one was Functional –At Risk and the third was Nonfunctional. The average width to depth ratio was >10, average total shade was 50.3%, and an average of 65.1% of the banks were unstable. In some reaches, entrenchment of the channel has moved it from a historical C type channel to a G or F type channel (Rosgen 1996). In some reaches, Beaverdam Creek is widening, has very little shade and little bank stability to keep the lateral scouring in check. In other reaches, active headcuts are migrating upstream, entrenching the channel, simplifying the geomorphology

and transporting sediment downstream. Sediment deposits are increasing the width to depth ratios. Beaverdam Creek is currently on the 303(d) list for temperature.

Heisler Creek

Heisler is a tributary to Beaverdam Creek. A survey on 5.5 miles of the stream was completed in 1997. Again the width to depth ratio was > 10 and the total shade 52% did not meet RMO standards. The amount of unstable banks was not as high as Beaverdam Creek and did not exceed the RMO. As in Beaverdam Creek there are reaches that are wide with very little riparian vegetation to help shade them and reaches in which active headcuts are downcutting the channel, lowering the water table and reducing the wetted perimeter where riparian vegetation can exist. Temperatures would be a concern if the stream flowed year round, but it is intermittent during the summer months.

Wolf Creek Subwatershed

Wolf Creek

Wolf Creek was surveyed for shade in 1989 and again in 2005. The range for shade was reduced from 39-59% in 1989 to 28-35% in 2005 indicating a large loss of riparian vegetation. The percentage of unstable banks in 2006 was not above the RMO. In both 1989 and 2005 the average width to depth ratios were 21 and 23 respectively. These are within the range for a C type channel. Wolf Creek is currently on the 303(d) list for temperature.

The Upper Beaver Vegetation Project Hydrology Report contains additional information on 303(d) listed streams, stream shading, and temperature (see the project file located at the Paulina Ranger District).

Effects

Alternative 1

There would be no reduction in shading from this alternative and no increase in water temperatures in the short term. Existing shade would be retained and would likely increase in some stands with potential for canopy expansion. Canopy expansion is also expected on portions of 303(d) listed streams. Thus solar exposure would not be increased and there would not be a measurable increase in water temperature in the short term.

Many RHCAs are over-dense in conifer cover and/or lack species composition (hardwoods) and age class of vegetation necessary to restore riparian condition. The current basal area exceeds historic levels in many stands, which is creating conditions for increased mortality due to stress, insects and disease. Susceptibility to insects, disease, and high intensity wildfire would continue to increase (see sections on forested vegetation (natural disturbance agents) and fire and fuels in Chapter 3 of this document, as well as Forested Vegetation and Fuels Specialists' Reports located in the Upper Beaver project file, Paulina Ranger District). If a large scale high intensity fire was to occur, increased solar input to streams would result from decreased shade. Increases in water temperature would be proportional to the amount of canopy lost, the distance to the stream and the aspect. The effect would be most pronounced in confined valleys with dense understory. Increased water temperatures that could be triggered by future disturbance events would be offset to some degree by increased stream flows due to decreased evapotranspiration and interception and increased snow accumulation. While high intensity fire would have other adverse effects (such as sediment delivery), loss of shade on seasonal or intermittent streams would not have much effect on summer maximum stream temperatures. Summer maximum stream temperatures would be more likely to be affected if high intensity fire were to occur within stands that shade perennial streams. It is difficult to predict the time or the scale and intensity at which event(s) might occur, but it is expected that future fires would be larger and more intense than what

happened historically due to increased ladder fuels and higher fuel loadings (see the section titled "Fire and Fuels" in Chapter 3 of this document).

Effects Common to Alternatives 2 and 3

The primary shade zone is important because the greatest solar loading (58% of the total amount falling on the stream) happens between the hours of 10:00 a.m. and 2:00 p.m. This is the most critical time for maintaining stream temperature. The secondary shade zone is the vegetation that shades the stream from 6:00 a.m. to 10:00 a.m. and from 2:00 p.m. to 6:00 p.m.; each period represents 21% solar loading (NWFP 2005, Pg. 21). Table 3-43 identifies primary shade zone width in the Upper Beaver project area (for more information, see the Hydrology Specialist's Report, Project File, Paulina Ranger District).

Table 3-43. Minimum width of primary zone (feet) based on slope and tree height used for Alternatives 2 and 3.

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	50	55	60
Taken from "Northwest Forest Plan Temperature TMDL Implementation Strategies" Final September 9, 2005 publication developed by the United States Forest Service and the Bureau of Land Management.			

Using Table 3-43 as a guide, a field review of the proposed units with RHCAs was done. The slopes were determined to be less than 30% and the largest trees were > 60 feet tall. A conservative estimate of the primary shade zone was determined to be 50 feet from the stream. Two different treatments are being proposed depending on which class of stream is present within the unit (see Figures 2-1 and 2-2 and Tables 2-1 and 2-2 for Alternative 2; Figures 2-3 and 2-4 and Tables 2-4 and 2-5 for Alternative 3; figures and tables are located in Chapter 2 of this document).

Because the trees that are proposed for removal in RHCAs are below the upper canopy, the primary shade zone in RHCA units would not be affected by activities proposed in Alternatives 2 and 3 in the short term, or at most an immeasurable change would occur for up to five years after treatment. In the long term, health and resiliency of the primary shade zone would be improved by decreasing stand density. The remaining trees would be more resilient to natural disturbances such as drought, wildfire or insect outbreaks (see Forested Vegetation, Chapter 3 of this document).

Alternative 2

Alternative 2 proposes 220 acres of commercial thinning in RHCAs. Of these acres 72% are along class I and II streams and 28% are located adjacent to class III and IV streams (see Tables 2-1 and 2-2, Chapter 2). Units 2, 3, and 5 are located along the main stem of Sugar Creek and unit 356 is located on an unnamed tributary to Sugar Creek, all within a Class I RHCA on a 303(d) listed stream. Units 22, 51, 55, and 57 are located along the main stem of Beaverdam Creek and units 30 and 46 are located along the main stem of Rager Creek, all within a class II RHCA on a 303(d) listed stream. Surveys of these RHCAs found that they were on flat ground or the area to be harvested had a bench away from the active channel. Commercial harvest in these units would be accomplished using a tractor logging system. Using the RHCA treatment prescriptions for class I and II as proposed, the primary shade zone should be unaffected. These activities would not reduce shade on fish-bearing streams or non-fish-bearing perennial streams; therefore, there would not be any decrease in overall shade and subsequent increase in stream temperature.

There would be about 1,037 acres of precommercial and hardwood thinning in Class I, II, and III RHCAs. Precommercial thinning within RHCAs occurs in RHCAs for 303(d) listed streams. In

the Beaver Dam Creek RHCA, precommercial thinning would occur in Units 22, 51, 55, 69, 133 and 217 and hardwood thinning would occur in Unit 346. In the Powell Creek RHCA, precommercial thinning would occur in Units 9, 191, 209, 210, 211, 249, 272, and 299. In the Rager Creek RHCA , precommercial thinning would occur in Units 45, 98, 225, 239, 245, and 312. In the Sugar Creek RHCA , precommercial thinning would occur in Units 2, 6, 264, and 304. The height of trees, at various slopes and distances that provide shade during the period when peak temperatures occur, were calculated. Thinning protocols were developed from this for fish-bearing and perennial nonfish-bearing streams and checked using a solar pathfinder. Only trees that do not provide 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; however, some shade would be maintained in Class IV. Shade monitoring of precommercial thinning within Class I and II RHCAs in 1998 found less than a one (1) percent change in shade readings when compared to shade readings taken prior to thinning (Fontaine 1998). Precommercial thinning would not reduce shade on streams, including 303(d) listed streams. There is a risk of conifer thinning in aspen stands reducing shade for a short time (up to 6 months); however, water temperatures would still meet state standards.

There is a risk of prescribed fire reducing shade for a short time (up to 6 months); however, there should not be any measurable increase in water temperatures. Short-term increases in temperature (up to 6 months) are allowed even on streams over threshold during activities designed to restore riparian vegetation (OAR 340-041-002(56) and 340-041-0004(5)(a)). Prescribed burning would occur within the RHCAs for 303(d) listed streams. Along Beaver Dam Creek, burning would occur in Units 22, 55, 69, 72, 105, 133, 134 and 163. Along Powell Creek, burning would occur in Units 9, 81, 191, 249, 272 and 299. Along Rager Creek, burning would occur in Units 98, 122, 225, 239, 245 and 312. Along Sugar Creek burning would occur in Units 2, 6, 257, 260, 262, 264, and 304. Burning would be accomplished when moisture conditions favor a low-intensity burn, which would result in a mosaic of burned and unburned vegetation. Prescribed fire would not be ignited within 50 feet of stream channels, although fire would be allowed to burn within this 50-foot buffer (see design criteria, Chapter 2 of this document). Approximately 8 percent of the RHCAs on fish-bearing streams and 92 percent on perennial non-fish bearing streams are in units with prescribed fire. It is estimated that 20 percent of the area in the RHCA would burn with most of this being at low intensity and further away from the stream. There would not be any measurable increase in water temperatures on perennial streams. 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 project area.

There would be no measurable temperature change on any of the Class I-III streams, including 303(d) listed streams, under Alternative 2. Activities proposed in RHCAs, including RHCAs for 303(d) listed streams, are designed to promote attainment of RMOs over time. Thinning conifers would increase the growth rates of residual conifers and hardwood and broadleaf species such as aspen, cottonwood, alder, and willow. Hardwood and broadleaf species are expected to increase in vigor and would provide additional shade. Increasing the growth rates of residual conifers would promote development of large trees that would become future large wood. As the amount of large woody material in streams increases over time, it would result in more pools which would help lower water temperatures.

The resulting RHCAs would have trees that are more resilient to catastrophic wildfire, drought, and insect damage. The trees that are left would have less competition and would be able to grow faster to increase the potential for large wood recruitment for the stream and increase the shade potential.

Alternative 3

Alternative 3 has reduced the RHCA harvest treatments proposed in Alternative 2 by 93%; commercial thinning is proposed on 14 acres of RHCA. Of these acres, 10 are adjacent to class I and II streams, and 4 acres are located adjacent to class III or IV streams. Only unit 3, located along the main stem of Sugar Creek, will have acres within a class I RHCA. There are 3 units within class II RHCAs: units 30 and 46 are located along the main stem of Rager Creek and unit 51 is located along the main stem of Beaverdam Creek. These RHCAs were surveyed; they are on flat ground or the area proposed for harvest has an associated bench keeping management activities away from the active channel. Therefore, there will not be any decrease in overall shade and subsequent increase in stream temperature.

The only commercial harvest within an RHCA on a 303(d) listed stream is in Unit 3 along Sugar Creek. Commercial harvest in this unit would be accomplished using a tractor logging system. Commercial harvest would only occur in the outer 250 feet of the 300-foot RHCA outside of the primary shade zone and would not reduce shade.

There would be about 990 acres of precommercial and hardwood thinning in Class I, II, and III RHCAs. Precommercial thinning within RHCAs occurs in RHCAs for 303(d) listed streams. In the Beaverdam Creek RHCA, precommercial thinning would occur in Units 22, 55, 69, 133 and 217 and hardwood thinning would occur in Unit 346. In the Powell Creek RHCA , precommercial thinning would occur in Units 67, 187, 189, 191, 209, 210, 211, 249, 272, and 299. In the Rager Creek RHCA, precommercial thinning would occur in Units 15, 45, 98, 202, 221, 225, 239, 245, and 312. In the Sugar Creek RHCA, precommercial thinning would occur in Units 6, 257, 262, 264, and 304. The heights of trees, at various slopes and distances that provide shade during the period when peak temperatures occur, were calculated. Thinning protocols were developed from this for fish-bearing and perennial nonfish-bearing streams and checked using a solar pathfinder. Only trees that do not provide 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; however, some shade would be maintained in Class IV. Shade monitoring of precommercial thinning within Class I and II RHCAs in 1998 found less than a one (1) percent change in shade readings when compared to shade readings taken prior to thinning (Fontaine 1998). Precommercial thinning would not reduce shade on streams, including 303(d) listed streams. There is a risk of conifer thinning in aspen stands reducing shade for a short time (up to 6 months); however, water temperatures would still meet state standards.

There is a risk of prescribed fire reducing shade for a short time (up to 6 months); however, there should not be any measurable increase in water temperatures. Short-term increases in temperature (up to 6 months) are allowed even on streams over threshold during activities designed to restore riparian vegetation (OAR 340-041-002(56) and 340-041-0004(5)(a)). Prescribed burning would occur within the RHCAs for 303(d) listed streams. Along Beaverdam Creek, burning would occur in Units 22, 55, 69, and 133. Along Powell Creek, burning would occur in Units 191, 249, 272 and 299. Along Rager Creek, burning would occur in Units 98, 122, 225, 239, 245 and 312. Along Sugar Creek, burning would occur in Units 6, 257, 260, 262, 264, and 304. Burning would be accomplished when moisture conditions favor a low-intensity burn, which would result in a mosaic of burned and unburned vegetation. Prescribed fire would not be ignited within 50 feet of stream channels, although fire would be allowed to burn within this 50-foot buffer (See design criteria in Chapter 2 of this document). Approximately 16 percent of the RHCAs on fish-bearing streams and 84 percent on perennial non-fish bearing streams are in units with prescribed fire. It is estimated that 20 percent of the area in the RHCA would burn, with most of this being at low intensity and some distance from the stream. There would not be any measurable increase in water temperatures on perennial streams. 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 project area.

There would be no measurable temperature change on any of the Class I-III streams, including 303(d) listed streams, in the project area under Alternative 3. Activities proposed in RHCAs, including RHCAs for 303(d) listed streams, are designed to promote attainment of RMOs over time. Thinning conifers would increase the growth rates of residual conifers and hardwood and broadleaf species such as aspen, cottonwood, alder, and willow. Hardwood and broadleaf species are expected to increase in vigor and would provide additional shade. Increasing the growth rates of residual conifers would promote development of large trees that would become future large wood. As the amount of large woody material in streams increases over time, it would result in more pools which would help lower water temperatures

Cumulative Effects

Past logging, road construction, and grazing have reduced shading in the project area and their effects have been incorporated into the affected environment section. This has been offset in some drainages by increased shading from dense overstocked stands of conifers. No reduction of shading on fish bearing and perennial non-fish-bearing streams is expected as a result of the proposed timber harvest or precommercial thinning. Possible short term reductions in shade resulting from conifer thinning in aspen and cottonwood stands and prescribed fire are not expected to produce any measurable increases in temperature.

Two timber sales; Sugar Creek and Runway, have occurred since 2004. These two sales included approximately 90 acres of commercial thinning in stands of primarily young ponderosa pine (see Forested Vegetation report, project file). In the Sugar Creek Sale Area, a 50-foot no-equipment and cutting zone was established within the Class I RHCA; this was determined to be the primary shade zone. The area between 50-100 feet from the stream was determined to be the secondary shade zone; individual trees were chosen by specialists, and 50% canopy closure was maintained so that shade reduction from the secondary shade zone was minimized.

All precommercial thinning was accomplished by hand felling and handpiling. All of the commercial cutting used a feller-buncher that was kept to the roads as much as possible to reduce any soil compaction and disturbance.

The Runway Sale included a class IV RHCA. There was no commercial harvest done in the RHCA, but precommercial thinning was accomplished. Commercial harvest that was done in the unit that included the RHCA used existing landings and roads that were reopened for the sale. All harvest activities were done when the soil conditions were dry to reduce any ground disturbance.

The project area contains all or parts of five grazing allotments. The Bearskull/Cottonwood, Heisler, Wind Creek, and Wolf Creek Allotments were established in 1957 . A new NEPA decision as issued for the allotment management plans for the Wolf and Heisler Allotments (5/2009). The updates to these allotments will be implemented in the 2009/2010 summer grazing seasons. It is reasonably foreseeable that changes in livestock grazing will result in improved channel condition because of activities such as moving water troughs out of riparian zones, fencing or enlarging exclosures at spring source areas of water developments, and developing more water sources in the uplands. In addition there will be an improvement in riparian condition due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT 2000). Studies in the intermountain region (Clary 1999) indicate that the height of grasses and forbs that are to be left in key riparian areas indicate a level of grazing that allows a corresponding recovery of palatable woody vegetation. Bank stability and channel geometry interact with vegetation but may respond differently, depending on the extent of continued mechanical disturbance in the channel and the current channel condition. See range report for monitoring the allotments located in the Upper Beaver Project Area.

Although the increased amount of hardwoods within the RHCAs may attract livestock, especially in Alternative 2, given the relatively small amount of acres treated, their spatial disconnection from one another, leaving thinning slash in strategic places, and with improved livestock management, experiencing increased resource damage is unlikely.

Sediment

Existing Condition

It is estimated that much of the sediment in the streams in the Upper Beaver Creek Subwatershed is coming from in-channel erosion such as bank erosion, head cuts, and channel scour. Streambank and in-channel erosion within the Upper Beaver Creek Watershed can be attributed to several factors including road construction, undersized culverts, timber harvest, motorized recreation, and cattle grazing. Potential increases from in-channel sources resulting from harvest and natural disturbance induced increases in runoff are analyzed by the Equivalent Harvest Area (EHA) model and are discussed in the next section.

The majority of the land (79%) that the watershed drains has a slope between 0-15%. Another 19% is less than 30% and the remaining 2% is greater than 30 %. (USDA 2004). The watershed contains large amounts of soils (54%) that rate as moderate or highly erosive. These areas adjacent to steep confined channels increases the sediment potential especially in the upper parts of the watersheds. As the gradient decreases this material will be deposited causing changes to the geomorphology of the stream.

The sediment load within a stream has a suspended and a bedload component. During spring run off unstable banks are continually eroded due to the lack of riparian vegetation whose roots would help to stabilize the banks against the increase in streamflow caused by past management activities. The high percentage of cutbanks, the active headcuts (entrenchment) and the lateral scouring of the stream, as indicated by the high width to ratios, are indications that the suspended portion of the sediment load is primary process causing changes to the types of channels.

Widening of the stream reduces the stream's power and in turn reduces the size of the particles that can be transported through the reach. As a result, more material becomes deposited. This increases the width to depth ratio by reducing the depth of the reach. In addition, more lateral scour takes place on the stream banks that have lost the armoring from the lack of riparian vegetation.

Stream surveys indicate that average cutbank disturbance values are the highest on Beaverdam, Powell, and Bellworm Creeks. Heisler, and Sugar Creeks also have reaches that are also relatively high (>30%) although overall values are within Forest Plan values. The width to depth ratios are > 10 on Beaverdam, Heisler, Powell, Sugar, Tamarack. All of the streams in the Upper Beaver Watershed exhibit increased sediment transport and deposition. On streams where multiple years surveys were done such as Powell Creek in 1979 to 2001, there is an increase in the amount of cutbank disturbance values from 6 to 50%. (See Table 3-44).

Table 3-44. Stream Survey data of cutbank and width to depth ratios.

Stream Name	% average Cutbank Disturbance (min,max)	Miles Surveyed	Width to depth ratio	Year Surveyed
Beaverdam	22 (4-59)	2.5	-	1976
Beaverdam	11 (0,50)	9.5	-	1979
Beaverdam	65	6	19.8	2005
Bellworm Canyon	14 (0,75)	0.7	11	2002
Heisler	10 (2-33)	1.5	-	1976
Heisler	1 (0,30)	5.6	28.6	1997
Powell	6 (0,15)	4.2	-	1979
Powell	14 (1,47)	6.9	-	1993
Powell	50	5.8	21.1	2001

Stream Name	% average Cutbank Disturbance (min,max)	Miles Surveyed	Width to depth ratio	Year Surveyed
Rager	3 (0,5)	2.5	-	1979
Rager	0-5	Unknown	-	2005
Sugar	10 (0,50)	8.3	13.2	1979
Sugar	0-50	Unknown	-	2005
Tamarack	4 (0,6)	3.8	-	1979
Tamarack	9 (1,28)	3.9	-	1993

Roads that contribute to major erosion have one or more of the following features: steep grades, insufficient drainage structures, native surface materials in areas of erosive soils, dust caused by vehicle traffic on some road surfaces, and rutting caused by vehicle use during wet or saturated conditions (Gucinski et. al 2001). Poorly located or maintained roads show signs of increased surface erosion with active sheet, rill and gully erosion occurring during runoff events. Large storm events may cause erosion at roads sites that normally do not have problems. Other contributing factors include lack of maintenance, natural events such as slides or fire, and cumulative effects from several factors. Most notably are Forest Roads 5800-120 and 5800-200 that continue to show signs of erosion and are ongoing concerns as they both cross several streams.

Depending on where the roads are located on the landscape has a profound effect on the effects to water quality. Roads in RHCAs are expected to contribute the most toward stream channel and water quality degradation, as they are generally close enough to streams to alter surface flow routing and influence water quality (primarily affecting turbidity and sedimentation) (Gucinski et al., 2001).

Approximately 11% of the total miles of roads within the watershed are located within RHCAs and roughly 85% of the 22.6 miles of road within RHCAs are currently open. A relatively high concentration of roads within RHCAs exist within Sugar Creek (primarily Forest Road 5810), the headwaters of Powell Creek (Forest Road 5820, 5820-100, and 5810-307), the headwaters of Tamarack Creek (Forest Road 5820, 5800-131, 5830-105, and 5830-190), Bellworm Canyon (Forest Road 5800-201), Rager Creek (Forest Road 5830, 5830-130, 5830-140, 5830-150, 5830-200, and 5830-203) and Beaverdam Creek (Forest Road 5840, 5840-200, 5840-600, and 5840-700). Many roads have been closed within the watershed and many of the impacts from roads are believed to have occurred in the past.

Undersized culverts typically increase water velocities and in-channel scour. Stream channels associated with undersized culverts and roads that are located on the floodplain generally exhibit downcutting and/or lateral scour. This is primarily due to the concentration of higher flows within a smaller floodplain area which produces higher boundary sheer stresses on banks. The result can be a change in channel morphology (pattern, profile, and dimension) and continues until the stream re-achieves a new equilibrium or the pipe is replaced. (Castro 2003).

Undersized culverts have been replaced over the past decade in Rager, Beaverdam, Tamarack, Powell, and Sugar Creeks, however, there are additional undersized culverts yet to be fixed. These include, but are not limited to, stream crossings on Sugar, Tamarack, Powell, Beaverdam (Crook County jurisdiction), and North Fork Crooked River (Crook County jurisdiction).

Oregon State water quality standards require that turbidity levels not cumulatively increase by more than ten percent as a result of any proposed activities (relative to a control point immediately upstream). The Forest Plan mandates that this will be accomplished by maintaining streambank stability (since bank erosion is often the most significant contribution to higher turbidity levels) and implementing Best Management Practices (BMPs) (USDA 1988). The LRMP states that stream channel cutbank disturbance should not exceed 20% for any given stream drainage. Likewise, the Riparian Management Objectives (RMOs) established by the

Inland Native Fish Strategy (USDA FS 1995a) require that the amount of unstable streambank in any reach not exceed 20%. Management activities cannot increase current levels of unstable banks if they are above 20% and Forest activities must not inhibit the "near natural rate of recovery" (USDA FS 1995a). Therefore, by measuring the amount of cutbank disturbance and width to depth ratios, one can get an idea of the degree of sediment impacts that exist within the watershed (See table z, above).

Effects

Effects to water quality from accelerated sediment delivery related to timber harvest practices, fire, and road construction and use were evaluated by comparing the relative erosion and sediment delivery rates of the alternatives based on the Relative Erosion Rate (RER) model. The Relative Erosion Rate (RER) procedure evaluates sediment delivery. It evaluates direct changes to sediment load resulting from current management practices and average rates that reflect previous practices and recovery rates. Only management activities within 600 feet of mapped streams are evaluated. Soil erosivity is based on the Forest Soil Resource Inventory (SRI); slopes are derived from the GIS Digital Elevation Model (DEM); delivery potential is calculated from a technique derived from PSWHA I (Leven, 1978); and potential sediment yield and recovery are calculated using the "Guide for Producing Sediment Yield from Forested Watersheds" (Forest Service, R1/R4, 1981), and WATSED (Forest Service, R1, 1992). Based on the low average annual precipitation in the planning area, low volume per acre, and not operating in the rainy season, haul delivered sediment should be low (less than 10 percent of the road delivered sediment). Because of the amount and period of haul on individual roads, annual precipitation, and the low sediment delivery, haul delivered sediment was not calculated. Sediment delivered on any given year will vary depending on weather patterns, storm tracks, and snowmelt. The Forest procedure does not calculate the actual sediment load but calculates a Relative Erosion Rate (RER) that is used to compare alternatives.

From field observations, it can be seen that the further a sediment source is from a stream, the smaller the percentage that gets delivered to the channel. The amount of sediment delivered from surface erosion and mass soil movement outside the stream channel is dependent on soil erosivity, soil infiltration capacity, the amount and type of ground disturbance, slope, and distance to the stream. About two-thirds of the sediment delivered to the stream from surface erosion comes from within 200 feet of the channel and more than 90 percent comes from within 400 feet (Seymour 2008). Management activities more than 600 feet from stream channels can be expected to deliver negligible sediment on this Forest.

Table 3-45 and Figure 3-24 compare the potential sediment delivery between the alternatives derived from the RER model.

Alternative 1

The current trends in sediment delivery and turbidity levels would not change in the short term as a result of this alternative. Streams that are currently exhibiting erosion would continue to erode, and streams that are recovering may gradually transport less sediment from in-channel erosion as vegetation develops. Over time fuel accumulations may lead to a higher risk of large scale, high intensity fire. If such future events occur, there is a high probability of increased sediment delivery resulting in adverse effects to aquatic habitats. It is difficult to predict the time, scale and intensity at which such an event(s) might occur, but it is probable that fires burning through landscapes with high fuel loading and continuous fuel beds would exhibit more extreme fire behavior, and would be larger and more severe than what happened historically. Refer to the section on Fire and Fuels for more detailed discussion on predicted fire regimes. High fire severity contributes to loss of organic material and vegetation at ground level, which can lead to higher surface erosion and reduced filtering of sediment. Thus there is higher potential for sediment to be delivered to stream systems during storm events in areas that have experience high

fire severity, which could increase turbidity. For more discussion on potential impacts to soils, refer to the Soils section. Roads in the stream influence zone would not be inactivated (closed) or decommissioned. Thus, roads that are currently contributing sediment loads would continue to do so. On some of these erosion could become worse if cross drainage is not maintained.

This alternative would not contribute additional sediment loads to streams in the short term. If a large scale disturbance were to occur in the future, there would be potential for deterioration of channel conditions, especially if an intense storm event follows a high severity fire, but headcut repairs that have been completed should help to stabilize drainages, making them better able to maintain streambanks, dissipate energy and filter and store sediment.

This alternative does not propose any road closure or decommissioning, and would not facilitate road maintenance activities associated with project activities. As a result, this alternative would not reduce the cumulative sediment delivery in the long run, but also would not result in ground disturbance from ripping and installing drainage structures. Precluding a large scale disturbance, sediment delivery from road systems would not be increased by this alternative except for that related to existing problem areas that would not be addressed under this alternative.

While Alternative 1 would not do anything to promote vegetative recovery, it would also not result in activity related ground disturbance or road construction. Therefore, vegetative development would continue on the current trend, precluding any large scale disturbance, without being affected by project generated sediment.

Alternatives 2 and 3

The increase in Relative Erosion Rate (RER) calculated for the alternatives should be roughly proportional to the area treated and the miles of road constructed and reconstructed. Haul delivered sediment should be proportional to the number of trips taken and miles traveled in the planning area, which should be roughly proportional to the volume harvested. The Relative Erosion Rate (RER) is an attempt to portray average sediment load changes attributable to forest management practices and natural disturbance factors. Sediment delivery on any given year will very depending on weather patterns, storm tracks, and snow melt.

Assumptions used in the RER process were as follows:

The harvest will be done in three years so a third of the total acreage is used in the calculation for sediment from harvesting activities.

The reopening of roads and construction of new ones will take place from 2010-2012 with a quarter done in 2010, a half done in 2011, and the last quarter done in 2012.

Burning will happen starting in 2013 and will end in 2017 so 20% of the total acreage is used in the calculation for sediment from burning activities.

Table 3-45. Yearly RER values by activity and alternative.

Yr	Alt					Yr	Alt				
		Roads	Harvest	Fire	Sum			Roads	Harvest	Fire	Sum
2009	Alt 1	15.69	0.00	0.00	15.69	2014	Alt 1	15.69	0.00	0.00	15.69
	Alt 2	36.34	0.62	0.00	36.95		Alt 2	36.85	40.84	48.57	126.26
	Alt 3	30.96	0.62	0.00	31.58		Alt 3	31.22	32.15	45.38	108.75
2010	Alt 1	15.69	0.00	0.00	15.69	2015	Alt 1	15.69	0.00	0.00	15.69
	Alt 2	41.41	51.55	0.41	93.37		Alt 2	36.61	22.71	49.22	108.54
	Alt 3	33.56	40.66	0.41	74.63		Alt 3	31.10	17.88	45.98	94.96

Yr	Alt					Yr	Alt				
2011	Alt 1	15.69	0.00	0.00	15.69	2016	Alt 1	15.69	0.00	0.00	15.69
	Alt 2	46.93	80.03	0.42	127.38		Alt 2	34.55	9.31	37.25	81.10
	Alt 3	36.39	63.04	0.42	99.85		Alt 3	29.32	7.33	34.88	71.52
2012	Alt 1	15.69	0.00	0.00	15.69	2017	Alt 1	15.69	0.00	0.00	15.69
	Alt 2	42.50	100.19	0.42	143.10		Alt 2	34.38	0.00	3.43	37.81
	Alt 3	34.12	78.88	0.42	113.42		Alt 3	29.20	0.00	3.21	32.41
2013	Alt 1	15.69	0.00	0.00	15.69	2020	Alt 1	15.69	0.00	0.00	15.69
	Alt 2	37.31	62.06	44.16	143.53		Alt 2	33.98	0.00	0.07	34.05
	Alt 3	31.46	48.85	41.27	121.58		Alt 3	28.91	0.00	0.06	28.97

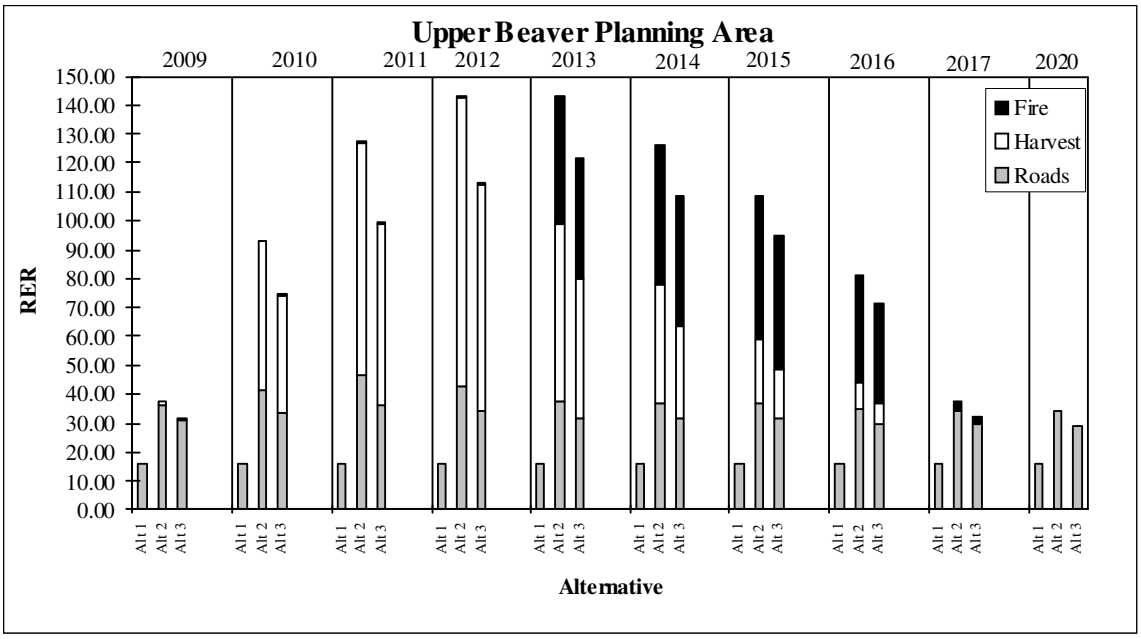


Figure 3-24. Sum of Yearly RER values for each activity by alternative.

Alternative 2

A total of 10% of the area will be harvested within the Upper Beaver Planning Area. A total of 8% of the area will be within 400 feet of a stream. A total of 220 acres would be harvested within the RHCAs. The Total Sediment Potential value is 1039 with 36% coming from harvest activities, 43% coming from roads reconstruction and the remaining 21% coming from fuels activities (see Table 3-45 and Figure 3-24). In looking at the total yearly RER values alternative 2 ranges from a low of 34.05 in year 2020 after all of the activities have finished at least 5 years previous to a high of 143.53 after three years of harvest and one year of burning has taken place. In terms of increased sediment potential from background levels it increases 7 fold in 2013 from it after all harvesting activities has been completed. In 2020 after all harvest and prescribed fire has been completed for at least 5 years the sediment potential from both fire and harvest has returned to baseline levels while the road sediment potential is double the background erosion potential.

There are about 4289 acres of commercial harvest and PCT treatments proposed within 400 feet of streams. This alternative proposes 48 acres or about 4 miles of tractor harvest in RHCAs. About 36 percent of the new potential sediment originates from these treatments. Commercial harvest and precommercial thinning would reduce ladder fuels and reduce the number of stands at high risk from insects and disease. Commercial harvest, precommercial thinning, and fuels treatments overlay about 64 percent of the forested plant associations in the project area. The reduction of surface and ladder fuels would reduce the amount of area susceptible to high-intensity wildfire, reducing the potential of major sediment sources in the future.

This alternative includes underburn activities on 39 percent (5190 acres) of the project area within 400 feet of streams. Planned ignitions are designed to produce a mosaic burn. About 20 percent of the units within RHCAs are expected to burn. Burning would not be accomplished all at one time, but is expected to take up to 10 years to complete depending on when thinning activities occur and when suitable weather conditions for fire ignition occur. About 4 percent (511) acres of natural fuels treatments are proposed within 400 feet of streams. About 21 percent of the new potential sediment originates from fuels treatments.

This alternative would reconstruct .85 miles and construct .67 miles of new temporary roads within 400 feet of streams (.23 mi/mi^2). New and reopened roads would be closed or decommissioned after use. Stream crossings are a major sediment delivery site. The RER analysis indicates that about 43 percent of the potential new sediment originates from roads. Most sediment delivered to streams would come from stream crossings, and road drainages close to streams.

Field observation and monitoring have shown that intact RHCAs are effective at filtering sediment. Design elements prevent mechanical disturbance of stream channels and generally preclude placing landings and using ground-based equipment in RHCAs. Based on past monitoring, design elements to protect stream channels from mechanical disturbance and maintain filtering in fuels units, and delayed burning in RHCAs with precommercial thinning slash, this alternative has a moderate risk of sediment delivery, but would still meet state water quality turbidity standards because filtering vegetation would be maintained in RHCAs.

Proposed closure and decommissioning of temporary roads would increase ground disturbance from ripping and installing drainage structures would increase sediment the first year or two.

Alternative 3

A total of 8% ground based harvesting will be done within the Upper Beaver the planning area. There is 6% of the area within 400 feet of a stream that will be harvested that delivers 90 percent of the sediment. A total of 14 acres of RHCA will be harvested. The total RER value for this alternative is 872 with 33% coming from harvest activities, 43% coming from roads reconstruction and the remaining 24% coming from fuels activities (see Table 3-45 and Figure 3-24). In looking at the total yearly RER values alternative 3 ranges from a low of 28.97 in year 2020 after all of the activities have finished harvest 8 years burning 3 years to a high of 121.58 after three years of harvest and one year of burning has taken place. In terms of increased sediment potential from background levels it increases 10 fold in 2013 from it after all harvesting activities has been completed. In 2020 after all harvest and prescribed fire has been completed for at least 5 years the sediment potential from both fire and harvest has returned to baseline levels while the road sediment potential is still almost double the background erosion potential.

There are about 4025 acres of commercial harvest and PCT treatments proposed within 400 feet of streams. This alternative proposes 48 acres or about 4 miles of tractor harvest in RHCAs. About 36 percent of the new potential sediment originates from these treatments. Commercial harvest and precommercial thinning would reduce ladder fuels and reduce the number of stands at high risk from insects and disease. Commercial harvest, precommercial thinning, and fuels treatments overlay about 61 percent of the forested plant associations in the project area. The

reduction of surface and ladder fuels would reduce the amount of area susceptible to high-intensity wildfire, reducing the potential of major sediment sources in the future.

This alternative includes underburn activities on 37 percent (5000 acres) of the project area within 400 feet of streams. Planned ignitions are designed to produce a mosaic burn. About 20 percent of the units within RHCAs are expected to burn. Burning would not be accomplished all at one time, but is expected to take up to 10 years to complete depending on when thinning activities occur and when suitable weather conditions for fire ignition occur. About 4 percent (511 acres) of natural fuels treatments are proposed within 400 feet of streams. About 21 percent of the new potential sediment originates from fuels treatments.

This alternative would reconstruct .85 miles of roads and construct .19 miles of new temporary roads within 400 feet of streams (0.16 mi/mi²). New and reopened roads would be closed or decommissioned after use. Stream crossings are a major sediment delivery site. The RER analysis indicates that about 43 percent of the potential new sediment originates from roads. Most sediment delivered to streams would come from stream crossings, and road drainages close to streams.

Field observation and monitoring have shown that intact RHCAs are effective at filtering sediment. Design elements prevent mechanical disturbance of stream channels and generally preclude placing landings and using ground-based equipment in RHCAs. Based on past monitoring, design elements to protect stream channels from mechanical disturbance and maintain filtering in fuels units, and delayed burning in RHCAs with precommercial thinning slash, this alternative has a moderate risk of sediment delivery, but would still meet state water quality turbidity standards because filtering vegetation would be maintained in RHCAs.

Proposed closure and decommissioning of temporary roads would increase ground disturbance from ripping and installing drainage structures would increase sediment the first year or two.

Summary

Alternative 3 decreases the sediment potential for all activities when compared to alternative 2. Alternative 3 reduced sediment produced from harvest activities by 21% ; from road maintenance, reconstruction and temp road building by 17% and from fuels activities by 6%. Looking at the total yearly RER values in every case the values are higher in alternative 2 than alternative 3 (see Table 3-45). In 2012 after all of the harvesting has been done and one year of prescribed burning has been completed the RER values for Alternative 2 increase 8-fold over background RER values and for alternative 3 it increases only 7-fold. By 2019 when harvest activities have been completed for 7 years and the prescribed burning has been done for 3 years the RER values for harvest have returned to zero and the fire is now back to almost zero. Only the roads RER values are still above background levels with Alternative 2 still over 100% and Alternative 3 is still 84% higher that the background level. The percentage of haul roads (96%) within 400 feet of the streams does not change between the two alternatives. However the percentage of temporary roads within 400 feet is 91% for alternative 2 and 89% for alternative. This will result in a lower sediment potential for alternative 3.

Since there is more harvest going on within the RHCAs, more roads being reconstructed, reopened or used alternative 2 has a slightly higher potential of producing more sediment from the various proposed activities than alternative 3. Alternative 2 always has higher sediment potential values regardless of if you look at the total sediment potential by individual years or the total value.

Cumulative Effects

Erosion and sedimentation has been increased well beyond the natural range of variability due to the cumulative effects of past and ongoing livestock grazing, logging, and roading (See soil and

hydrology resource reports for more detail), and have been incorporated into the existing condition.

Ground disturbance associated with trails, off highway vehicle (OHV) use, dispersed recreation, and firewood gathering may cause localized sediment delivery but is small on a watershed scale and was not included in the analysis. Sediment from routine road maintenance, which is included in the model, was overestimated because the model assumes annual maintenance on open roads. It is estimated that most of management derived sediment delivered to streams by surface erosion on NFS lands in the project area is coming from roads. Open road densities within 400 feet of stream channels, the source area of an estimated 90 percent of surface sediment delivered sediment, are shown in Table 3-46.

Table 3-46. Open road densities within 400 feet of streams.

Subwatershed	Alternatives 1	Alternative 2	Alternative 3
Beaverdam	.95 mi/mi²	.97 mi/mi²	.96 mi/mi²
	19.56 miles	19.94 miles	19.64 miles
Powell	1.76 mi/mi²	1.81 mi/mi²	1.80 mi/mi²
	43.61 miles	44.65 miles	44.48 miles
Sugar	2.32 mi/mi²	2.33 mi/mi²	2.33 mi/mi²
	21.31miles	21.41 miles	21.41 miles
Wolf	1.37 mi/mi²	1.37 mi/mi²	1.37 mi/mi²
	0.77 miles	0.77 miles	0.77 miles

While livestock can affect sediment delivery, in the Upper Beaver project area their primary impact appears to be on riparian vegetation and channel condition. Degraded channel conditions in the headwaters of many streams and in spring areas in the project area have resulted from livestock concentration. Changing livestock management is outside the scope of this document; however, it is reasonably foreseeable that cattle will continue grazing in the allotments. Upward trends in riparian condition are expected to continue due to changes in the range utilization standards in the Grazing Implementation Monitoring Module (IIT 2000). These utilization standards are used to determine when livestock are to be removed from pastures. The monitoring results indicate that riparian vegetation is improving (see Range section). Studies in the intermountain region (Clary 1999) indicate that the height of grasses and forbs that are to be left in key riparian areas indicate a level of grazing that allows a corresponding recovery of palatable woody vegetation. Bank stability and channel geometry interact with vegetation but may respond differently, depending on the extent of continued mechanical disturbance in the channel and the current channel condition.

Stream Flow Characteristics

Existing Condition

While the hydrograph and associated streamflow still resemble, in part, the historical conditions that once existed in the Upper Beaver Creek Watershed, a number of anthropogenic modifications have changed these historical characteristics. These actions include wildfire exclusion, conifer encroachment, beaver removal, road building, channel modifications, grazing, timber harvest, and water withdrawals. Collectively, these activities have changed the timing, duration, and magnitude of flows in all the streams in the watersheds. So, although several of the smaller streams in the watersheds have always been intermittent, it seems probable that peak flows were lesser historically while base flows were greater (see also the soils resource report).

Changes to the vegetation communities within the watersheds have affected stream flow. In the uplands, the changes in the xeric sagebrush plant communities by the encroachment of conifers, has affected stream flow. Juniper has moved in to these plant communities and increased

evapotranspiration; thus reducing groundwater discharge to the streams. This has decreased summer base flows. Riparian areas have lost most of their hardwood component, primarily due to overgrazing by livestock in the early 1900's. This caused a lowering in the water table reducing the wetted perimeter of the stream and a corresponding change in vegetation. The alder, willow, cottonwood, and dogwood communities that were there historically helped to retain soil moisture in the floodplain, and the increased soil moisture helped to recharge meadows. This cool water was added slowly to the streams during the hot summer months keeping the base flow cool. With the replacement of these communities with conifers and plants adapted to drier soil conditions, these functions have been compromised.

The loss of beaver in these systems has also had an effect on both stream flow and channel morphology. Beaver dams helped moderate high flow events by acting as a reservoir. (Woo 1990). Beaver Dams increase the width of the flood plains and the depth of pools behind the dam. Beaver dams could help increase base flow conditions such that some of the streams that flow intermittent during the summer today could flow perennially, as they did in the past. In addition, in the past, these dams kept streams connected with their floodplains, unlike today's conditions. The resulting reduction in the stream power from these dams would have helped to alleviate the extensive headcutting we see now (Pollock et al., 2007).

Peak annual flows resulting from snowmelt normally occur in March through April in the planning area. However, peak annual flows resulting from rain on snow events in early winter have produced some of the highest flows in the planning area over the last 50 years. High flows can also result from intensive convective thunderstorms that cause flash floods during the spring and summer. The probability of having a flash flood increases as the elevation and precipitation decrease primarily as a response to vegetation and ground cover. Forest canopy tends to buffer the intensity of thunderstorms at higher elevations. Peak flows are probably earlier and higher than historically due to loss of floodplain storage a result of entrenched channels, soil loss, and compaction, all of which cause flashier responses. This phenomenon 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 under-stocked 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 over-stocked and conifers and juniper have moved into formerly unforested areas and wet meadows. Increases in base flow due to partial removal of trees tends to be short term (5 to 10 years) and return to pre-disturbance levels as other vegetation (grasses and shrubs in Juniper stands and primarily remaining trees in higher precipitation zones) utilize the increase.

Effects

The probability of an event (flood) occurring can be increased by increasing the runoff efficiency of a drainage by road construction, increasing the snow pack through unit size and distribution, increasing snow melt rate through reducing canopy closure, or increasing the amount of water available by removing vegetation. Hibbert (1965) and Bosch and Hewlett (1982) found in a literature reviews that measurable increases in flow start showing up when the Equivalent Harvest Area (EHA) of a watershed reaches about 20 percent. EHA is defined as a watershed index of snowmelt and evapotranspiration rates relative to baseline condition where tree stands are considered fully canopied. Other studies have found that that a measurable increase starts showing up between 20 and 25 percent of the basal area is removed (Douglass 1967, Rothecher 1971, Megahan 1976, Troendle and Leaf 1980). Measurable increases in flow should be roughly proportional to the percentage of the area above that value. Increases in snow accumulation, faster melt rates, and increased soil moisture in harvested areas may result in increased peak flows.

Woods (2007) concluded that thinning treatments did affect the rate of snow melt and could substantially change the timing and magnitude of snowmelt runoff. Changes in snow accumulation may not be directly corralled to increased peak flows in larger streams due to the synchronization or desynchronization of flows in tributaries.

The Ochoco National Forest developed its' EHA procedure as a means of depicting how much of the area in a drainage could be in a "Equivalent Harvest" condition (clearcuts, partial cuts, and burns) and not cause an increase in water yield that could adversely affect channel condition in average or above average runoff years. The processes assumptions/modeling parameters can be found in the Hydrology specialist's report.

The EHA model was developed to evaluate third, fourth and fifth order drainages. Stream order is a term used to characterize the branching of streams from the top of the drainage. A first order stream is an unbranched tributary. Second order streams are initiated by the confluence of two first order streams; third order by the confluence of two second order streams, etc. While the model was developed to evaluate third through fifth order drainages and has primarily been used to evaluate watersheds and sub-watersheds, almost all the studies of water yield and peak flow have been based on much smaller (first and second order) drainages (Anderson, 1989). Headwater streams, used in the studies, are especially sensitive to increases in flow due to faster delivery of water, less opportunity for channel storage, and greater chance of synchronization. Therefore, water yield affects resulting from proposed treatments analyzed by the EHA model should also reflect effects to the second and third order drainages of concern in the planning area.

The Equivalent Harvest Area Model was used to assess if there will be cumulative impacts to stream banks or water quality by the alternatives. Fifth and sixth order watersheds were evaluated. There are two fifth order watersheds Upper and Lower Beaver and four fouth order watersheds, Beaver Dam, Wolf, Sugar, and Powell Creeks

In 1995, the Equivalent Harvest Area (EHA) level was at 25% for the Upper Beaver watershed. This is below the Land and Resource Management Plan (LRMP) threshold level of 35%. Current EHA level is projected at approximately 20%.

Prior harvest in the planning area was derived from the Forest activity layers for the 70s, 80s, and 90s (see hydrology report for specifics). EHA calculations assume all harvest activities, in Alternatives 2 and 3, would take place between 2010 and 2012. Non-commercial treatments i.e. pre-commercial thinning would be completed by 2017. Natural fuels treatment is assumed to not remove enough canopy to produce a measurable increase in water yield.

Tables 3-47 & 3-48 summarize the EHA values for all of the fifth & sixth order watersheds located within the Upper Beaver project area.

Table 3-47. Summary of EHA for Sixth Order Watersheds for the three alternatives.

	Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
HUC 6 Sub Watersheds												
Beaver Dam												
No action		7.8	7.2	6.6	6.2	5.9	5.7	5.5	5.3	5.0	4.8	4.6
Alt2		7.8	9.0	10.3	11.7	11.9	12.0	12.2	12.3	12.4	11.9	11.4
Alt3		7.8	8.7	9.8	10.9	11.1	11.3	11.5	11.7	11.8	11.3	10.8
Powell Creek												
No action		12.3	11.6	11.1	10.7	10.3	9.9	9.5	9.2	8.9	8.5	8.2
Alt2		12.3	13.1	14.2	15.3	15.2	15.1	15.0	14.9	14.8	14.2	13.6
Alt3		12.3	13.0	13.9	14.8	14.7	14.7	14.6	14.5	14.4	13.8	13.2
North Wolf Creek												
No action		12.5	11.8	10.9	10.1	9.4	9.0	8.6	8.2	7.8	7.4	7.0
Alt2		12.5	11.8	10.9	10.1	9.4	9.0	8.6	8.2	7.8	7.4	7.0
Alt3		12.5	11.8	10.9	10.1	9.4	9.0	8.6	8.2	7.8	7.4	7.0
Sugar Creek												
No action		8.5	8.0	7.7	7.4	7.2	6.9	6.7	6.4	6.2	5.9	5.7
Alt2		8.5	9.7	11.1	12.5	12.5	12.5	12.5	12.4	12.3	11.8	11.3
Alt3		8.5	9.3	10.3	11.3	11.3	11.3	11.4	11.3	11.3	10.8	10.3
Wolf Creek												
No action		12.5	12.1	11.4	10.8	10.4	10.0	9.6	9.3	8.9	8.6	8.3
Alt2		12.5	12.2	11.6	11.1	10.7	10.3	10.0	9.7	9.3	9.0	8.7
Alt3		12.5	12.1	11.5	10.9	10.5	10.2	9.9	9.6	9.2	8.9	8.6

Table 3-48. Summary of EHA for Fifth Order Watersheds.

HUC 5 Watersheds												
Lower Beaver	yr	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
No action		12.5	12.0	11.3	10.6	10.1	9.7	9.3	9.0	8.6	8.3	8.0
Alt2		12.5	12.1	11.4	10.8	10.3	9.9	9.6	9.3	8.9	8.6	8.2
Alt3		12.5	12.0	11.3	10.7	10.2	9.8	9.5	9.2	8.8	8.5	8.2
Upper Beaver												
No action		10.1	9.5	9.0	8.6	8.2	7.9	7.6	7.3	7.1	6.8	6.5
Alt2		10.1	11.1	12.3	13.5	13.6	13.6	13.6	13.6	13.5	13.0	12.4
Alt3		10.1	10.9	11.8	12.8	12.9	12.9	13.0	13.0	13.0	12.4	11.9

Alternative 1

The EHA values for the no action alternative range from 7.8-12.5 for sixth order watersheds (Beaverdam, Powell, Sugar, Wolf and North Wolf Creek) and 10.1-12.5 for the fifth order watersheds (Upper and Lower Beaver). These EHA values are below the 25% level and represent a low risk threshold value.

Alternative 2

All of the EHA values are below the 25% EHA low risk value. The highest EHA values in the sixth order watersheds range from 10.1-15.3. These are found in 2012 after the 3 years of harvest has been completed.

The fifth order watersheds also show values below the 25% low risk EHA threshold values. The highest values seen are 10.3 for Lower Beaver (2012) and 13.6 for Upper Beaver (2013). These

low EHA values indicate that there will be low risk to increased stream bank instability and water quality from the management activities proposed.

Alternative 3

All of the EHA values are below the 25 EHA low risk threshold value in both the fifth order and sixth order watersheds. The highest EHA values in the fifth order watershed range from 11.6-15.9 while in the sixth order watershed they range from 12.6-13.5. These low EHA values indicate that there will be low risk to stream bank stability and water quality from the management activities proposed.

Alternatives 2 and 3

There is a slight increase in the EHA values in Lower Beaver Creek Watershed of 1.9% (Alternative 2) and 1% (Alternative 3) in 2011 after all of the harvest is done, when compared to the No Action alternative. In looking at the Upper Beaver Watershed and comparing the EHA values to the no action alternative in 2012 there is a larger increase of 65.9% (Alternative 2) and 36.4% (Alternative 3). By 2019, 8 years after all harvesting has been completed and 3 years after burning has been finished, both Alternative 2 and Alternative 3 are close to the background EHA values in Lower Beaver. This is due to the small amount of activity that was done in this water shed. In the Upper Beaver watershed by 2019 both alternative 2 and 3 are both below the 25% threshold (i.e. 12.9 and 11.4) indicating that the harvest activities will not have a measurable increase runoff and subsequent streamflow.

EHA values are quite low for both alternatives and are below the threshold value of 35 so an increase to stream flow and subsequent channel erosion should not occur from these management activities.

Aquatic Species

Summary of Determinations

Redband trout & Columbia spotted frog

Alternative 1

- Determination for alternative 1 is **NI, no impact** to redband trout as there are no proposed vegetative, fuels or road projects.
- Determination for alternative 1 is **NI, no impact** to Columbia Spotted frogs as there are no proposed vegetative, fuels or road projects.

Alternative 2 & 3

- 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).

Fish populations would increase in the long-term as pools and large woody material providing refuge and material for food sources increase, width-to-depth ratio decreases, and riparian vegetation increases shade and reduces sediment input to the stream. Any short-term disturbance

from treatments to a few individuals is not expected to be adverse, nor would it impact the growth or survival of those individuals. The population of fish would not decline as a result of the proposed treatments in Alternatives 2 or 3. Any disturbed fish would move out of the area of activity.

Existing Condition

The Upper Beaver project encompasses approximately 30,000 acres. This project lies mainly within the Upper Beaver Creek Watershed (Sugar Creek, Powell Creek, and Beaverdam Creek Subwatersheds). A small portion lies within the Wolf Creek Subwatershed within the Lower Beaver Creek Watershed; however, there are no Category I-IV RHCAs draining this area so it will not be discussed further in this report (see Hydrologist section for more details). Stream systems containing resident native redband trout (*Oncorhynchus mykiss*) and Columbia spotted frogs (*Rana luteiventris*) include: Sugar, Powell, Tamarack, Rager, and Beaverdam Creeks of the Upper Beaver Watershed. Other small, unnamed perennial and intermittent streams also exist and are described in Appendix B of the Fisheries Biological Evaluation.

There are approximately 127 miles of streams in the Upper Beaver Creek area within the National Forest (NF), 61 miles of which were surveyed at least once in the past 27 years. Table 3-49 summarizes the miles of stream by stream class and subwatershed.

Table 3-49. Miles of stream, by class, on National Forest lands within sub-watersheds (6th Field Hydrologic Unit Codes (HUC) of the Upper Beaver Creek Watershed.

Subwatershed	Stream Class (miles)				
	I	II	III	IV	Total
Beaverdam Creek	0	8.8	4.4	4.2	17.4
Powell Creek	0	13.2	6.8	6.2	26.2
Sugar Creek	5.2	0.0	0.4	3.0	8.6
TOTAL	5.2	22.0	11.6	13.4	52.2

Riparian Habitat Conservation Areas (RHCAs) are portions of watersheds where riparian dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines, MA-15, contained in the Ochoco National Forest Land and Resource Management Plan (LRMP, 1991) as amended by INFISH (1995). These RHCAs include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems. These areas are 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 overlain on other Forest Plan Management Allocations. Overall, there are about 3,983 acres of RHCAs in the Upper Beaver Project area.

For water bodies on Forest Service lands, the width of an RCHA is determined by whether or not the stream is fish-bearing and whether it is perennial or intermittent. 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 channels 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 31.7 miles of Category I channels in the Upper Beaver project area. The RHCAs for the Category I streams encompass 2,292 acres.

Category II channels 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 18.8 miles of Class III streams in the Upper Beaver project area. The RHCAs for the Category II channels encompass 669 acres.

Category III RHCAs are located along ponds, lakes, reservoirs (possibly fish-bearing), wetlands, landslides and landslide-prone areas greater than one acre with RHCA buffer area extending 150 feet slope distance from the feature. As noted previously, these areas are not mapped for the Upper Beaver project area and are not included in the calculation of RHCA acres; however, buffers would be applied if Category III RHCAs are discovered during project layout. See Chapter 2, Project Design Criteria, for more information.

Category IV channels 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 76.5 miles of Category IV streams that encompass approximately 884 acres of RHCA in the Upper Beaver project area.

INFISH established landscape-scale interim Riparian Management Objectives that would be applied to watersheds with inland native fish, until Forest Plans could be revised. INFISH recognizes that in many cases interim Riparian Management Objectives (RMOs) would not be met instantaneously, but would be achieved over time (INFISH A-2). There are no RMOs 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 of which are RMOs in INFISH. The amount and type of vegetation in riparian areas play an important role in maintaining and improving both water quality and fish habitat. As described in the Silviculturist section, the increasing amount of small diameter conifers in RHCAs of the Upper Beaver Project Area is preventing hardwood vegetation such as alder, willow, aspen and shrubs from expanding. The roots of hardwood vegetation help to stabilize streambanks and the stems act as a roughness element that reduce the velocity and erosive energy of over bank flow during high water events. Conifers do not provide the same bank stabilizing function as these brushy, shrubby species. Most broadleaf, hardwood species within Upper Beaver are shade-intolerant. In summary, throughout the project area, conifers are competing with and shading the out broadleaf vegetation, and these shrubby species are losing vigor and are not able to recolonize exposed stream banks.

INFISH allows for RMOs to be modified to better meet site-specific habitat requirements and/or best available science. Table 3-50 provides a list of RMOs that were considered during the analysis of the effects of the proposed project on fish and frog populations and their habitat. Large Woody Debris (LWD) and pool RMOs were modified based on best available information (Cordova, 1995; Rosgen, 1996) to represent conditions that are applicable and attainable in the Upper Beaver planning area.

Table 3-50. Upper Beaver Planning Area Riparian Management Objectives.

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). See the Hydrologist's report for temperature information.
Shade	> 80 percent of water surface shaded
Pool Frequency	See Table 3-51: Spacing between pools by channel type
Large Woody Debris	See Table 3-52: Natural amounts of large, woody material in the Blue Mountains
Bank Stability	> 80 percent stable banks

Habitat Feature	Interim Objective
Width/Depth Ratio (mean wetted width divided by mean depth)	<10, INFISH- all channels; Rosgen A and E channels

Table 3-51. 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

To determine pool spacing in Table 3-51, determine the channel type and bankfull width of the channel. Many of the stream channels in the Upper Beaver project area are "C" channel types. For example, Beaverdam Creek is a "C" channel. Since the average bankfull width for three of the reaches of Beaverdam Creek is approximately 18 feet, the spacing between pools should range from 90 feet (5 x 18 feet) to 126 feet (7 x 18 feet). Surveys indicate pool frequency is approximately 0.62 pools per 100 feet. According to Table 3-51, pools should be 0.8 to 1.1 per 100 feet (100/126 and 100/90), suggesting that there are not as many pools as there should be for this stream type.

Table 3-52. Natural amounts of large, woody material in the Blue Mountains (Cordova 1995).

Large Woody Material Size	Number of pieces per 100 feet		
	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

RMO Habitat Features

Streamside vegetation provides shade in summer and insulation in winter and is critical to maintaining optimum stream temperatures and temperature-dependent processes. Contributing to the increased water temperatures in the project area has been 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. Riparian shrub planting occurred between 1996 and 2002 in several stream systems in the project area including Sugar, Powell, Tamarack, Beaverdam, Heisler and Rager Creeks. Shrub survival, growth and development have generally been low in most areas due to conifer cover, grazing by livestock and big game, and a continuing drop in water table heights due to channel instability.

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.

Temperatures of 60 degrees F are considered ideal for rapid growth of rainbow trout (Leitritz and Lewis 1980). For the Upper Beaver Planning 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.

Several streams within the Upper Beaver Planning Area are on the State of Oregon's 303(d) list of streams for exceeding the maximum temperature standard of 64 degrees F (7-day floating maximum temperature; Table 1). Results of temperature monitoring are discussed in the Hydrology Resource Section (EHA, temperature, H2O developments). However, to summarize water temperatures at monitoring stations in Sugar, Powell, Tamarack, Rager and Beaverdam Creeks have exceeded the 7-day average daily maximum stream temperatures almost every year since. See Table 3-53, and the Water Quality section (Chapter 3 of this document) for more information regarding stream temperatures.

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 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 (i.e, streams in the project area) 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).

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.

Surveys of selected streams in the project area indicate that the amount of pool habitat is less than recommended in INFISH in most streams. For example, pools per 100 feet range from 0.30 to 0.49 on Rager Creek and 0.13 to 0.55 on Tamarack Creek, while pool frequency should range from 1.4 to 2.0 pools per 100 feet. This pattern is common for the majority of streams within the project area. See table 4 and the individual subwatershed narratives at the end of this section, and Appendix B of the Fisheries BE Report, for more detail.

Gravel embeddedness is not identified in the RMOs for INFISH but is an important habitat feature for fish. 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. However, embeddedness data lacking for streams on the Ochoco National Forest, but sedimentation information has been collected in some areas and is addressed in the Soils and Hydrologist section. Since sediment amounts are a conjugate for embeddedness, embeddedness will be discussed in terms of sedimentation for the effects analysis.

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.

In the Upper Beaver project area, surveys indicate that large wood is deficient in many stream reaches. LWD ranges from essentially no LWD in several stream reaches (e.g. Powell, Tamarack Creeks) to 1.7 pieces per 100 feet in Reach 1of Beaverdam Creek. See Table 3-53 and the individual subwatershed narratives at the end of this section, and Appendix B of the Fisheries Report, for more detail.

Streambank Condition (% stream bank stability, channel width to depth ratio)

Although Upper Beaver Planning Area is a forested system, bank stability is an important habitat feature for redband trout and Columbia spotted frogs. Stable stream banks are less inclined to erode and are better able to withstand seasonal flooding than unstable banks. Bank stability is dependent upon deep-rooted vegetation, such as willows and sedges, and is improved by the presence of structures like logs and rocks in the stream channel. Bank stability directly affects sediment delivery to streams as discussed above and the channel morphology (width-to-depth ratio) described below. As bank instability decreases, fish and frog habitat (e.g. quality spawning/breeding areas, water temperature) also shift toward less desirable conditions.

The Forest standard and INFISH RMO for bank stability is greater than 80 percent in a given stream reach. Recent habitat survey data indicate that four of the streams, six stream reaches, do not meet the RMO: Powell Creek (R2 & R4), Rager Creek (R3), Tamarack Creek (R1 & R4) and Sugar Creek (R1 & R2). The most current bank stability values range from nearly 100 percent stable (Beaverdam Creek R3) to nearly 100 percent unstable (Tamarack Creek R1 trib). See table 4 and the individual subwatershed narratives at the end of this section for more detail.

Width-to-depth ratios are 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 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. Showing 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.

The interim RMO for width-to-depth ratios are less than 10. Surveys indicate that all but one stream reach (Sugar-Reach 1) in the entire project area have a width-to-depth ratio over these RMOs and only four reaches have width-to-depth ratios appropriate for their stream type (Bellworm, Bronco, Rager R1, and Sugar R1). Width-to-depth ratios vary from 7.4 on reach 1 of Sugar Creek to 32.9 on reach 1 Tamarack Creek. See Table 3-53 and the individual subwatershed narratives at the end of this section for more detail.

Subwatershed Specific Discussions

The following is a discussion of the eight named streams that are tributaries to Upper Beaver Creek. Of the eight tributaries, seven have been formally surveyed at least once since 1989. A summary of a) width to depth ratio, b) shade (total and hardwood), c) density of large woody debris (LWD), and amount of unstable bank is presented where data was available (see also table 4). In general, past management activities have resulted in streams with greater width/depth ratios, reduced riparian vegetation and shade, few undercut banks, low channel sinuosity, and a higher susceptibility to bank erosion due to the loss of rooting strength from over-utilization of riparian vegetation. It has also been described that many stream reaches in Upper Beaver Creek Watershed are entrenched and have developed into G- and F-type Rosgen stream channels (1996). Historically, all of the channels in this area would have been Aa+, A-, B-, C-, and E-types (See the Hydrologist section for a more complete discussion of Rosgen). These entrenched channels are no longer able to efficiently move their flow and sediment without excessive erosion.

Beaverdam Creek Sub-Watershed

Beaverdam Creek – Class II

Over the three reaches that were surveyed, the average width to depth ratio was 19.8, average total shade was 50.3%, and 65.1% of the banks were unstable on average, all less than RMOs. The stream channel continued to become wider and shallower as the width to depth ratio increased the farther upstream surveys went. Furthermore, shade decreased steadily across the three reaches as the surveys traveled upstream. The average density of LWD (0.8 pieces/100') was sufficient across the surveyed reaches. However, there was over a 50% reduction in LWD between reaches as the surveys moved upstream with the upper most reach being below the RMO.

Bronco Creek – Class III

Bronco Creek is a tributary to Beaverdam Creek. Limited survey data from 1982 suggests that the stream is poorly shaded and had a width-to-depth ratio of 6.4. There are three reservoirs located on the stream between the forest boundary the headwaters.

Heisler Creek – Class II

Heisler Creek is a tributary to Beaverdam Creek. A five and half mile reach was surveyed in 1997. The lower end of which had multiple channels across the flood plain. Overall, the channel was very wide and shallow, width to depth ratio well above the RMO at 28.6, and was deficient in total (52%) and hardwood (0.4%) shade, although total shade had actually increased 23% from a 1993 survey.. The LWD objective of 0.38 pieces/100' was exceeded with 0.45 pieces every 100 feet. However, the creek runs through five harvest units of the Butte Timber Sale (1993-1994) and trees were harvested to the edge of the creek. Consequently, there is minimal potential of recruiting LWD into much of the stream in the future.

Powell Creek Sub-Watershed

Bellworm Creek – Class III

Bellworm Creek is a small tributary to Rager Creek near the Rager Ranger Station. Bellworm Canyon has been predominately used for cattle grazing, logging, mining, and water extraction. The results of these practices can be seen near the stream in the form of old stumps, unstable banks, head cuts, metal pipes in the stream, and cement holding tanks. A survey in 2002 began at the stream's confluence with Rager Creek near the Forest boundary and terminated at Bob Spring, approximately one mile upstream. Bellworm Creek was below the Forest Plan standard for shade and below the RMO for large woody debris. Total shade averaged 41.7% and hardwood averaged 7.4% across the reach. Large woody debris averaged 0.37 pieces per 100 feet and

unstable banks averaged 14.0%, which is above the standard of 20 percent or less. In general, the stream had a low width/depth ratio (11.0), presumably due to the canyon limiting the lateral expansion of the channel.

Powell Creek – Class II & III

Overall, there has been little to no improvement in stream stability and riparian vegetation between the surveyed years of 1993 to 2008. The 1993 survey found that total shade (55.3%) was below Forest Plan standards and hardwoods were mainly only present in the open areas along the stream. In the fifteen years between shade surveys, (1993 to 2008) total shade increased 7% when averaged across the stream reaches. However, the contribution of shade from hardwoods remained minimal (0.33%), with the amount decreasing the further upstream surveys went. In 2001 Powell Creek was above the RMO of <10 for its width to depth ratio (average of 21.1), suggesting the stream is wider and shallower than it possibly was historically. The density of LWD was well below the RMO in 2001, exhibiting nearly an 88% decrease from 1993. Furthermore, almost 50% of the surveyed stream banks were determined to be unstable due to the lack of riparian plants.

Rager Creek – Class II

A 2000 survey indicated Rager Creek was near or above RMOs in the lower reach near the ranger station (except shade), but then degraded in the upstream reaches. The stream channel in the first reach was narrow and well defined, with 55% total shade coverage mainly from small diameter conifers, and the rest, 14%, coming from hardwood shade. This was a two percent increase from the 1993 shade data. Large woody debris was lacking. Livestock impacts became more evident on upper Rager Creek as cattle trails and grazing induced cutbanks (20% of reach) increased. However, total shade increased nearly 20 %, but was still below the Forest Plan standard of 80%. The hardwood component remained nearly non-existent (0.03%) due to the over-stocked stands of small-diameter conifers and livestock use. Large woody debris remained below the RMO.

Tamarack Creek – Class II & III

In a 1993 survey, total shade was 20% below the RMO when averaged across the three surveyed reaches. There was abundant woody debris in each reach (average of 0.7 pieces/100').

In 1997 the stream was in fairly good condition with good fish habitat in the lower reach starting at the Forest boundary. The channel was narrow and deep (width to depth ratio = 6.3). Tamarack Creek had an average total shade of 77%. Hardwood shade averaged 39%, mostly from alder. There were a large number of young and mature alder (*Alnus incana*) stands in the open areas. LWD objectives were met with 2.1 pieces per 100 feet for the entire length of the creek. Unstable banks averaged .03%. However, there are numerous headcuts averaging 2.9' tall with the tallest one at five feet. Fish barriers such as these headcuts and blown out, perched culverts were common throughout the stream.

Data from the 2001 survey illustrated that Tamarack Creek had become wider and shallower than it was in past across the entire survey area (average width to depth ratio = 23). Furthermore, there was only a slight increase (9.7%) in total shade between the 11 years shade data was gathered (shade data from 2008). Smaller diameter conifers within the RHCA provided most of this shade, as the hardwood component (15%) remained low. Overall, there was a drop in the density of LWD (average of 0.2 pieces/100') across the reaches when compared to the 1993 data witch is below the RMO. Bank stability was measured in one reach in 2007 and nearly 50% of the reach was determined to have unstable banks, well beyond the Forest Plan Standard of 20% or less.

Sugar Creek Sub-Watershed

Dutchman Creek - Class IV

Dutchmen is an intermittent tributary that parallels the 58 road until it flows into Sugar Creek near the Sugar Creek Campground. There is little total shade (45% average) along the two surveyed reaches and riparian vegetation is intermittent and poorly developed. There is evidence that alder once grew along the bank in greater densities (dead standing and fallen wood). Field reviews also indicated that aspen occurred on the site but has died out. Severely overstocked, small diameter conifer trees provide existing shade. Cutbank conditions occur throughout the reaches and bank conditions are poor. Overall, there is a severe shortage of riparian species, bank instability, and very little pool development (USDA, 2007).

Sugar Creek – Category I & II

In a 1989 survey, the average width to depth ratio was 13.2 for the three surveyed reaches. The channel was wide and shallow (width /depth ratio = 17.3) at the lower reach, but narrowed and got deeper as the survey went farther upstream through the second (14.0) and third 3 (9.4) reaches.

A 2000 survey noted the stream had narrowed and gotten deeper overall, most notably in the lower reach, when compared to the 1989 data. However, data from the upper reach showed the channel had increased in width and gotten shallower. In 1989, shade was at 79% for total shade and 16 % for hardwood. Overstocked, small diameter conifers mainly provided existing shade. Some alder and willow were present along the riparian area where there was minimal conifer cover. Banks stability was less than the RMO of <20% or less and density of woody debris was below Forest Plan standards.

Table 3-53. Stream channel survey data on drainages in Upper Beaver Planning Area. See Fisheries Report, Appendix B for more detail.

Subwatershed Stream Name	Survey Date	Class	Reach Length (ft)	Reach	Pools/100'	Total unstable bank/100' (%)	Wood/100' (Total)	Average Total Shade (%)	Temperature (°F, 303d listed year)
Beaverdam									
Beaverdam	2005	II	2,640	1	0.95	3.3	1.7	53.3	64.4 listed in 2004
Beaverdam	2005	II	10,771	3	0.61	0.37	0.46	52.4	64.4 listed in 2004
Beaverdam	2005	II	9,821	4	0.3	0.69	0.29	45.2	64.4 listed in 2004
Bronco	1982	III	6,336	1	-	-	-	-	not listed
Heisler	1993	III	-	1	NA	-	19*	27.8*	not listed
Heisler	1997	III	29,800	1	0.06	0.68	0.45	51.8	not listed
Powell									
Bellworm	2002	III	3,988	1	0.8	14	0.37	41.7	not listed
Powell	1993	II	4,500	1	-	-	0.5	58.1	-
Powell	1993	II	4,500	2	-	-	0.4	62.2	-
Powell	1993	II	5,200	3	-	-	0.1	50.1	-
Powell	1993	II	7,800	4	-	-	0.7	55.5	-
Powell	1993	II	10,400	5	-	-	1.9	56.1	-
Powell	1993	II	4,500	6	-	-	1.2	49.6	-
Powell	2001	II	5,552	1	0.50	-	0.09	59.2	64.0 listed in 1998
Powell	2001	II	6,318	2	0.70	40	0.06	67.4	64.0 listed in 1998
Powell	2001	II	1,907	3	0.37	-	0.05	64.4	64.0 listed in 1998

Subwatershed Stream Name	Survey Date	Class	Reach Length (ft)	Reach	Pools/100'	Total unstable bank/100' (%)	Wood/100' (Total)	Average Total Shade (%)	Temperature (°F, 303d listed year)
Powell	2001	II	17,741	4	0.09	55	0.07	58	64.0 listed in 1998
Rager	1993	II	-	1	NA	-	25*	52.9*	-
Rager	2000	II	15,398	1	0.49	9	0.23	55.3	64.4 listed in 2004
Rager	2000	II	-	2	-	-	-	57.2	64.4 listed in 2004
Rager	2000	II	2,300	3	0.30	19.7	0.35	71.1	64.4 listed in 2004
Tamarack	1993	II	5,174	1	-	-	0.5	64	-
Tamarack	1993	II	7,814	2	-	-	1.1	56	-
Tamarack	1993	II	7,814	3	-	-	0.6	60	-
Tamarack	1997	II	10,800	1	1.70	0.03	2.1	77.0	-
Tamarack	2001	II	6,072	1	0.55	-	0.1	75.3	not listed
Tamarack	2001	II	9,662	2	0.23	-	0.06	73	not listed
Tamarack	2001	II	10,929.6	3	0.13	-	0.05	70.2	not listed
Tamarack	2007	II	4,723	4	-	48.1	0.5	60.2	not listed
Tamarack	2007	II	2,847	1	-	74.0	1.2	-	not listed
Tamarack	2007	II	1,682	1	-	100.0	0.9	-	not listed
Sugar									
Sugar	1989	I	12,978	1	NA	-	NA	NA	-
Sugar	1989	I	4,496	2	NA	-	NA	NA	-
Sugar	1989	I	5,771	3	NA	-	NA	NA	-
Sugar	2000	I	12,938	1	1.68	50.9	0.21	73.4	64.0 listed in 1998
Sugar	2000	I	11,300	2	3.42	41.9	0.15	83.9	64.0 listed in 1998
Dutchman	2007	IV	-	-	-		-	45	not listed
- indicates data not available									

Redband trout and Columbia spotted frog

Redband trout, *Oncorhynchus mykiss*

Redband trout is the only known salmonid species currently present within the project area. Modification to, as well as loss of fish habitat have reduced the health of and the number of redband trout most streams can support.

Redband trout are stream spawners, normally spawning in the spring (March through June). The eggs usually hatch in four to seven weeks and alevins (pre-emerging fish) take an additional three to seven days to absorb the yolk before becoming free-swimming. The average age of first spawning is two to three years, but some wild populations do not spawn until they are age five. Gravel embeddedness, amount of sediment, of less than 20 percent is essential to maintain healthy salmonid populations, especially in those areas identified as potential or existing spawning areas (Bjorn and Reiser 1991).

Temperatures of 60 degrees F are considered ideal for rapid growth of rainbow trout (Leitritz and Lewis 1980). For the Upper Beaver Planning 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.

The results of temperature monitoring are discussed in the Hydrology section of this EIS. However, to summarize, the water temperatures at monitoring stations in Sugar, Powell, Tamarack, Rager and Beaverdam Creeks have exceeded the State of Oregon's maximum temperature standard 7-day average daily maximum stream temperatures of 64.4 degrees F almost every year since 1995, and have been at levels that are not conducive to productive fish habitat.

Streamside vegetation provides shade in summer and insulation in winter and is critical to maintaining optimum stream temperatures and temperature-dependent processes. 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. Riparian shrub planting occurred between 1996 and 2002 in several stream systems in the project area including Sugar, Powell, Tamarack, Beaverdam, Heisler and Rager Creeks. Shrub survival, growth and development has generally been low in most areas due to conifer cover, grazing by livestock and big game, and drop in water table heights.

Redband trout populations are currently depressed reflecting degraded habitat conditions within the Upper Beaver Planning Area. However, existing populations are generally in fair condition, based on age distribution and condition factors (ODFW 1991, 1993, and 1994). The combination of habitat modification, low summer flows, high summer stream temperatures, lack of suitable riparian vegetation (due to livestock and agricultural activities), and increase in sediment (due to past logging activities and roads built within RHCAs) have affected redband trout populations. Sediment fills in the small spaces between spawning gravels resulting in lower oxygen levels, lower numbers of fry emergence, and change in food sources and habitat features (see pg. 8, Gravel Embeddedness discussion).

Fish population estimate data and general condition of redband trout in this area has not been completed since 1991 (ODFW 2008). However, redband trout sightings are noted during stream surveys to determine the uppermost extent of fish presence (USDA 1982, 1989, 1993, 1997, 2000, 2001, 2002, 2005, 2008). Noting habitat survey information such as on Powell Creek, the data indicates that hardwood shade has not significantly changed in the past eight years (USDA 1993, 2001). Hardwood shade data from Sugar Creek and Beaverdam Creek was not collected in the past to compare against recent information, but information is available for Tamarack Creek (USDA 1993, 2007) and conditions appear to be similar to Powell Creek. Consequently, redband trout populations in these creeks have not likely increased due to the slow habitat improvement. If streams are noted to be in a static condition for bank stability wood density, as described above, then fish populations are also likely to be in a static condition.

Suitable riparian vegetation provides filtering of sediments, shade to cool water temperatures, and bank stability. Excessive bank erosion, due to accelerated lateral (side to side) channel migration may increase sedimentation. Gravel embeddedness would decrease if there was an increase in vegetation that could filter sedimentation. With less gravels covered in fine sediment, spawning success could potentially increase.

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. For example, in Powell Creek, the headwaters lack riparian shrubs and shade, is dominated by early seral vegetation, and has numerous headcuts. Riparian vegetation needs to improve in the non-forested open areas to improve bank stability and reduce sedimentation.

Columbia spotted frog, *Rana luteiventris*

Columbia spotted frogs inhabit a variety of vegetation communities, including coniferous or mixed forests, grasslands, and riparian areas of sage-juniper brushlands. Historically, Columbia spotted frogs were found at elevations ranging from near sea level to 7,370 feet, which encompass the project area (elevation range 3,927 to 6,483 feet). In the Programmatic Biological Assessment (USDA/USDI 2006-2009), project design criteria were designed to protect and maintain ponds, lakes, sloughs, wet meadows, and other wetlands, high channel complexity and stability, abundance and diversity of side channel habitats, water quality, low levels of fine sediment, in-stream wood, and wood recruitment. The criteria are also designed to protect and maintain hydraulic regimes and temperatures that are consistent with unaltered basins, and maintain, restore, and open connective corridors to spotted frog suitable habitat.

Duma (1966) reported that relative humidity of 65% or lower is lethal to adult spotted frogs in approximately 2 hours, a factor which would restrict spotted frogs to higher elevations or moist riparian zones in arid western landscapes. Because both breeding and over-wintering occur at aquatic sites, populations are located in the general vicinity of ponds, lakes, springs, and/or streams. A study in arid southwestern Idaho (Munger et al. 1998) found adult spotted frogs were associated with palustrine, shrub-scrub, seasonally flooded sites, or with intermittent riverine, streambed, seasonally flooded sites. Frogs were also associated with vegetation indicating permanent water sources (i.e., willows and submerged aquatic plants rather than with emergent vegetation such as sedges) and vegetation providing hiding and thermal cover (e.g., willows). Spotted frogs are located in similar habitats in the Upper Beaver Planning Area.

The following are the three main components necessary for adequate breeding and juvenile rearing habitat: water bodies, vegetation, and temperature.

Water bodies should include stagnant or slow-moving water, with shallow areas. Breeding and egg deposition take place in ponds, marshes, stream oxbows, small springs, and along the margins of lakes and slow-flowing streams. Permanent, temporary (seasonal), and fabricated water bodies (Monello and Wright 1999) all may serve as breeding sites. Eggs are deposited in shallow water, reported as usually no more than 10-20 cm (3.9-7.9 in) deep by Reaser and Pilliod (2005).

Egg deposition occurs soon after snowmelt and prior to significant seasonal growth by most emergent and aquatic vegetation. Breeding activities and egg deposition usually occur in the portion of the water body with high exposure to morning sunlight (Morris and Tanner 1969), or where snow melts most quickly in spring. However, oviposition (egg laying) locations are variable and depend on inlets, outlets, surrounding tree heights, and surrounding horizon. Eggs are normally deposited in water at temperatures of approximately 57.2 degrees F.

Summer foraging may occur at the same water body used for breeding and over wintering, but in many cases frogs move to other areas. Spotted frogs move to other sites in summer for a variety of reasons including predator avoidance and the attractions of more abundant food and less competition (Bull and Hays 2001). Foraging sites include ephemeral pools in forests and meadows, streams (permanent and intermittent) and river edges, riparian zones, temporary and permanent ponds, lake margins, and marshes.

Sites used for foraging only may be shallower, less vegetated, and more ephemeral than breeding sites. Sites used for summer foraging only (as opposed to breeding-and-summer or winter-only sites) in mountains of Idaho included all types of wetland habitats and were on average smaller and shallower than wetlands used for breeding and wintering, with less forest or shrub cover along shorelines (Pilliod et al. 2002). Patla (1997) found that “spotted frogs demonstrate considerable plasticity in summer foraging habitat, making use of small wet or damp areas in forest and meadows, including water-filled tire tracks, stream edges, and marshes.” Water bodies that provide year-round habitat have diverse habitat features.

Wintering habitat may include ponds, streams, under stream banks, springs, beaver dams, and underground areas (associated with water bodies), but all such sites must have above freezing temperatures, be moist or wet, and be well oxygenated. Columbia spotted frogs' winter in or immediately adjacent to aquatic sites, where they can avoid the threat of freezing or oxygen depletion (Bull and Hayes 2002).

In the project area, Columbia spotted frogs can be found along perennial streams, ponds, and springs as well as intermittent flooded sites. Vegetation preferred by frogs such as sedges, willows, and alders is limited, but available along some of the streams in the project area. These areas provide sites for breeding activities, egg deposition, and summer foraging. Frogs can move to other areas for use of habitat and predator avoidance. Because of the high desert environment and lack of water in the hot summer months in the project area, frogs use small wet or damp areas, including water-filled tire tracks and stream edges. Formal Columbia spotted frog surveys have not been completed in the project area; however, frog sightings are noted in most of the surveys conducted for fish habitat. Stream surveys have identified Columbia spotted frogs in Sugar, Powell, Tamarack, Rager, and Beaverdam Creeks. For this project, it is assumed that where suitable Columbia spotted frog habitat exists, individuals may be present.

Effects

The effects of the Upper Beaver Vegetation Management Project were assessed using redband trout and Columbia spotted frog population and habitat requirements. Other aquatic species that are sympatric with these species have similar habitat requirements as those associated with the listed species. Effects to fish, frogs and their habitats were considered for the proposed activities, together with past, present and the reasonably foreseeable projects listed below. The timing of the effects of the project are in the range of decades after the project is implemented. In the example of sedimentation, the effects of past projects and future projects may last until adequate flows occur to clean the substrate.

Past, Present, and Reasonably Foreseeable Actions Considered in the Analysis of Fish and Frog Habitat

The projects listed below are activities that were considered to have some influence on the fish and frogs and their habitats within the Upper Beaver Watershed. The projects listed below all occur or have occurred in the project area and their relationship with the environment is reflected in the Affected Environment discussion. More recent sales, Willow Pine, Runway, and Sugar Creek, will be touched upon briefly, and ongoing grazing more deeply, in the cumulative effects discussion.

- Fire suppression since early 1900s
- Grazing and ditching since 1880s
- Commercial logging dating back to the 1950s
- Fuels reduction projects
- Road maintenance
- Quarry material extraction

Table 3-54 provides the treatment acres within the RHCAs for each alternative. A detailed description of each treatment type can be found in the Silviculturist's Report for this EIS.

Table 3-54. Comparison of activities within RHCAs by alternative.

	Treatment Type				
	Commercial Thinning (with precommercial thinning and fuels treatments)	**Precommercial Thinning (without other activities)**	**Underburn (without other activities)**	**Hardwood Treatment**	**Juniper Thinning**
Alternative 1	0	0	0	0	0
Alternative 2	248	1457	556	31	49
Alternative 3	24	1526	542	15	49

Alternative 1

Under Alternative 1, there would be no proposed activities within the project area, including in RHCAs. Dense conifers stages, already above the historic abundance, would continue to increase, reaching the highest levels of all alternatives. In many places, high densities of conifers within the RHCAs would continue to inhibit the growth of deciduous, broadleaf species such as alder, willow, aspen, and cottonwood, resulting in a continuation of the undesirable riparian conditions present in and along most of the streams.

Water Temperature (stream shade)

Due to past management of RHCAs few stream reaches have been improving over the past 15-20 years in which monitoring has occurred. Under this alternative most streams would continue to be below the shade RMO and summer water temperature would remain above Oregon DEQ and Ochoco National Forest standards. Aquatic habitats would remain in this condition due to the low densities of hardwoods and the overstocked densities of conifers inhibiting expansion and establishment of riparian plants.

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) begin to fall into the stream over the next 10 to 15 years. Because of competition, conifers would grow at slower rates and trees (future large woody debris) would be smaller in diameter. In the long-term (20-100 years) this LWD would eventually increase and 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 would result in increased fire hazard and reduce growth on individual trees. Severe wildfire could reduce the availability of future large trees if riparian areas burn although it would create an initial 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.

Pool Frequency (pools/100') / Pool Quality/ Sediment

Under this alternative there are no proposed activities; therefore, there would not be any direct effects to pool frequency and quality. Frequency of pool habitat would continue to be insufficient and would likely continue to decline because no actions would be taken to change large wood recruitment (in the near future) to form pools and the channels would continue to widen. There

would be no short-term effects to pool quality in the Upper Beaver watershed because no change would occur to the riparian vegetation or channel process. Furthermore, Alternative 1 would not change fine sediment delivery from current levels mainly because of the existing road system.

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 the shrubs. As a result, stream banks would continue to lack well-rooted riparian plants that stabilize banks and can prevent further increases in width-to-depth ratios.

Fish and frog populations – disturbance to individuals

Based on the depressed habitat features discussed above, it is expected that 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.

Alternative 2

Commercial harvest in alternative 2 would occur in 39 units equaling 220 acres within RHCAs (see Table 2-1, Chapter 2 of this document). Commercial harvest of conifers is combined with precommercial thinning and underburning to promote the attainment of RMOs. When combined with precommercial 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 and wetlands. 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). INFISH (1995) allows timber harvest within RHCA when silvicultural practices are used to acquire desired vegetation characteristics that would aid in attainment of RMOs while avoiding adverse effects to inland native fish species. The project is designed to improve RMOs and minimize potential short-term impacts (see Chapter 2 of this document).

Precommercial thinning, juniper thinning and prescribed fire are proposed on 1,037 acres within the RHCAs across 180 units, including units with proposed commercial harvest. Table 2-2 (Chapter 2) displays the area treated precommercially (precommercial thinning, juniper thinning, fire and/or all three) outside of commercial harvest units by drainage for alternative 2.

Project design criteria identified in Chapter 2 should prevent all effects, except for limited short term effects under certain circumstances (see following discussions) to all of the RMOs and fish and frog populations.

Water Temperature (stream shade)

Most of the RHCAs within the project area have become overstocked with small diameter conifers. 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 2005). The Northwest Forest Plan Temperature Total Maximum Daily Load (TMDL) Implementation Strategies (2005) 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. There are five stream reaches (192 acres) in Category I and II RHCAs and six stream reaches (28 acres) in Category III and IV RHCAs that would have different harvest treatments applied to them. These are described in detail in Chapter 2 of this document, and depicted in Figures PA1 and PA2. These same two figures also depict the precommercial thinning, juniper treatment, and prescribed fire treatments allowed within RHCAs.

Under Alternative 2, shade would increase over the next 5-10 years due to higher vigor of existing (and currently proposed planted) hardwoods once some of the conifer canopy and understory is removed. Increased shade from the hardwoods would lead to 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. The anticipated amount of additional hardwood growth and distribution will largely be dependent on local conditions such as water table, substrate type, aspect and increase in sunlight due to the thinning. Under optimal conditions, planted or released hardwoods could grow up to five feet high in five to ten years based on experiences where the plants have been excluded from grazing and or conifers have been thinned out near a stand in other areas of the forest.

Precommercial thinning, and juniper treatment would occur to within five 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. Precommercial thinning would reduce the competition between riparian-associated species and conifers resulting in more woody, shrubby species. Precommercial thinning would result in increased growth rates for both conifers and riparian shrubs.

Prescribed fire would occur on approximately 1,400 acres designated as RHCA. 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. If the PDCs listed above are followed, a reduction in riparian hardwoods is unlikely. Burning in RHCAs is expected to expose less than 5% mineral soil in the riparian area (see Fire Specialist report). Mineral soil exposure is expected to last less than one year or until new growth of grasses and shrubs recovers in the burned area. 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 Upper Beaver 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 precommercial thinning would reduce fire hazard and the potential for severe wildfire within the RHCA and reduce competition for resources between hardwoods and conifers.

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

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). However, the number of trees available for in-stream recruitment (LWD = trees greater than 12 inch dbh and 36 feet long) would be reduced in the outer half of the RHCA (see Figure 1, 50-300 foot). Considering that the average conifer tree height in these stands is ~120 feet and the proposed, post-harvest basal area is high, it is believed there will be adequate numbers of trees remaining for future in-stream wood recruitment. Furthermore, trees that remain would contribute to stream LWD over the long-term (present-100 years) as they mature to greater size (12-21+ inch dbh), die and blow/fall over into the stream.

In stream reaches that are deficient in LWD (e.g. Beaverdam R3 and R4, Powell R1-R4, Rager R1, and Sugar R1 and R2) some trees would be felled/moved into the stream channel and placed to assist in attainment of the RMO. This activity would occur with coordination of the Fish

Biologist or Hydrologist. A short term increase (one to two days) in sediment supply to the stream may occur during placement of the LWD if the material is to be keyed into the banks to narrow the channels and create fish habitat, but would only displaced fish for that short time period and would benefit them in the long term. Felling and moving LWD across the channels could benefit the stream and fish in the long term, but depending on the local situation the wood may cause further bank instability. To lower the risk of this occurring, the Fish Biologist or the Hydrologist would provide on site input during the activity. Prescribed fire and precommercial thinning treatments are designed to reduce smaller fuels within RHCAs and reduce stocking of conifer seedlings, and to rejuvenate grass and shrub cover. Prescribed fire and associated harvest and precommercial thinning would reduce fire hazard and the potential for severe wildfire within the RHCA. Reducing fuels would protect large wood on the ground and standing trees for future large wood recruitment needed for fish habitat. While some large wood may be consumed, fire is expected to kill some standing trees that over time would fall and become large woody debris in the streams. Reducing competition would promote the growth of residual trees that would be future large woody debris. Large woody debris and beaver dams create 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 the 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 frog survival.

Pool Frequency (pools/100') / Pool Quality/ Sediment

The harvest treatments inside RHCAs would not directly affect pool frequency or quality. However, pool frequency and quality would increase in the short term (1-3 years) due to restoration work at stream crossings after project implementation (discussed below) and in the long-term (3-100+ years) due to large trees falling into the channel, capturing sediment and developing pool habitat.

The primary sediment delivery sites due to harvest would be from logging trucks and harvesting equipment at road/stream crossings. Based on monitoring of sediment delivery during a culvert installation project on Badger Creek, a Class II stream, only small amounts of sediment are expected and sediment is expected to settle out within 200 feet of the area of disturbance. This monitoring indicated that suspended sediment levels returned to background levels in less than 24 hours. Monitoring of stream structure work on McKay Creek (Class I) also resulted in increased sediment within 200 feet of the area of disturbance. However, sediment settled out or was dispersed within a few hours of the activity (USDA 2003). The short duration of the increased sediment supply would not likely negatively effect fish or frogs in the areas. Reconstruction of roads within RHCAs 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 at the following locations (see Road Manager's Report for more details):

Heisler Creek (Class III and IV), Road 5830, rip-rap would be filled in along the road to build up road surface above and below culvert; an armored drain dip may also be installed at Bellworm Creek (Class III and IV), roads 58-201, an armored drain dip, or temporary culvert would be installed. These actions would prevent and/or reduce sediment delivery to the streams at these locations.

Using small, existing (closed or open) 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. After proposed activities are completed, any placed

culverts would be removed and the channel would be restored. Streams sites identified for temporary culverts are located in intermittent or ephemeral channels, therefore fish and frogs will not be disturbed by these activities. However, some sediment will enter the stream channel during this process from the material used for the crossing on top of the culvert. This sediment would be flushed out during the next spring high flows and would not effect fish or frogs in the area because of the short duration of the material being transported and the dilution in the high flows. Restoration would include re-establishing channel grade, restoring the floodplain, restoring fish passage, and shrub planting. See Hydrology Resource Section for sediment effects outside of RHCAs.

Furthermore, 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. 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 mosaic fire patterns in the area and the required 100-foot no-ignition buffer strip. Prescribed burning would be implemented over approximately 10 years and in different seasons resulting in reduced potential for sedimentation due to there being less exposed soil at one time. Additionally, there are minimal anticipated effects on runoff because of the low potential for soil impact due to the logging methods, the soil type in most areas and the relatively flat terraces along the streams that would be harvested (see Soils Section).

Streambank Condition (% stream bank stability, channel width to depth ratio)

There would be minimal effect on bank stability during harvest activities since all logging equipment and off road vehicles would be kept at least 50 feet away from the banks in Category I and II RHCAs and at least five feet from the banks in Category III and IV RHCAs. There would be a short-term (one-two years, or duration of project implementation) reduction in bank stability at stream crossings, but effects would be mitigated 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. Effects of the mitigation actions would likely be a short-term (approximately one day) increase in sediment supply, but would result in a long-term increase in bank stability and shade from the planted hardwoods. Additionally, only existing skid trails, crossings and landings would be used within the RHCAs (see pg. 13 for required PDCs). Pulling 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 (following spring) 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 (over the next 5-15 years) 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. Precommercial thinning would not cause soil or bank disturbance as the activity would occur with hand tools and by personnel on the ground. Prescribed fire will likely not affect streambank conditions under the PDCs listed above.

Fish and frog populations – disturbance to individuals

Under Alternative 2, 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 redband trout because of the minor additional amounts. Furthermore, this project would be done at a time of year that would avoid

effects to spawning fish, incubating embryos and fry as well as breeding and juvenile frogs. If treatment activities do disturb fish or frogs, individuals would likely relocate to another part of the stream to seek refuge. Therefore, survival of redband trout would not be reduced. However, mortality of frogs may occur on haul routes when adult frogs traveling to new feeding/breeding locations are driven over by vehicles. Overall, Alternative 2 poses the greatest potential for improving fish and frog habitat, and subsequently their population numbers, due to the addition of LWD to the channel and the reduction of resource competition for hardwoods and other riparian species.

Cumulative Effects

Other present, past and future commercial harvest and other vegetation management activities are summarized in the Upper Beaver Silviculturist's Report. Cumulative effects of past harvest and the proposed activities have been analyzed in the Upper Beaver Hydrology Report. In summary, past logging activities, road construction, grazing and fire management has affected the ability of these watersheds to provide vigorous and stable riparian habitat.

There is one planned timber sale unit, Wheeler Aspen #1, within the project area on the upper slope of Wolf Mountain. Details are discussed in the Silviculurist's Report. Harvest and follow-up noncommercial thinning is proposed to begin in 2009. Cummulative effects from this project to RMOs or individual fish and/or frogs would not occur since project activities from Wheeler Aspen take place outside of RHCAs. There are no other active or planned timber sales within the planning area. There are no other vegetation projects currently ongoing or planned within the area.

The project area contains all or parts of the Bearskull/Cottonwood, Heisler, Wind Creek, and Wolf Creek Allotments. 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 RMOs in most streams. 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.

Livestock grazing in the project area has also been 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 where cattle have been grazing are not meeting RMOs. 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. 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. Stricter grazing management practices are being implemented on the Wind, Wolf and Heisler Creek Allotments (Southside AMP) as discussed in the Range Resource Section. Under Southside implementation, riparian species should 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 and shade.

A minimal number of mortalities of Columbia spotted frog (CSF) could result from project activities. Because the project site is located within and near a stream, 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 and 3, 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 (1-3 months/year) and of small area within RHCAs, limiting any potential cumulative effects to CSF.

Furthermore, several treatment units have remnants of old livestock exclosures around portions of riparian areas. Riparian planting has occurred in many of these areas, but the young plants are being heavily browsed in areas that are not caged. Repairing old exclosures, along with planting and caging new young hardwoods along stream channels, would help restore/reestablish hardwoods in the proposed treatment units.

Large wood that forms pools is not transported in these streams and therefore the primary agent of pool formation are large trees that are standing within 100-150 feet of the stream. No other projects in the project area would effect large wood and combine to have a cumulative effect with the Upper Beaver Vegetation Management Project. Any sediment that is displaced into streams would be dispersed through the streams during winter and spring runoff events and would not affect spawning/breeding or rearing redband trout and Columbia spotted frogs. The culvert on Forest Road #5840-600 that crosses Beaverdam Creek is currently a fish migration barrier on the downstream side and there is a large sediment plug on the upstream side that is forcing water onto the road (thus increasing erosion and sediment transport to the stream) during spring runoff.

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. Since 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.

Alternative 3

Alternative 3 was designed to minimize commercial harvest and equipment in RHCAs in order to eliminate the risk of any short-term impacts to RMOs, and fish and frog populations from commercial harvest. In addition to the PDCs described under Alternative 2, the treatment setbacks, standard INFISH RHCA buffer widths, from the stream channels, for some of the treatments (commercial and precommercial thinning) are more conservative than under Alternative 2. Category I and II streams would have 300 foot buffers on each side of the stream. Category III RHCAs would be 150 foot buffers and Category IV RHCAs would be 50 foot buffers (Figures PA3 and PA4, Chapter 2)). Heavy equipment would not be allowed in these zones, but commercial harvest would be allowed within reaching distance of the logging equipment (approximately 25 feet). Commercial harvest in Alternative 3 would occur in 11 units equaling 14 acres within RHCAs (Table 2-4, Chapter 2). Commercial harvest would occur on the outer edge (~50-100 feet) of these RHCAs in Category I and II areas and therefore harvest would not be removing trees that are capable of contributing LWD, or shade to the stream system or improving RMOs which will result in similar effects described in Alternative 1 under this variables. However, because of the distance to the streams, the PDCs, and the fact that there are existing roads, that can act as buffer strips, between the commercial harvest treatments and the streams, there should not be any negative effects to the streams near these small, fragmented pieces of RHCA units. Commercial harvest will only be discussed if there is a potential to produce measurable effects that are different then those discussed under Alternative 2.

Precommercial thinning, juniper thinning and prescribed fire would occur in a total of 188 units on 990 acres of RHCAs. Table 2-5 (Chapter 2) displays the area treated precommercially (precommercial thinning, juniper thinning, fire and/or all three) outside of commercial harvest units by drainage for Alternative 3.

Water Temperature (stream shade)

Precommercial thinning and juniper treatment 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. Precommercial thinning would reduce the competition between riparian-associated species and conifers resulting in more woody, shrubby species. Precommercial 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 nine inches) after precommercial thinning occurred would continue to shade out hardwoods and hinder their growth and expansion. The pre-commercial thinning would not increase sediment to the stream since the work would be done by hand and would not be removing bank stabilizing trees.

Fire would be placed on approximately 990 acres within RHCAs. 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. If the PDCs are followed, a reduction in riparian hardwoods is unlikely. Burning in RHCAs is expected to expose less than 5% mineral soil in the riparian area (see Fire Specialist report). Mineral soil exposure is expected to last less than one year or until new growth of grasses and shrubs recovers in the burned area. 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 Upper Beaver 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 precommercial thinning would reduce fire hazard and the potential for severe wildfire within the RHCA and reduce competition for resources between hardwoods and conifers. With more available resources (e.g. sunlight, water, and nutrients) existing and planted hardwoods would be able to reestablish and expand along the stream corridors, thus increasing shade and bank stability and leading to a reduction in water temperatures.

However, trees with a dbh larger than 9 inches would be left within the RHCA. This would leave the RHCAs with elevated stand densities and accumulating fuels of these larger trees which would likely result in increased fire hazard compared to Alternative 2. Severe wildfire could reduce the availability of future large trees if riparian areas burn although it would create an initial 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.

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

The decrease in acres 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. Furthermore, commercial harvest of timber under Alternative 3 would not effect the current, short-term, or long-term rate of recruitment of trees to the stream since trees would not be removed from the inner 200 feet of RHCAs. Most streams in the Upper Beaver planning area would continue to be devoid of large wood to form pools and catch sediment. Precommercial thinning, juniper treatment, and underburning would still occur within RHCAs, but the effects

would be less than Alternative 2 because there are nearly 400 fewer acres being treated under this alternative. Nonetheless, the overstocked densities of trees too large for precommercial thinning would remain, thus reducing the potential of achieving RMOs (in a shorter period than if commercial harvest 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 active flood channels, there would be no effect directly or indirectly on in-stream wood or habitat for fish.

Pool Frequency (pools/100') / Pool Quality/ Sediment

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 changed due to commercial harvest, precommerical thinning set backs and the low intensity of underburns in these humid environments. Fish and frog habitat would remain at its current depressed 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 $\geq$ 12' dbh, INFISH) and then fall into the stream (15-30 years), leading to an increase in pool frequency and quality. Trees would not be felled/moved into the stream channel and placed to assist in attainment of the RMO as described in Alternative 2. Residual slash from precommercial thinned 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. Prescribed burning would be implemented over approximately 10 years and in different seasons resulting in reduced potential for sedimentation due to there being less exposed soil at one time.

Under Alternative 3, no heavy equipment or vehicles (i.e. ATVs, tractors, trucks) will be used inside RHCAs for any of the treatments. Therefore, no roads will be built, reopened or improved within RHCAs, which will minimize potential for increased erosion into the stream channels. Consequently, additions of sediment will be via dust from other road surfaces or rain-induced erosion. See Hydrology Resource Section for sediment effects outside of RHCAs. Existing travel routes could be used through RHCAs to transfer equipment and material from the project area.

Although there is a chance that a small amount of sediment could enter the stream under implementation of Alternatives 3 due to rain events during commercial harvest, thinning, or fuels treatments it would not be measurable enough to increase the sediment already in streams. Additionally, there are minimal anticipated effects on runoff because of the low potential for soil impact due to the logging methods, the soil type in most areas and the relatively flat terraces along the streams that would be harvested. All stream crossings would be limited to roads over culverts in the Category I and II RHCAs and on existing roads that cross dry channels in Category III, and IV RHCAs. 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. No new roads would be constructed in the project area, however currently open roads, roads that are closed (would be reconstructed) and some temporary roads would be utilized. Roads that are closed and any temporary roads would be decommissioned after the project has occurred. Since some channels would be dry during the project, minimal amounts of sediment would be moved into the channel.

Streambank Condition (% stream bank stability, channel width to depth ratio)

There would be no direct affects on bank stability under this alternative since no logging equipment or off road vehicles would be allowed with RHCAs. Furthermore, only existing skid trails, crossings and landings would be used within the RHCAs. Pulling trees out of the outer edge of the RHCA (first 20-30 feet) would cause a temporary removal of vegetation of the top of the soil for the first one to three months until vegetation regrows. The amount of disturbed

sediment from harvest would be insufficient to cause excessive sedimentation to the stream. Additionally, existing vegetation along the stream would filter the sediment that may move as a result of logging. Precommercial thinning, and juniper treatment would not cause soil disturbance. 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. 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.

Fish and frog populations – disturbance to individuals

The direct and indirect impacts of the activities to fish and frog populations would be less under Alternative 3 than under Alternative 2. The possibility of the addition of sediment, via dust and rain-induced erosion at road crossings attributing to the movement of fine silt downstream during high flows remains; however the likelyhood and impacts are reduced because of the limited commercial activities near aquatic habitats. These activities (e.g. hauling timber on major roads, pre-commerical thinning, underburning) 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 redband trout because of the minor additional amounts. Furthermore, this project would be done at a time of year that would avoid effects to spawning fish, incubating embryos and fry as well as breeding and juvenile frogs. Therefore, survival of fish or Columbia spotted frogs would not be reduced. If treatment activities do disturb fish or frogs, individuals would likely relocate to another part of the stream to seek refuge.

Cumulative Effects

Alternative 3 would have similar cumulative effects as Alternative 2. However, because of the very limited commercial harvest, and fewer acres of precommercial thinning and prescribed fire within RHCAs, there is less risk of short-term negative impacts to RMOs and individual fish and frogs from the implementation of Alternative 3. Conversely, by treating fewer acres, long-term improvement to the habitat features discussed above would be slower.

Wildlife

Federally Listed Species

Threatened, Endangered, and Sensitive (TES) species that are documented or suspected to occur on Ochoco National Forest are listed in Table 3-55.

Table 3-55. List of Threatened, Endangered, and Sensitive Species, Their Status, and Presence.

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 not occur in the project area)
Peregrine Falcon (*Falco peregrinus anatum*)	Sensitive	Not Present (suitable habitat does not occur within the project area)
Greater Sage-Grouse (*Centrocercus utophasianus*)	Sensitive	Present (sightings within project area)
Bufflehead (*Bucephala albeola*)	Sensitive	Not Present(suitable habitat not present in the project area)

Species	Listing	Presence
Upland Sandpiper (*Bartramia longicauda*)	Sensitive	Not Present (suitable habitat not present within the project area)
Gray Flycatcher (*Empidonax wrightii*)	Sensitive	Suspected (unconfirmed in the project area)
Tri-Colored Blackbird (*Agelaius tricolor*)	Sensitive	Not Present (suitable habitat not available in the project area)

There are no federally listed terrestrial wildlife species known to occur on the Ochoco National Forest. The Northern bald eagle was delisted in 2006 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 has been determined to have insufficient primary habitat to warrant management of Lynx Analysis Units (per direction in the amended Lynx Conservation Assessment and Strategy, 2000). There are nine wildlife species on the Regional Forester's sensitive species list that are known or suspected to occur on the Ochoco National Forest. They are: Northern bald eagle (*Haliaeetus leucocephalus*), Peregrine falcon (*Falco peregrinus anatum*), bufflehead (*Bucephala albeola*), upland sandpiper (*Bartramia longicauda*), western sagegrouse (*Centrocercus urophasianus*), gray flycatcher (*Empidonax wrightii*), tricolored blackbird (*Agelaius tricolor*), pygmy rabbit (*Brachylagus idahoensis*), and California wolverine (*Gulo gulo*). The project area contains potential habitat for bald eagle, western sage grouse, gray flycatcher, and wolverine. These species are discussed below.

Five species were not addressed because there is no or only low probability habitat in the project area. Effects to the Canada lynx will not be discussed for the Upper Beaver alternatives, because, on May 29, 2001 the Forest received concurrence from the U.S. Fish and Wildlife Service that implementation of any activities contained within the Ochoco National Forest Land and Resource Management Plan, as amended, is not likely to adversely affect the Canada lynx outside of an existing Lynx Analysis Unit (LAU). At the time this consultation took place there were, and continue to be, no LAU's existing on the Ochoco National Forest.

The determination for Canada lynx is **"May effect, but not likely to adversely affect" (NLAA)** for any action within the guidelines set forth by the LRMP. Therefore the NLAA determination applies to all the alternatives. The other sensitive species do not have habitat within the project area and will not be impacted by the project. They include the upland sandpiper, the tricolored blackbird, bufflehead, and the pigmy rabbit and will not be further discussed in this document.

Summary of Determinations

Table W-2 summarizes the determinations for effect/impact on the species assessed in this EIS.

Table 3-56. Summary of Effects Determinations for Threatened, Endangered and Sensitive Species for the three Alternatives for the Upper Beaver Project.

Species	Status	Presence	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	Not Present	NI	NI	NI
Western Sage-Grouse	Sensitive	Confirmed	NI	MIIH	MIIH
Bufflehead	Sensitive	Not Present	NI	NI	NI
Upland Sandpiper	Sensitive	Not Present	NI	NI	NI

Species	Status	Presence	Alt. One	Alt. Two	Alt. Three
Gray Flycatcher	Sensitive	Suspected	NI	MIIH	MIIH
Tri-Colored Blackbird	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

Bald eagles (*Haliaeetus leucocephalus)* utilize large trees for nesting, and they forage in a variety of habitats, particularly water bodies, wetlands and riparian meadows. Suitable habitat for bald eagle winter roosts includes a moderate stand density of trees greater than 12" diameter at breast height (dbh), with a substantial component of large, open structure mature trees that serve as roost trees for roosting bald eagles. Ponderosa pine is a prominent tree type used. Snags and dead topped are also an important stand feature in winter roosts. There is one known bald eagle nest adjacent to the project area within the Wolf Creek Bald Eagle Management Area (BEMA). The Wolf Creek BEMA is both a nesting and winter roost BEMA. The Wolf Creek BEMA is partially located within the project area. The Sugar Creek winter roost (ERA) is also located within the project area. A management plan was written for the Sugar Creek winter roost area in 1991. The management plan has specific recommendations for management of the winter roost. Bald eagles primarily forage on the adjacent private land although they may also forage within the project area when opportunities exist.

Alternative 1

There would be no activities outside of the ongoing program of work 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. Over time live trees currently supporting a nest or 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.

Determination

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. The potential cumulative effect of combining implementation of this alternative with the past, present and reasonably foreseeable actions, is that a higher risk for high intensity wildfires threatening existing nesting habitat would be maintained with this alternative. However, such a loss is not predictable. Large diameter trees would continue to be at risk for insect attacks and disease. The development of additional potential nest or roost trees would be slower under the no action alternative because of the current high stocking levels that exist. Winter Roost stands will remain susceptible to insect infestations and disease.

Alternatives 2 and 3

Alternatives 2 and 3 propose vegetation treatments within the Wolf Creek BEMA and the Sugar Creek ERA. Under alternative 2, 59ac. of commercial harvest and associated fuels treatments are proposed within the 509 acre Wolf Creek BEMA. Alternative 3 would treat approximately 12 acres within the Wolf Creek BEMA. No treatments are proposed within the nest stand under both alternatives 2 and 3. The prescriptions will thin from below to promote the development of large

live trees which are important as both nest trees and roost trees. Currently large trees are deficient. Seasonal restrictions and other conservation measures are prescribed in the Project Design Criteria in the Programmatic BA, and are included in the Project Design Elements. There is a risk that harvest activities and burning activities will result in a decrease of large snags suitable as roost or perch trees. Harvest activities will be designed to avoid large diameter snags in Units 31 and 32. Excessive fuel accumulations around snags or live trees greater than 21"d.b.h. will be reduced prior to burning in units 31 and 32.

Harvest and related treatments are proposed within ½ mile of a known nest tree in Units 31 and 32. A seasonal restriction between Jan 1 – Aug 31 will be applied to Harvest units 31 and 32 and associated pre-commercial thinning and prescribed burning within units 31 and 32.

Alternatives 2 and 3 propose the following treatments within the Sugar Creek winter roost (ERA). Commercial harvest will occur in Unit #1-23ac., Unit #33 – 31ac., Unit #2 – 1ac., and Unit#35 – 1 ac. All commercial harvest units will have fuels treatment following harvest activities. An additional approximately 247 acres of pre-commercial thinning is proposed within the winter roost. The winter roost management plan describes objectives for stand conditions with the winter roost. In general an un-even aged condition is desired with 5-8 trees per acre 36" – 40"d.b.h. in the overstory and an understory with between 15 – 20 trees per acre 12" 20"d.b.h. The large tree component currently is lacking. Prescriptions will be modified to meet the desired conditions within the winter roost management plan. Currently heavy stocking levels in the understory increase the risk of disease and insects. Alternatives 2 and 3 will decrease stocking levels in the understory and improve the longevity and growth of the current overstory. Moderate stocking levels will continue to maintain a moderate risk for attacks from insects in order to provide roosting eagles protection from inclement weather conditions. Alternatives 2 and 3 will move towards the desired condition described in the winter roost management plan.

Harvest and related treatments are proposed within the Sugar Creek winter roost primary and secondary zone. Activities will be restricted between Nov. 1 – April 30 for the following units. Commercial harvest units 1,33, 2, and 35, and associated fuels treatments. Pre-commercial thinning units 317, 304, and 316.

Cumulative Effects

Management activities and uses that have occurred in the past have influenced the availability and quality of habitat for bald eagles. Removal of large trees, snags and down wood through timber harvest have altered the availability of potential nest or roost sites. Fire suppression activities over the last 100 years have lead to the development of dense stand conditions that currently exist.

Road construction and development of the Sugar Creek Campground and Day Use Area, have altered the extensiveness and level of human activity throughout the project area, increasing the potential for disturbance to wildlife. In order to mitigate possible disturbance to wintering bald eagles, a timing restriction of no-use is in effect from December 1 to May 1 within the Sugar Creek Campground. Prescribed burning, and hazard tree reduction within the project area has removed some snags potentially affecting the abundance of roost sites. There has also been increased forage production for big game in thinned or burned areas, contributing to food resources for bald eagles in the form of carrion. The Sugar Creek vegetation management project treated 55 acres within the winter roost area in 2008. The Sugar Creek vegetation project combined with the proposed action alternatives are intended to improve the overall habitat conditions for bald eagles in the long term.

Cumulatively, habitat conditions in the BEMA would not significantly change with implementation of this project. Stand densities would be reduced on 59 acres within the 509 acre BEMA, which will promote the development of large tree structure within these acres in the future, although the majority of the BEMA will remain unchanged. Habitat conditions within the

Sugar Creek winter roost is expected to improve in the future with the development of additional large trees and a decrease in the potential risk from insect attacks and disease.

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 both action alternatives because: nesting, foraging and roosting use occurs in and adjacent to the project area; and actions are proposed in the Bald Eagle Management Area (BEMA) associated with one nesting pair, and in an Eagle (Winter) Roost Area (ERA) mapped in the LRMP. Seasonal restrictions and other conservation measures are prescribed in the Project Design Criteria in the Programmatic BA, and are included in the Project Design Elements section of the EIS. Both action alternatives will result in conditions moving towards the desired conditions described within the Sugar Creek winter roost management plant. Both alternatives propose treatments within the Wolf Creek (BEMA). The prescriptions for these treatments should be consistent with the intent of maintaining or promoting the development of large live trees in these areas.

California Wolverine

California wolverine habitat is best described more in the terms of its ability to provide seclusion and freedom from disturbance while also meeting foraging habitat and prey base (Ruggiero et al., 1994). Wilderness areas, large tracks of roadless areas, high elevation alpine areas and other similar habitats most often provide the highest quality habitat and are where wolverines are most often found. Reproductive habitat is defined as large structure moist grand fir plant associations or boulder fields at high elevations. Very few acres within the moist grand fir plant association occurs within the project area. The analysis area does not have sufficient habitat to be used as a reproductive home range. 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). Wolverines often exhibit large territories that they will actively travel in search of food/prey and in search of mating opportunities.

These territories and home ranges may vary seasonally following foraging sources. Habitat within the project area would not be considered high quality. Road densities in the project area are generally below Forest Plan standards for density management, however, road denstities and high recreational activity remain high enough to increase the likelihood of disturbance effects from general vehicle traffic and forest use. Vegetative habitat conditions are not those identified as primary habitat types (Ruggiero et al., 1994). The broken, fragmented nature of the project area, due in large part the natural distribution of forest and scab/shrub-steppe habitats, as well as past timber harvest management, produces a lower quality habitat. Ruggiero et al. describe various forest types, primarily associated with boreal and conifer forest, along with other types not common in north east Oregon (1994). Existing forested habitat, however, would provide cover and support some forage sources, primarily big game animals that may provide carrion forage sources. No sightings are known for this species in the project area. Several unconfirmed sightings are associated with the Black Canyon wilderness to the north of the project area.

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. Under this alternative forage for many herbivorous species would continue to decline, 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 extent and intensity of future disturbance events.

Ongoing uses in the project area would continue to occur. There are no cumulative effects to wolverine that result from combining ongoing activities with implementation of this alternative.

Determination

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 construction of new roads. Temporary road construction and opening closed roads, proposed under both action alternatives, would increase the potential for human disturbance in the short term. Although, these effects would be short term and would not have a long term effect on wolverine use of the available habitat. There would be no affect to rock or talus habitat. Large wood accumulations, which could alter denning habitat may be affected by fuels treatment activities in the upper elevation areas near wolf ridge. Although, potential denning habitat within the project area would be considered marginal because of the lack of large wood accumulations associated with moist grand fir plant associations. Activities associated with both action alternatives would improve forage conditions for potential prey species and sources for carion. As a result, food sources for carnivores such as wolverines would be improved. The analysis area does not have sufficient habitat to be used as a reproductive home range. Wolverines could use the upper portions of the analysis area for foraging within a portion of their home range or may be used by dispersing individuals.

Cumulative Effects

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.

Western Sage-Grouse

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.

Sage grouse sightings within the project area are concentrated in the southeast portion, in an area referred to as the ozone, where juniper densities are sparse. Approximately 1200 acres within this area provides the largest contiguous sagebrush associated habitat within the project area. The predominant plant community within this area is identified as rigid sagebrush and Sandberg's bluegrass. Currently bunchgrass is the most common vegetation type. Low sagebrush also occurs but to a lesser degree than rigid sagebrush. Rigid sagebrush habitat is not often referenced in the literature as a preferred or selected habitat for sage-grouse (Connelly et al. 2004, Connelly et al. 2000, Wambolt et al. 2002). This is likely due to the deciduous nature of the shrub's leaf, short stature, and low densities of shrub cover that often exist in these habitats. These habitats, however, are often abundant in forbs and insects, which are important for brooding sage-grouse during the late spring and early summer (Connelly et al. 2004, Connelly et al. 2000). Sightings within the project have primarily occurred between May and September. The later sightings, which would likely occur after the majority of forbs have dried out would not be consistent with sage grouse use of rigid sage habitat types, although variations in winter snow pack, precipitation, as well as low sagebrush also being present, are possible explanations. Table 3-57 displays the acres of sagebrush shrub steppe communities that occur in the project area. Data is from a GIS query of the project area. Table 3-57 does not display juniper/low sagebrush or juniper/rigid sagebrush communities that occur in the project area. Juniper densities that currently exist in these community types would likely make the majority of these acres unsuitable for use by sage grouse. A large portion of the rigid sagebrush acres are scattered across the project area in relatively small patch size and separated by conifer or juniper stringers. The small patch size and lower quality of rigid sage communities on a large portion of acres reduces the potential for use by sage grouse. Low sagebrush associations also occur in the project, although to a lesser degree than rigid sagebrush communities (Table 3-57). A large portion of these acres are relatively small in size and fragmented by conifer stands or juniper associated communities. Juniper expansion has occurred throughout the project area and is likely affecting the suitability of portions of the existing sage brush associated habitats. There is no research that describes juniper densities in relation to use or non use by sage grouse. However, in central Oregon, sage grouse avoided western juniper communities for nesting and winter use (Bureau of Land Management 1994).

Potential nesting habitat is limited within the project area. Mountain big sagebrush communities are represented by 230 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. Marginal nesting habitat occurs on the east side of sugar creek in the southern portion of the project area. Mesic meadow and riparian habitats that could potentially provide habitat for sage-grouse comprise <1% of the project area, with 71 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 project area.

Table 3-57. Summary of Sagebrush Shrub-Steppe Habitat Types within the Project Area.

Shrub-Steppe Habitat Type	Acres	Percent of Project Area
Low	**1,793**	**5**
Mountain Big	**230**	**<1**
Rigid	**7,835**	**17**
***Table does not include juniper/low sagebrush and juniper/rigid sagebrush communities**		

Alternative 1

The no action alternative would maintain the existing habitat conditions within the project area. Nesting habitat would likely be insufficient to support nesting sage grouse. Use of the existing habitat, primarily in the vicinity of what is called the ozone, is expected to be sporadic primarily because of the low quality of the existing habitat compared to higher quality habitat that exists to the south of the project area on private and BLM administered land. There would be no prescribed burning activities that would potentially reduce sagebrush cover and the suitability of the existing habitat. Juniper expansion would be expected to continue also decreasing the suitability on portions of the existing habitat. 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.

Determination

The determination for alternative 1 is **No impact (NI)** as there would be no change to habitat and no change in potential disturbance levels.

Alternatives 2 and 3

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 power lines and fences, grazing, increases in invasive species and noxious weeds and the discontinuance of intensive predator control (ODFW 2005 and USFWS 2005)). The commercial harvest and pre commercial thinning activities would not directly affect habitat degradation problems identified in the Sage-Grouse Conservation Assessment and Strategy and the U.S. Fish and Wildlife Service's petition finding. There are two proposed commercial harvest units proposed that are within plant associations with a sage brush component. The two units include 29 acres, and conifer densities prior to and following treatment would likely eliminate potential use of these areas by sage grouse. Treatments in these two units would likely benefit the grey flycatcher that utilizes mountain big sagebrush habitats. Increased activity in association with harvest activities in close proximity to potential habitat could have a short term effect on use in these areas, although this effect is expected to be small and short term. One temporary road will be constructed across approximately 326 feet of a low sagebrush community. The location is within identified sagebrush steppe habitats (Table 3-57). Although, the proposed location is currently within a small fragmented patch of low sagebrush and separated form more contiguous habitats. There have been no sage grouse sightings in this area. The temporary road will be closed following harvest activities.

Juniper thinning is proposed under both alternatives 2 and 3. Juniper thinning is being proposed within juniper/sagebrush associations that currently are not identified as potential habitat because of current densities. In alternative 2 and 3 1,661 acres of juniper thinning is proposed within the juniper steppe habitat type. Additional juniper thinning is proposed within the juniper woodland habitat type, although benefits to sage grouse would likely be less because of the densities of juniper that would likely remain following treatment would be higher. Juniper thinning may benefit sage grouse by providing more open conditions, especially where thinning is adjacent to sagebrush dominated areas that are currently open providing larger more contiguous blocks of habitat. Juniper thinning will also improve the vigor of understory vegetation which may improve

foraging opportunities. Increased activity associated with juniper thinning may have a short term effect on sage grouse use where sightings have been documented. Although, sage grouse are very mobile and the effect would be minimal as well as short term. Prescribed burning is proposed following juniper thinning under alternatives 2 and 3. Burning is expected to occur on a very small portion of the treatment areas and would only occur where fuel concentrations would be high and there would be a risk of high intensity fires occurring. There is expected to be a reduction in the sagebrush component where burning occurs, although the reduction is expected to be minimal because of the small amount of acres where burning would actually occur. There is a small risk that burning activities will result in the increase of cheat grass, if cheat grass is currently a component.

Under alternatives 2 and 3 additional burning is proposed on 210 acres within the sagebrush steppe habitat type. A small amount of sagebrush reduction is expected on these acres. This represents only 3% of the sagebrush steppe habitat within the project area.

No burning will occur in areas where there are current sightings or areas that are identified as potential nesting habitat or where field reviews indicate higher quality habitat currently exist.

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)). This alternative does not propose to add to any of these identified adverse cumulative effects on sage-grouse.

Past activities in the analysis area include vegetation management, livestock use, fence construction, fire suppression, pond construction, road construction. Vegetation management activities within the project area prior to 1985 that have contributed to current resource conditions include: Buckhorn, Powell Creek, Snow Course, Dusty Well, Hat Springs, Hog Wallow, Willow, Butte, Tower, Robin, TNT, Aqua, Sugar Creek, and Runway Timber Sales. Primary activities under these actions are summarized in Table B. These timber sales occurred between 1985 and 2007. Precommercial thinning has occurred from 1976 to the present. Various other small projects with beneficial effects or effects too small to measure include juniper thinning, spring developments, riparian exclosures, campground improvements, culvert replacement, and fence construction.

Table 3-58. Past vegetation activities that have occurred in the Upper Beaver Project Area

Timber Harvest	
Regeneration	639 acres
Thinning	2,819 acres
Overstory removal	3,176 acres
Natural Fuels Burning	? acres
Precommercial Thin	? acres

Road construction has occurred in conjunction with past timber harvest activities. Roads that cross or run parallel to streams have effects on the channel and vegetation. Roads alter stream drainage patterns by confining the stream, reducing the area within the floodplain, so floodplain interaction is disturbed. This in turn affects riparian habitat and its function.

Historic grazing, particularly the documented over-grazing of sheep and cattle near the turn of the century has affected some plant community types. Shallow soils, low precipitation, and low overall productivity make shrub-steppe habitats particularly vulnerable to over grazing. This can result in changes in species composition of grasses, forbs and shrubs in these habitats, many times

resulting in the establishment of invasive or noxious plant species. In general, such changes are detrimental to sage grouse (Connelly et al. 2004).

Fire suppression effects are associated with the changes in plant community composition because of the absence of fire as a disturbance event. The expansion of juniper and increase in juniper densities within sagebrush communities is the greatest effect from fire suppression. Increasing juniper densities can have an effect on the understory shrub component and moisture availability for understory grasses and forbs. Currently many of the mountain big sagebrush and low sagebrush cover types in the early phase of woodland encroachment, which still support populations of sage grouse, will be lost as trees gain dominance on these sites and shrubs are lost (Bates et al. 2000). Increasing juniper densities also provide additional perch sites for raptors that prey on sage grouse. To a lesser degree, conifer encroachment into meadow and riparian habitats through the exclusion of fire has reduced the availability of those habitats to sage-grouse. A limiting factor in the presence of sage-grouse is the availability of mesic meadow and riparian habitats for use in brood rearing. The loss of these habitats to conifer encroachment can be significant to sage-grouse presence and habitat use and alternative 1 will continue allowing the encroachment of conifers into these important habitats through the continuation of fire suppression of most wild fires.

Road building and recreational use in riparian areas are also detrimental to quality sage-grouse habitats. These features can lead to direct mortality to the birds through indiscriminate shooting, direct habitat loss, facilitation of predation and facilitation of the spread of invasive and noxious plant species and also sage-grouse are very likely to abandon nests during laying and incubation if disturbed and flushed off of nests (USFWS 2005).

Invasive species change vegetation communities, and more desirable forbs and grasses and sagebrush habitats often loose to those infestations. Connelly et al. recognized the significant adverse effects invasive species have on sage-grouse habitat quality (2004). Cheat grass is perhaps the most well known invasive species that's permanently altered sage-grouse habitat, but others are also having an effect (Connelly et al. 2004, Connelly et al. 2000). The effects of invasive species are further compounded by the other actions described above, in both taking advantage of disturbances created by actions such as livestock grazing, prescribed burning, road building, and recreational use of habitats, and simultaneous use those actions as distribution vectors to spread out across the landscape. Invasive species issues in relation to cheat grass are relatively small in the project area. *Ventanata* is another annual that occurs in the project. The extent of occupancy within the project area has not been determined. Please refer to the discussion on noxious weeds and other invasive plant species in the EIS.

There potentially would be a small decrease in the sage brush component associated with burning activities under alternatives 2 and 3 and the potential exists for a small increase in cheat grass. As described under direct and indirect effects, the effects to sagebrush habitats and sagegrouse are expected to be minimal when the quality, amount, and current use of the existing sagebrush associated habitats are considered. The short segment of temporary road construction (approx. 326 feet) will result in a degradation of sagebrush in that segment. Although the effects to sage grouse and potential sage grouse habitat would be minimal because of the location as described above. Reductions in juniper densities, which are proposed in both alternatives 2 and 3, would provide more open contiguous conditions as well as providing additional foraging opportunities.

Determination

A 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 (MIIH) determination is reached for Alternatives 2, and 3 as proposed for the following reasons. Both alternatives would have a small affect on sage grouse habitat through the proposed actions. Potential disturbance associated with increased activities adjacent to sage grouse habitat will be

short term. There will be a decrease in sage brush associated with burning activities. The decrease in sage brush will occur on a small number of acres when compared to the amount available. Potential nesting habitat is limited and there will be no activities associated with potential nesting habitat. No activities are proposed in areas with documented use. Habitat within the project area is currently marginal and fragmented in nature.

Gray Flycatcher

The gray flycatcher uses a combination of shrub-steppe and conifer woodland habitats in the Great Basin region of the western US (Marshall, Hunter and Contreras 2003). Ponderosa pine and western juniper, with sagebrush and/or bitterbrush understories and mountain mahogany stands are often selected for nesting and foraging habitat (Marshall, Hunter and Contreras 2003). Nesting occurs relatively low to the ground. The species migrates well south every winter, returning late April/early May (Marshall, Hunter and Contreras 2003). Marshall et al. identifies the end of May through early July as the breeding season for the gray flycatcher (2003). Habitat exists for this species within the project area, although bitterbrush and big sagebrush does not make up a significant understory component where present and would reduce habitat suitability. No sightings of this species has occurred within the project area, but they are expected to occur there. Mountain mahogany is scattered across the project area, but typically occurs in small stands less than an acre in size. This species would likely inhabit juniper habitats which are abundant within the project area where young juniper and sagebrush or bitterbrush occurs in the understory. Approximately 8,189 acres of habitat exists in the project area. This is according to a Wildhab query of the silviculture databases for the Project Area.

Those plant communities include dry ponderosa pine forest/woodlands and juniper shrub and woodland habitats (Marshall, Hunter and Contreras 2003).

Alternative 1

The no action alternative does not directly alter upland shrub habitat. Under alternative 1 a decrease in mountain big sagebrush could be expected where it occurs in the understory of pine sites as the overstory continues to develop. Nesting habitat would continue to decline in juniper steppe and juniper woodland habitats as juniper densities increase and young juniper would no longer be present within the sagebrush understories. Shrub communities would also be expected to decline with increasing juniper and pine densities. Under Alternative 1 there will be an increased risk of high intensity fires effecting habitat as conifer densities increase throughout the project area. Habitat could be expected to fluctuate over time as high intensity wildfire would set some areas back to a grass/forb stage. Shrub communities would likely redevelop on effected sites. However, within the project area a large portion of suitable habitat would exist on the interface between scabs and conifer stands and the shrub component is primarily low and rigid sagebrush. Wildfire would potentially have a higher impact on many these sites because of the slower recovery rate in these sagebrush types.

Ongoing uses in the project area would continue to occur. There are no cumulative effects to gray flycatcher that result from combining ongoing activities with implementation of alternative 1.

Determination

The determination for alternative 1 is **No impact (NI).**

Alternatives 2 and 3

Disturbance from silvicultural treatments and prescribed burning could disrupt activities of individuals during implementation. Spring burning activities are typically completed prior to breeding season, which begins at the end of may and would reduce potential effects to nesting individuals. When thinning or burning occurs in the fall, the activities would be outside of the nesting season, and potentially after these birds have left Oregon for the fall migration. Thinning

and burning would reduce coniferous canopy closure and water uptake, allowing more light and moisture to be available to the understory vegetation. This could improve habitat over time by allowing shrub nesting habitat to develop. Burning can also reduce nesting structure in the short term by removing tall shrubs. Relatively open juniper woodland and juniper steppe habitats have the highest potential to support nesting gray flycatchers. Treatments on these juniper sites should improve habitat for flycatchers as long as some tall shrub or small juniper habitat remains scattered throughout treatment units. Improved habitat conditions is expected to occur on approximately 700 acres within juniper/low sagebrush habitats and approximately 931 acres within Rigid sagebrush habitat types. Burning is also proposed in both alternatives for juniper thinning which may result in decreases in the sagebrush componet where burning occurs. Burning is only expected to occur on a small portion of treated acres where fuels concentrations are high. Burning is expected to occur on less than 10% of treated acres. There is 115 acres of ponderosa pine/mountain Big sagebrush habitat type that occurs in the project area.

Activities including commercial and pre-commercial thinning and burning are proposed on 30 acres under both alternatives 2 and 3. Depending on the time of year activities could effect nesting individuals. A small amount of mechanical disturbance is expected from harvest activities in the short term, although thinning is expected to improve the mountain big sagebrush component in the long term. Overall, habitat conditions are expected to improve for the grey flycatcher with the implementation of either alternative 2 or 3.

Cumulative Effects

Past activities that have that have affected grey flycatcher habitat within the project area include fire suppression, prescribed burning, and pre-commercial and commercial thinning. Fire suppression activities have resulted in increases in juniper density from what would be expected historically. Prescribed burning has resulted in decreases in the sagebrush component and bitterbrush component at selected sites, although the amount is small and would be expected to occur historically. Past thinning has helped to reduce conifer densities, although commercial harvest large diameter pine in the past is in part responsible for dense stand conditions that exist today with limited shrubs in the understory which has affected the quality of the existing habitat. The proposed activities associated with both alternatives 2 and 3 are expected to improve and increase habitat for the grey flycatcher by thinning juniper. Similar to the sage grouse, higher quality habitat occurs south of the project area on private and BLM land where tall sagebrush occurs in larger contiguous areas. Ongoing uses in the project area would continue to occur. 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

The Breeding Bird Atlas (Adamus et al. 2001) indicates that this species population is presently increasing and that this species is widely distributed across its range. Lower elevation areas, below the forest boundary are the core reproductive habitats for this species. For these reasons the determination is **May Impact Individuals or Habitat, not likely to contribute to a trend toward federal listing (MIIH)** for all action alternatives.

Peregrine Falcon

Peregrine falcons utilize sheer rock cliff faces for nesting sites, and forage over a variety of habitats where smaller birds are abundant. Suitable habitat likely exists within the lower reaches of Black Canyon Creek and also along the South Fork John Day River canyon, north and east of the project location. Sheer rock cliff faces that would be suitable nesting habitat does not occur in the project area. There are peregrine falcon sightings south of the project area along Beaver Creek on private land. Suitable foraging habitat exists, although peregrines typically do not select denser forested habitats or rolling topography that characterize the project area.

The activities proposed would not adversely affect peregrine falcons or their habitat. Suitable habitat is not present.

Determination

A No Impact (NI) determination is reach for the peregrine falcon relative to the activities proposed with the three alternatives. Suitable habitat is not present.

Bufflehead

The bufflehead 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 will also nest in ponderosa pine and Douglas fir (Marshall et al. 2003). In Oregon, breeding occurs primarily in the central Cascade Lakes region, more than 20 miles from the Grassland (Marshall et al. 2003).

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 Upper Beaver Vegetation Management project. Suitable habitat for this species is not present in the project area.

Upland Sandpiper

Upland sandpipers inhabit wet meadows and grassland areas near water. High elevation sagebrush communities will also be utilized as habitat. Habitat exists and has been occupied in the Big Summit Prairie area on the Lookout Mountain Ranger District of the Ochoco National Forest, west of the analysis area. Habitat and the number of breeding pairs are very limited in Oregon.

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 the alternatives proposed in the Upper Beaver project. Suitable habitat for this species is not present in the project area.

Tri-colored Blackbird

The tri-colored blackbird is a wetland/cattail marsh associated species that will also use wet meadow habitats. Larger marsh complexes are considered typical habitat for this species. Willow habitats and blackberry shrub habitats associated with marshes will also be used for nesting in absence of cattails.

Suitable habitat for this species is non-existent in the project area. The project area lacks large marsh habitats, and the available wet meadow complexes and rangeland types are generally small. The species is not documented as occurring in the project area (Csutsi et al., 1997).

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 Upper Beaver Vegetation Management project. Suitable habitat for this species is not present in the project area.

Management Indicator Species

Goshawk

Nest cores and Post- fledging areas (PFA) have been mapped around or adjacent to known goshawk nesting sites. Within the planning area there are four mapped PFA and associated nest stands. Of these nesting territories, all have been occupied in the last five years. One of these territories has two nest cores mapped, based on recorded nest locations. Tamarack Creek and Powell Creek did not show activity in 2008. Bear Creek was not surveyed in 2008. See Table 3-59 for information on goshawk territories and occupancy.

Table 3-59. 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
Bear Creek	2007	411 ac.	2 stands, 30 acres each	2
Tamarack Creek	2007	398 ac.	31	1
Tamarack Spring	2008	671 ac.	29	1
Powell Creek	2006	613 ac.	29	1

Goshawks are considered forest habitat generalists that use a variety of forest conditions. Goshawk habitat is often characterized by three types: 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 or at the bottoms of drainages. Post-fledgling areas are from 300-600 acres in size and provide hiding cover and foraging opportunities for young goshawks. 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. 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. 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. 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.

There are currently 1,923 acres mapped in four PFAs and their associated nest cores within the project area. One of these PFAs, Bear Creek, is partially within the project area (241acres) and partially outside (160 acres). A total of 13,045 acres of suitable nesting habitat occurs within the Upper Beaver watershed, based on structural/seral conditions (dominated by size class 4 or 5 trees pine and/or fir trees). Historically, between 10,182 and 18,500 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).

Alternative 1

This alternative would not treat forest stands within currently mapped PFAs, nesting areas or suitable goshawk habitat outside of existing PFAs. The no action alternative will maintain the existing acres of suitable habitat within mixed conifer and ponderosa pine stands in the short term. The majority of the existing habitat consists of stands dominated by trees in the 9 inch to 20

inch d.b.h. 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, a condition preferred by goshawks. Within the majority of habitat the development of stands dominated by large tree structure with high canopy closures will be slow because of the high stocking levels that currently exist. Over time stand densities will continue to increase and the risk of mortality to the remaining overstory trees is 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. High stocking levels is likely partially responsible for the observed mortality. There is also an increased threat of high severity wildfires occurring as stand densities increase and ground fuels accumulate. Under Alternative 1 open understory conditions that is preferred by foraging goshawks is 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. The suitability of the existing habitat will change over time, both positively and negatively. This alternative would not result in displacement of goshawk from existing occupied territories.

Alternative 2

This alternative would commercially treat timber stands within two PFA's, (Tamarack Spring and Tamarack Creek). Harvest activities would occur on 269 acres which represents 40% of the area within the Tamarack Spring PFA. Harvest prescriptions will vary. Harvest prescriptions within 125 acres or 46% of the treatment acres are designed to reduce basal area, to promote growth of residual trees, and to reduce the risk of loss to insects or high intensity fire (Units 271,154). Harvested prescriptions within 144 acres or 45% of the treatment acres within the Tamarack Spring PFA will have a variable marking prescription that will leave variable tree densities throughout the units (Unit 16,19). Harvest activities would occur on 28 acres which represents 7% of the acres within the Tamarack Creek PFA. All prescriptions will thin from below with no trees 21" dbh or larger being harvested. Prescriptions will reduce cover within treatment areas because of the high densities of mid story and understory trees that are present within treatment areas. Treatments are intended to improve the longevity of dominant and do-dominant trees as well as increasing the growth rate of mid story and understory trees that remain following treatment. Treatments will also create a diversity of differing stand conditions and habitat for a variety of prey species within PFAs. Cover will be reduced within treatment areas in the short term, although foraging opportunities will likely be improved by creating more open understory conditions for flight. No commercial harvest activities are proposed under alternative 2 within the Powell Creek and Bear Creek PFAs.

Alternative 2 proposes pre-commercial thinning and fuels treatment within mapped PFAs on 1,540 acres. This represents 73% of the PFA acres within the planning area. This includes 297 acres of pre-commercial thinning associated with harvest treatments. Precommercial thinning treatments in individual PFAs are as follows: 0% in the Bear Creek PFA, 25% in the Powell Creek PFA, 55% in the Tamarack Creek PFA and 60% in the Tamarack spring PFA. This includes 20 acres of grapple piling and 40 acres of hand piling within the Tamarack Spring PFA. Alternative 2 would implement underburning of natural fuels outside of thinning units and harvest units within PFAs on 753 acres. This represents 36% of the PFA acres in the planning area. Fuels treatments within PFAs including treatment of pre-commercial thinning and natural fuels within individual PFAs are as follows: 58% of the Bear Creek PFA, 78% of the Powell Creek PFA, 68% of the Tamarack Creek PFA, and 73% of the Tamarack Spring PFA. Commercial harvest exceeding 50% of any individual PFA will likely remove excessive amounts of hiding cover and has potential to displace the existing pair of birds. This does not occur within any PFA under this alternative.

Total treatment, including commercial harvest, pre-commercial 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 all four PFAs under this alternative (See Project Design Elements).

No commercial Harvest treatments will occur within mapped 30 acre goshawk nest cores. Pre-commercial thinning will occur within the Tamarack Spring nest core. Pre-commercial thinning will occur on 50% of the Powell Creek nest core and under burning will occur on 100%. Pre-commercial thinning and fuels treatment will occur on 25% of the Tamarack Creek nest core. Under burning will occur within two nest core areas in the Bear Creek PFA.

Seasonal restrictions on disturbance activities would be employed from March 1 to August 31, generally within ½ mile of nests. The restriction would apply to the following commercial harvest units (and associated pre-commercial thinning and activity fuels burning): 154 and 271. The restriction would also apply to the following pre-commercial thinning and fuels burning units: 243, 266, 267, and 312. The restriction would also apply to the following natural fuels burning units 109, 146, 82, 76, 77, 78, 79, 21, and 122. The restriction would also apply to the following pre-commercial thinning and grapple pile units: 241 and 314. The restriction would also apply to the following pre-commercial thinning and hand piling unit 17. Restrictions on hauling would only be applied within nest core areas and/or within 10 chains of nests. This restriction applies to hauling on the following road: 5820 beginning at section line between sections 5 and 8 north for .5 miles. Restrictions may be waived or shortened on a case by case basis, depending on nesting status and chronology, topographic features, movement of the fledged young out of the nest area or other site specific factors.

Conclusion: This alternative would alter stand densities on 1,142 acres of currently suitable goshawk habitat within the project area. This represents 8% of the 13,543 acres of currently suitable goshawk habitat within the project area. Stand densities will be reduced on 297 acres within PFAs which represents 14% of the 2093 acres. Timber harvest within PFAs would be designed to meet silvicultural as well as habitat objectives. Under this alternative the majority of commercial harvest acres within PFAs would currently be considered marginal for nesting because of the lack of large tree structure and there locations in relationship to streams. Observations of preferred goshawk nesting locations within the project area indicate preferred nesting locations are in close proximity to streams. This alternative is expected to improve the diversity of structural conditions present within PFAs and the project area which is expected to improve goshawk habitat in the long term. Project design criteria specific to PFAs will reduce potential effects to prey species. This alternative is not expected to affect occupancy within existing PFAs.

Alternative 3

This alternative would treat timber stands within PFAs the same as alternative 2. There would be 2 acres less treated within alternative 2 which would have a very small affect on goshawk habitat within PFAs. Prescriptions would remain the same for both Alternative 2 and Alternative 3 for commercial harvest units. This alternative would alter stand densities on 974 acres of currently suitable goshawk habitat within the project area. This represents 7% of the 13,543 acres of currently suitable goshawk habitat within the project area. There are 168 acres less treatment proposed in alternative 3 within currently suitable goshawk habitat when compare to alternative 2. The majority of these acres are located in close proximity to streams which are desirable nesting areas for goshawks. The majority of the 168 acres would remain susceptible to insects and disease because of the high tree densities that are present. There would be no under burning within the Bear Creek PFA or nest core areas under this alternative. The Bear Creek PFA would remain susceptible to high intensity wildfires under this alternative. All restrictions and design elements would remain the same for alternatives 2 and 3.

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 1985. Regeneration harvest activities have occurred on 639 acres within the project area.

Treatments included: Clearcut, Clearcut with reserve trees or shelterwood. Overstory removal has occurred on 3,176 acres. Most of the 3,815 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 2,727 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. Two recent timber sales; Sugar Creek and Runway, have occurred since 2004. These two sales included approximately 90 acres of commercial thinning in stands of primarily young ponderosa pine. These two sales likely will improve goshawk habitat in the future by opening the understory for goshawk foraging activities and decreasing the threat of insects. 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 including thinning and burning projects between 1995 and 2005 have occurred on 8,608 acres within the project area. These activities 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.

There have been no specific snag or downed wood surveys within the project area. Personal observations indicate snag levels are currently deficient across the project area. In 2002 the 747 fire burned approximately 89 acres within the project area. The majority of the acres burned in low intensity had no effect on goshawk habitat within the project area.

It is reasonably foreseeable that the Forest will 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 will 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 will 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.

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 (PFA) have been mapped for all known occupied goshawk territories in the project area. The 30 acre goshawk nest core areas would have no commercial timber removal under any action alternative. Harvest activities within PFAs will not remove late and old structure trees or snags. Treatments within nest core areas and post-fledging areas (PFA) 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 August 31 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 determined 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.

Other Raptors, including Golden Eagle and Prairie Falcon

A variety of raptors have sightings located within the area of influence of this project. They include red-tailed hawk, Cooper's hawk, bald eagle, golden eagle, prairie falcon. There are no known golden eagle of prairie falcon nests known to occur within the project are. Cliff faces and ledges suitable for prairie falcons do not occur within the project area. There should be no impacts to prairie falcons. One red-tailed hawk nest occurs within the project area. Refer to the TES section for a discussion on northern bald eagles.

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

Canopy closure may be reduced to less than 60% crown closure 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. 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, although under alternative 3 there would be 470 acres less commercial harvest treatment when compared to alternative 2. These acres are primarily ponderosa pine dominated stands, dominated by trees in the range (9”dbh – 21”dbh) with high densities. 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. Observations indicate this is currently occurring within the project area. Increased tree mortality is expected. Snag and downed wood habitat could be expected to increase in the short term which could improve habitat for raptor prey species.

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 2,727 acres in the project area.

It is reasonably foreseeable that he Forest will 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 will 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.

Grazing by livestock and big game will 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.

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') will 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.

Pileated Woodpecker

Reproductive areas are designated as Old Growth Management Areas (OGMA), MA-F6 with associated feeding habitat (pfh) outside of designated old growth. There are three OGMAs in the analysis area, one at Sugar Creek (OG-D2-04) one at Beaverdam Creek (OG-D2-08), and one at Bear Creek (OG-D2-09). The first of these, OG-D2-04 is mapped at 276 acres and is predominately ponderosa pine. The second, OG-D2-08 is mapped at 290 acres which includes three forested drainages separated by low/stiff sage flats. The first drainage is mapped as a

Douglas-fir Plant association, although is currently dominated by pine. Douglas fir does not make up a significant component of these stands. Field reviews indicate fairly high mortality occurring within the larger diameter pine. Mortality is either directly or indirectly related to prescribed burning activities that have occurred in the past. The second and third drainages are dominated by ponderosa pine. Field reviews of all designated Old Growth Management Areas within the planning area indicated the species composition is primarily pine dominated and lacks a significant fir component with high canopy closure and is currently providing low quality pileated reproductive habitat. The designated Old Growth Management Areas also lack suitable pileated foraging habitat in close proximity to the designated OGMA. The OGMA are located in the southern portion of the project area, and are primarily surrounded by other pine dominated habitats or juniper and sagebrush dominated scabs. Pileateds select for more contiguous habitat blocks (Bull and Holthausen 1993). Habitat features important to the pileated woodpecker include high (>60%) canopy closure, stands dominated by fir species, sufficient snags for feeding and nesting, and abundant down logs for foraging. Suitable pileated woodpecker habitat is primarily located in the northern portion of the project area in the dry grand fir plant association. Queries of forest habitat databases, using the Viable Ecosystems definitions of habitat (forest type and structure) identified 1,143 acres of suitable pileated woodpecker habitat within the Project Area. The largest contiguous block of habitat is located in the upper reaches of Powell Creek. Additional suitable habitat is located to the east of Powell Creek. Most of this habitat is located in smaller blocks that are broken by non-forested habitats. Field reviews in 2008 indicated pileateds were making use of the available habitat.

Alternative 1

This alternative would not treat forest stands within pileated habitat or designated OGMAs. This action will maintain the existing acres of fir-dominated understories and canopy closure, at least in the short 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. Large woody debris would be retained at the current levels. Over time, high stand densities may lead to declining stand health due to insects and disease, although this may also benefit the pileated woodpecker by increasing its forage base. Extensive mortality due to insects and disease could also increase the risk high intensity fire in the future. 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).

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 proposes commercial harvest (with associated pre-commercial thinning and fuels treatment) within 65 acres of the 276 acre Sugar Creek designated old growth area. An additional 20 acres of precommercial thinning and underburning and 13 acres of underburning is proposed outside of commercial harvest treatment areas. The harvest prescription will retain all old growth trees larger than 21”dbh as well as cohert trees that may be below 21”dbh. The prescription will use variable marking to leave trees in both clumped groups as well as individually spaced trees to allow for maximum growth. Pre-commercial thinning will leave 15% of the thinned area in un-thinned clumps. This alternative will reduce the suitability of pileated habitat within treated areas, although currently the Sugar Creek old growth provides marginal nesting and foraging habitat because of being dominated by ponderosa pine and lacking suitable large tree structure or a

significant fir component. The lack of suitable nesting habitat as well as the lack of contiguous blocks of foraging habitat surrounding the old growth area reduces the suitability of this old growth to provide suitable habitat for a pair of pileated woodpeckers. This alternative also proposes 182 acres of selected pre-commercial thinning within the 290 acre Beaverdam Creek allocated old growth area and 242 acres of underburning and 24 acres of juniper thinning within the Bear Creek allocated old growth area. Pre-commercial thinning is not expected to have an effect on pileated habitat within the majority of the Beaverdam or Bear creek allocated old growth areas. Although, precommercial thinning that will occur on the 154 acre portion that occurs on Beaverdam Creek proposes to selectively thin conifers up to 16"dbh around selected large diameter trees. Treatments are intended to reduce stress o the remaining large diameter trees as well as providing woody material in the stream channel. Beaverdam Creek is currently deficient in large woody material. The lack of large woody material has lead to a wide shallow channel that is lacking in vegetation. Increasing large woody material will help to trap sediment and improve the current channel and vegetation conditions. Precommercial thinning within this 154 acre portion may slightly reduce crown closures and densities at selected locations. The proposed activities is not expected to have large impact on pileated habitat within the allocated old growth area.

This 154 acre portion currently provides potential nesting habitat for pileateds, although large contiguous blocks of foraging habitat in close proximity to the nesting habitat is not available. No underburning will be conducted in the Beaverdam Creek allocated old growth until a review is conducted with a wildlife biologist and fisheries biologist following the completion of thinning activities. Underburning that is proposed may reduce downed wood habitat in the short term, although large woody material would be retained at levels consistent with Viable Ecosystems or Eastside Screens (which ever is more restrictive) as follows: Dry grand fir, 100 to 257 lineal feet per acre; Douglas-fir, 100 to 233 lineal feet per acre; moist ponderosa pine, 55 to 167 lineal feet per acre; and Dry ponderosa pine 20 to 55 lineal feet per acre. These standards would allow removal of down wood where accumulations exceed these levels, thus reducing potential foraging substrate for this species at least in the short term. Precommercial thinning and the commercial treatment of mid-story trees would promote the development of large structure trees over time, ultimately providing a source of recruitment for large snags and down logs. Reducing competition from below is also likely to improve the longevity of existing large trees in the overstory.

Alternative 2 will reduce the suitability of 161 acres of currently suitable reproductive habitat across the entire project area. Under this alternative 982 acres of reproductive habitat will be retained. The majority of this habitat occurs in LOS (late and old structure) stands in the upper reaches of Powell, Tamarack and Beaver dam Creeks. Under this alternative 389 acres in upper Powell Creek will be deferred from any treatment. This is the most contiguous block of reproductive habitat remaining in the project area. Under this alternative pileated reproductive habitat will remain within the range of what would be expected historically.

Alternative 3

No treatments would be proposed under alternative 3 within allocated old growth management areas. Under alternative 3 high stocking levels that currently exist in the understory would slowly increase over time. As a result the stands may be more susceptible to insects and disease with mortality expected to increase in the overstory layer. Snags and large woody debris levels are expected to increase which would potentially increase foraging habitat, although the majority of habitat within allocated old growth areas would remain marginal as both foraging and reproductive habitat due to the lack of a fir component and deficient large tree structure. A portion of the Beaverdam Creek old growth area (154acres), would remain as suitable nesting habitat, although foraging habitat is not available in close proximity to this stand.

Alternative 3 will reduce 141 acres of currently suitable reproductive habitat within the project area. Under this alternative this alternative 1002 acres of suitable reproductive habitat will be

retained. The majority of this habitat occurs in LOS (late and old structure) stands in the upper reaches of Powell, Tamarack and Beaver dam Creeks. Under this alternative 389 acres in upper Powell Creek will be deferred from any treatment. This is the most contiguous block of reproductive habitat remaining in the project area. Under this alternative pileated reproductive habitat will remain within the range of what would be expected historically.

Cumulative Effects

Past harvest activities have occurred on approximately 3,815 acres in the project area since 1985. The majority of the treatments would have removed previously suitable pileated woodpecker reproductive and foraging habitat. Thinning and selective harvest has occurred on approximately 2,727 acres in the project area. A portion of these acres could be expected to provide foraging habitat depending on the intensity of harvest. Additional harvest prior to 1985 focused primarily on the larger high value trees which would have also provided high value pileated nesting and roost trees. Fire exclusion has also had an impact on pileated habitat within the project area and across the landscape. Fire exclusion has resulted in the development of grand fir and to lesser extent Douglas fir in the understories than would have occurred historically. In these stands pileated woodpecker habitat would be increased. Although, at the same time timber harvest activities removed a large portion of the large tree (size class 5) that decreased pileated woodpecker habitat. The relative abundance of structural and seral stages by plant association are displayed in the Silviculture Report. Pileated woodpecker reproductive habitat would generally be represented by stands in structural stages four and five “a” in mid and late seral stages. Stands that are currently suitable as primary reproductive habitat for pileated woodpeckers would generally be represented as seral/structural stages M4a, M5a, L4a and L5a in the grand fir and Douglas-fir plant association groups (PAGs). Overall large tree size class 5 is deficient within the project area and across the landscape. Both action alternatives are designed to reduce tree density, maintaining all trees greater than 21”dbh, accelerating the development of large tree size, and increase the amount of acres in single strata structure. Both alternatives maintain pileated reproductive habitat within the desired range that would be present historically. The project area is also south facing and characterized as scab/stringer country. As a result the drainages are timbered and the majority of the land between the timbered drainages is composed of either sagebrush/bunchgrass or juniper/bunchgrass. Pileated woodpeckers prefer contiguous blocks of habitat.

In the future, it is expected that implementation of Viable Ecosystems at the watershed and Forest level will continue to remove true fir from many forested stands, resulting in increased domination of pine and larch, more open forest conditions and single stratum stand structure on more acres than is currently present. This will reduce the quality of pileated woodpecker habitat in the long term, though total reproductive habitat will increase as dominant tree size becomes larger. At the same time, stands that have developed densities and species compositions that are not sustainable due to site capability, would be brought closer to a sustainable level with future management actions. At the watershed scale, the abundance and distribution of pileated woodpecker habitat would move closer to what is believed to have been the historic condition. 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 LRMP indicates that the allocated OGMA are intended to provide reproductive habitat for pileated woodpeckers. The plan also states that a multi-layered canopy with shaded conditions and a large number of dead snags is considered optimum for old growth habitat. Wildlife and Fish standards and guidelines for MA-F6 indicate that vegetative management will not be allowed, until further research is available on the needs of the dependent species. However, the Fire, Forest Health and Forest Residues standards and guidelines for MA-F6 indicate that reduction of

accumulations of fuel load, treatments to reduce risk of loss to insects and disease, or treatments to promote attainment of desired future condition may be appropriate in some instances. Therefore, there is a conflict between providing suitable conditions for pileated woodpeckers and meeting seral and structural conditions within some plant association groups (PAG). For example, dry ponderosa pine PAGs are better suited ecologically to providing habitat for white-headed woodpeckers in a variable, but generally more open forest dominated by large structure ponderosa pine. However, the same OGMAs have been assigned to meet distributrion requirements for pileated woodpeckers. Commercial harvest is proposed in one OGMA (Sugar Creek) under alternative 2. This is not consistent with direction in the forest plan (LRMP, p. 4-210), eventhough current conditions within the Sugar Creek old growth area is marginally suitable for both reproductive and foraging habitat. Under Alternative 3, there are no treatments proposed within any OGMA. Both alternatives provide reproductive and feeding habitat consistent with their needs in the grand fir plant associations in the upper reaches of Powell Creek, Tamarack Creek, and Beaver Dam Creek.

Snags would not be marked for removal, and post treatment monitoring would be done, to ensure that snags and down logs are retained at a level consistent with the Regional Forester's Plan Amendment 2, or the Viable Ecosystem Management Guide, which ever is most restrictive. Both of these Guidelines exceed the snag requirements set forth in the LRMP for pfh. For these reasons, it is expected that this project is consistent with LRMP standards and guidelines for pileated woodpecker.

Primary Cavity Excavators

The northern flicker is listed as a Management Indicator Species in the FEIS for the LRMP. This species was identified as an indicator for old-growth juniper. 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 of the appropriate dimensions are present. However, this species can excavate nests in old growth juniper, where other species of woodpeckers do not serve as primary cavity excavators. Currently there is 3,813 acres of juniper habitats with large structure. Habitat generalists among the primary cavity excavators can be assured habitat by providing suitable habitat for the range of species that select for specific habitat types or more limiting habitat conditions. The existing conditon for primary excavators is addressed by focusing on two species of habitat specialists, the white-headed and pileated woodpeckers. Other species of primary cavity excavators are also described in the section on migratory birds and focal species below.

The pileated woodpecker prefers closed canopy, late to old-growth fir-dominated habitat. The best pileated woodpecker habitat is within stands dominated by large (>20"dbh) true fir. Current conditions for pileated woodpecker habitat in the project area is limited by site potential. The entire project area is south facing with the southern portion of the project being dominated by pine and juniper plant associations. The northern portion of the project area being dominated by the dry grand fir and Douglas fir plant associations provide the best opportunity to provide pileated habitat. On grand fir sites (which have better potential to provide pileated woodpecker habitat than pine sites) current abundance of pileated woodpecker nesting habitat is limited by closed-canopy late seral stands with large tree size. The existing condition (907 acres of primary nesting habitat for the pileated woodpeckers) is currently at the lower end of the range predicted to be in the watershed historically. The predicted range for primary nesting habitat in the watershed historically (804 acres low end and 1683 acres high end). The characteristic natural fragmentation of habitats within the watershed from the scab stringer landform does not provide large contiguous blocks of habitat preferred by the pileated woodpecker.

The white-headed woodpeckers prefer ponderosa pine habitat that has more open overstory with large live pine for foraging and snags for nesting habitat. Its habitat associates are generally called the pine birds, including the pygmy and white-breasted nuthatches and the flammulated owl. This habitat is used by all of the local primary excavators with the exception of the pileated

woodpecker, which prefers a fir component for foraging substrate and roost structure. Open forest conditions are preferred by Lewis' woodpecker, Williamson's sapsucker, pygmy and white-breasted nuthatch. Current conditions in the project area are limiting for white-headed woodpeckers, and associated species, since open-canopy stands with large tree size are below the historical range of variability in the grand fir PAG (E5b, M4b and M5b); in the Douglas-fir PAG (E5b, M5b and L5b); and in the xeric ponderosa pine PAG (L4b and L5b) and in the Mesic-Pine PAG (L5b). Currently, the Douglas fir M4b structural condition is within the historic range and the Mesic Ponderosa Pine L4b structural condition is above the historic range. The M4b and L4b structural conditions has the potential for providing large structure in the future if maintained in the open condition. The existing condition (9,134 acres of primary nesting habitat for white-headed woodpeckers) is currently below the historic range within the watershed, as compared to the historic range of variability (9,952 acres low end, 19,098 high end). White headed woodpeckers have been observed within the watershed.

Alternative 1

This alternative would not treat forest stands and thus the current trends in snag and large wood abundance would continue to occur. Mortality due to stand densities being above sustainable levels would result in recruitment of snag and down log habitat. The large pine trees in the overstory are particularly vulnerable to competitive stress from an overly dense understory. Many of overstory pine that are currently alive would succumb to this stress and become large snags. Observations within the project area indicate this is currently occurring. Pockets of mortality in the pine understory are also occurring at scattered locations. High stand densities would result in increasingly high levels of insect activity. These insects, primarily bark beetles and western spruce budworms would provide a food resource for woodpeckers for a period of time. 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 with low density of snags in 50 to 100 years afterwards. Large snag recruitment would begin again after the new stand matures enough to provide such structure. This may take 150 years or more. Large scale insect outbreaks and high intensity fires also reduce foraging opportunities for cavity nesters that include food resources from live forests in their diet (seed eaters, sapsuckers and foliage gleaners).

This alternative would maintain the existing acres of fir-dominated understories and the trend toward fir dominated habitats. The no action alternative will favor the species that utilize dense, fir-dominated habitats and habitat generalist, in the short term. There would be a continued decline in suitability of existing 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, as rapidly as the action alternatives which promote the development of large size ponderosa pine. White-headed woodpecker habitat is below HRV (the range of habitat that would be expected historically). The risk of high intensity wildfires affecting currently suitable habitat and the development of future habitat would be higher under this alternative with the continued development of the understory and ladder fuels.

Conclusion: This alternative would not accelerate development of habitat for white-headed woodpeckers.

Alternative 2

This alternative would treat approximately 2,674 acres with commercial thinning, and 6,727 acres of precommercial thinning. Treatments would move stands in a multi-strata condition towards a single-strata condition. In treatment units all existing snags would be left that are not deemed to be a safety hazard. Large pine trees in the overstory that are particularly vulnerable to competitive stress from an overly dense understory would be released from competition by young conifers. Treatments would also encourage the development of additional large trees in the future.

Treatments would favor early seral species primarily ponderosa pine on a large portion of the acres, although late seral species would continue to be present where they existed prior to treatments. Insect activity and the availability of forest insects as a food resource for woodpeckers would continue to occur across the landscape, but the occurrence of extensive areas of high tree mortality should be reduced. Under alternative 2 4,233 acres of natural fuels burning and 8,714 acres of activity fuels burning will occur. Some existing snags and large downed woody material may be consumed during prescribed burning and snags and future large downed woody material may be created. The extent of reduction of snags and creation of snags through burning activities is highly variable across treatment areas depending on weather conditions, time of year, and fuel concentrations. Large woody debris would be retained at levels consistent with Viable Ecosystems or Eastside Screens (which ever is more restrictive).

This alternative would help restore white-headed woodpecker habitat on most of the commercial harvest area. Where pre-commercial 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. This alternative is expected to restore white-headed woodpecker habitat on 1653 acres post harvest. 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 would accelerate development of habitat for white-headed woodpeckers.

Alternative 3

This alternative would treat approximately 2,205 acres with commercial thinning, and 6,867 acres of precommercial thinning. Treatments would also move stands in a multi-strata condition towards a single-strata condition, although to a lesser extent. In treatment units all existing snags would be left that are not deemed to be a safety hazard. Large pine trees in the overstory that are particularly vulnerable to competitive stress from an overly dense understory would be released from competition by young conifers. When compared to Alternative 2, Alternative 3 would retain 469 acres predominately dominated by ponderosa pine plant associations. These acres would retain high density levels and would be vulnerable to insects and disease. Increased mortality could be expected in the overstory from stress. Increased mortality could be expected in the understory from pine beetle attacks. Increased insect activity would be increased on 469 acres and would provide a food source for foraging woodpeckers. Treatments under alternative 3 would also encourage the development of additional large trees in the future. Treatments would favor early seral species primarily ponderosa pine on a large portion of the acres, although late seral species would continue to be present where they existed prior to treatments. Insect activity and the availability of forest insects as a food resource for woodpeckers would continue to occur across the landscape, but the occurrence of extensive areas of high tree mortality should also be reduced under alternative 3. Under alternative 3, 3,942 acres of natural fuels burning and 8,518 acres of activity fuels burning will occur. Some existing snags and large downed woody material may be consumed during prescribed burning and snags and future large downed woody material may be created. The extent of reduction of snags and creation of snags through burning activities is highly variable across treatment areas depending on weather conditions, time of year, and fuel concentrations. Large woody debris would be retained at levels consistent with Viable Ecosystems or Eastside Screens (which ever is more restrictive).

This alternative would help restore white-headed woodpecker habitat on most of the commercial harvest area. Where pre-commercial 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. This alternative is expected to restore white-headed woodpecker habitat on 1057 acres post harvest. 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 and increasing stands dominated by open large ponderosa pine.

Conclusion: This alternative would accelerate development of habitat for white-headed woodpeckers.

Cumulative Effects

The project area totals approximately 35,000 acres. There are approximately 19,036 acres of mixed conifer and ponderosa pine habitat types, approximately 54% of the area. The remaining acres include approximately 12,600 acres of juniper woodland and juniper steppe habitats, approximately 36% of the project area, and non-forest includes approximately 4% of the area. Juniper thinning has occurred on a small percentage of the juniper acres. Activities that have occurred in the past have had little to no effect on the distribution of snags and downed wood in the juniper habitat types. Alternative 2 proposes juniper thinning on 2,299 acres and alternative 3 proposes juniper thinning on 2,279 acres. Juniper treatments will retain all old growth components and no existing snags will be cut. Burning is proposed within juniper treatment areas, although burning is expected to occur on a small percentage of the acres, primarily where juniper has expanded into ponderosa pine habitat types. Burning could be expected to increase snags and future downed within the juniper habitat types, although this increase is expected to be small. Downed woody debris is not expected to be affected in these habitat types.

Activities that have occurred in the past that have affected the distribution and densities of snags and downed woody debris include: timber harvest activities and prescribed burning activities within ponderosa pine and mixed conifer habitat types. Regeneration harvest and overstory removal have occurred on approximately 3,815 acres in the planning area since 1985. The majority of these treatments would have removed most or all of the overstory trees and snag habitat. Within these areas snag retention is assumed to be near 0% of the potential population capability for primary cavity excavators. Thinning and selective cutting has occurred on 2,727 acres. Depending on the Prescriptions many of these areas have retained both overstory trees and understory trees capable of providing some future large snag and log habitat. These areas are estimated to average 50% population potential.

Approximately 12,494 acres of forested land occurs within the planning area and outside of the 6,542 acres of previous harvest history described above. Prior to 1985 some form of harvest activities occurred over much of the 12,494 acres of forested stands, beginning as early as 1950. The majority of this harvest focused on the selective or group removal of large high value trees.. As a result the majority of stands have had snag density reduced by previous management activities. Observations indicate that within stands with no harvest history snag densities in both large and medium sized trees have increased in recent years. Much of the mortality occurring in the medium size trees occurs in pockets and are scattered across the project area. Mortality is also occurring in the large tree size. This is believed to be from stress caused by overstocking occurring in the understory as well as indirect effects from underburning activities. Stands that have no harvest history are assumed to have 100% population potential. The level of snag retention within the project areas is estimated to be at 73% of the potential population capability for primary cavity excavators, compared to data tables in Thomas 1979.

The action alternatives do not propose harvest of existing snags, so the amount of existing snags present within the project area should not be substantially altered by implementation of silvicultural treatments under any alternative in the short term. Treatments that promote the development of large trees would promote the development of large snags in the long term, while

reducing the recruitment of small and medium size snags in the near and mid term (less stand mortality results in less snag recruitment). Some snag habitat will be reduced incidentally to reduce work area hazards, or potentially at landings, although this is not expected to reduce overall snag densities and distributions across the project area.

Conclusion: The project will remove trees up to 20.9 "dbh, so could affect abundance and size of trees available for recruitment of future snags. There could be some effect on the likelihood of developing areas with high snag density within treated stands. This could affect species that select for high snag density, such as black-backed woodpeckers. Although there may be less of a tendency for high density snags to develop in treated stands, across most of the project area there will be sufficient residual tree stocking to allow for recruitment of snag patches in the future. Approximately 78% of acres present outside of those acres with recorded harvest would remain untreated under Alternative 2 (82% for Alternative 3) maintaining opportunities for snag patch recruitment across the landscape. All alternatives would retain options for future snag recruitment or creation, but commercially treated acres would have reduced potential for high density or snag patch recruitment.

Forest Plan Consistency

The Regional Forester's Eastside Forest Plan Amendment #2 (Screens), which amends the Ochoco National Forest Land and Resource Management Plan (Forest Plan), identifies specific standards for the management and protection of cavity excavator habitat. The Regional Foresters Plan Amendment 2 revises the LRMP and requires snags to be retained at the 100% population level (at least 2.25 snags per acre in ponderosa pine and mixed conifer PAGs) within harvest units. However, the Viable Ecosystem Management Guide (VEMG) has been adopted by the Forest and provides more specific standards for snag retention by PAG. Table 3-60 displays the recommend snag densities by plant association group and snag size. The Ochoco agreed to use snag levels within the VEMG or the snag levels prescribed by the Regional Forester's Eastside Forest Plan Amendment #2 (2.25 snags per acre) whichever is greater.

Table 3-60. Recommended Snag Densities by PAG and Snag Size Class

Snag Levels by Size Class	Dry grand fir PAG	Douglas-fir PAG	Moist p. pine PAG	Dry p. pine PAG
VEMG Range <20" diameter	**3.2 – 7.1**	**1.3 – 3.1**	**1.2 – 2.7**	**0.0 – 0.3**
VEMG Range 20"+ diameter	**1.0 – 3.3**	**0.2 – 1.6**	**0.2 – 1.6**	**0.1 – 0.7**

Elk

The Upper Beaver analysis area lies within one Oregon Department of Fish and Wildlife (ODFW) management zone, the Ochoco Game Management Unit (GMU). The Ochoco GMU contains 53% public lands and 47% private lands. ODFW, in their state-wide "Oregon's Elk Management Plan" established population management objectives (MO) for all GMU's in the state. The GMU includes all lands within the boundary, whether privately owned or managed by state or federal agencies. The population management objective (MO) for the Ochoco Unit is 4,500 elk and 20,500 for mule deer. ODFW population estimates for 2008 are 4,300 for elk and 15,700 for mule deer. The current estimated population is slightly below management objectives for elk and below management objectives for mule deer. In the last decade population estimates for elk have generally increased, although there has been a slight decrease between 2007 and 2008. In the last decade population estimates for mule deer have decreased.

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 project area throughout the year. During winters with normal to above normal snow accumulations, the majority of the animals move to lower elevations within the project area or move to adjacent private or BLM managed lands.

Calving and fawning does occur within the project area, although they primarily occur in proximity to riparian areas that provide high quality forage. No specific calving areas have been identified within the project area.

The Habitat Effectiveness Index (HEI) for elk was used to analyze and describe the existing habitat condition within the Upper Beaver planning area, and the effects of the alternatives. HEI is the total habitat effectiveness within General Forest (GF) 15,252acres, General Forest Winter Range (GFWR)15,399 and Winter Range (WR) 4,522 management allocations. 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. Percent cover is the percent of 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 this analysis area, cover is limited in amount and distribution.

The distribution and amount of forested acres in relation to non-forest and juniper acres limits the amount of cover the planning area can produce. The planning area is composed of 48% forested acres and 52% non-forest and juniper acres. Past harvest activities have also decreased the amount of cover that currently exists. Table 3-61 displays existing percent cover, road density, overall HEI value and the LRMP goal for each management area for which standards apply.

Table 3-61. 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	LRMP Goal Road Density mi./sq. mi	Existing HEI	Pin #11 HEI Goal (2nd Decade)
General Forest	29.5	24	2.4	3	37	18
General Forest Winter Range	17.5	18	2.0	*3	13.5	4
Winter Range	7	7	.8	1	6.5	4
*cover is provided by pine and mixed conifer *Road Density goals are 1mi./sq.mi. Dec. 1 to May 1 and 3mi./sq.mi. the remainder of the year						

Alternative 1

No satisfactory cover or marginal cover would be treated under this alternative, and no roads would be closed. Percent cover and HEI would remain at the current levels for a period of time. In General Forest (GF) percent cover is currently at 29.5% and HEI is 37. In General Forest Winter Range (GFWR) percent cover is at 14% and HEI is 82. In Winter Range (WR) percent cover is 24 and HEI is 23. Habitat effectiveness would continue to follow the current trend, with gradual development of additional cover as the canopy of untreated stands continue to close. The year-round open road density is expected to remain at approximately the current level of 2.4 mi/square mile in GF. The winter open road density is expected to remain at current density of 2.0 miles/square mile in GFWR and 0.8 miles/square mile in WR. Winter road closures within GFWR reduce road densities to 1mi./sq.mi. Dec. 1 - May 1.

Conclusion: This alternative would maintain the current condition of all existing habitat for big game animals, including elk, in the short term. Stands that currently provide marginal cover would continue to close in and over time more satisfactory (thermal) cover would develop as

canopy closure increases. Additionsl stands would continue to develop and additional areas of marginal cover would be produced. Road densities would likely remain the same or possibly increase depending on the effectiveness of current road closures. The effectiveness of current road closures within the project area will continue to be a problem. The project area is a apart 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 devlop and crown closures increase. There would be no initial change in HEI in any management allocation. Over time HEI is expected to increase in all management areas.

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 51 acres and reduce marginal cover by 657 acres. Total cover acres in GF would be reduced by 708 acres, resulting in a 4.5% reduction in percent cover. Within General Forest Winter Range (GFWR), this alternative would reduce satisfactory cover by 23 acres, and reduce marginal cover by 456 acres. Total cover acres in GFWR would be reduced by 479 acres, resulting in a 4.5% reduction in percent cover. Within Winter Range (WR), this alternative would reduce satisfactory cover by 0 acres, and reduces marginal cover by 10 acres. Total cover acres in WR would be reduced by 10 acres. It is assumed that precommercial thinning and prescribed burning will not affect thermal cover in the short term. Precommercial thinning is expected to increase growth on younger trees and increase the development of crowns and thermal cover in the long term.

Alternative 2 would temporarily increase open roads during harvest activities within GF (MA-F22) a total of 5.97, within GFWR (MA-F21) a total of 4.71 miles, and within WR (MA-F20) a total of .07miles. Increased roads during harvest activities will affect the distribution of elk during harvest activities, although these roads will be closed following harvest activities and will not affect open road densities. No new road construction would occur under alternative 2. As a result of changes in cover HEI would be decreased from 37 to 16 in GF, decreased from 13.5 to 8 in GFWR, and HEI will not change in WR. Precommercial thinning activities and associated fuels treatments are proposed on 6,727 acres. An additional 4,233 acres of burning will occur outside activity fuels burning. These activites will improve forage production and diversity of forage species throughout the project area.

Seasonal restrictions on harvest, thinning, fuels and related activities would be implemented between December 1 and May 1 in General Forest Winter Range and in Winter Range allocations. Within Winter Range and General Forest Winter Range temp road construction and use would be restricted between December 1 and May 1 of each year.

Conclusion: This alternative would reduce current thermal cover within GF, GFWR and WR as described above, although the percentage of cover reduced is small and will likely have limited impacts on the overall quality of habitat within the project area. Road densities, which can have a high impact on the quality of elk habitat will not change. Current road densities are within goals established within the forest plan. Forage conditions should improve with the implementation of this alternative.

Alternative 3

The effects of alternative 3 are similar to alternative 2, although under alternative 3 there will less acres of thermal cover treated and less temp roads. Within General Forest (GF), this alternative

would reduce satisfactory cover by 37 acres and reduce marginal cover by 527 acres. Total cover acres in GF would be reduced by 564 acres, resulting in a 3.5% reduction in percent cover. Within General Forest Winter Range (GFWR), this alternative would reduce satisfactory cover by 13 acres, and reduce marginal cover by 311 acres. Total cover acres in GFWR would be reduced by 324 acres, resulting in a 3.5% reduction in percent cover. Within Winter Range (WR), this alternative would reduce satisfactory cover by 0 acres, and reduces marginal cover by 10 acres.

Total cover acres in WR would be reduced by 10 acres. It is assumed that precommercial thinning and prescribed burning will not affect thermal cover in the short term. Precommercial 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) a total of 4.8 mi, within GFWR (MA-F21) a total of 3.5 miles, and within WR (MA-F20) a total of .37miles. These roads will be closed following harvest activities and will not affect open road densities. No new road construction would occur under alternative 2. As a result of changes in cover HEI would remain at 37 within GF, decreased from 13.5 to 8 in GFWR, and HEI will not change in WR. Precommercial thinning activities and associated fuels treatments are proposed on 6,177 acres. An additional 3,942 acres of burning will occur outside activity fuels burning. An additional 2,279 acres of juniper thinning and underburning is proposed under this alternative. These activities are expected to improve the production and diversity of forage species within treatment areas.

Seasonal restrictions on harvest, thinning, fuels and related activities would be implemented between December 1 and May 1 in General Forest Winter Range and in Winter Range allocations. Within Winter Range and General Forest Winter Range temp road construction and use would be restricted between December 1 and May 1 of each year.

Conclusion: This alternative would reduce thermal cover within GF, GFWR and WR as described above, although the percentage of cover reduced is small and will likely have limited impacts on the overall quality of habitat within the project area. Road densities, which can have a high impact on the quality of elk habitat will not change. Current road densities are within goals established within the forest plan. Activity associated with temp road construction and harvest activities is expected to have a short term effect on the distribution of elk within the project, although all temp roads will be closed following harvest activities. The quality of forage should improve with the implementation of this alternative.

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. Although, the project area has a natural low potential for producing cover, in part because of the scab stringer nature of the topography. There is approximately 35,180 acres within the project area. Of those acres approximately 19,565 acres or 56% of the project area is within vegetation types that either do not have the potential to produce cover or have a low potential for producing cover. Currently, 41% of the approximate 17,300 acres capable of producing cover are producing cover. Both action alternatives will reduce cover within the entire project area by 15% for alternative 2 and 12.5% for alternative 3. Refer to tables 3-62 through 3-64 for a comparison of cover, HEI, and road densities. Past harvest activities have improved forage availability and the diversity of forage species which has had a positive effect on habitat. Although, young tree densities have increased across the project area and as a result, forage quality has slightly decreased. Activities associated with the action alternatives will help to improve forage conditions across the project area.

Road densities are currently within goals identified within the forest plan. Past road closures have reduced road densities within the project area, although the effectiveness of the closures are varied. Road closure violations continue to occur, in part because of the relatively open conditions that exist. Temporary roads constructed under both action alternatives will increase the amount of open roads within the project area during harvest activities and will have a short term effect on the distribution of elk. The effects are expected to be short term and will not effect road densities over the long term. The Rager green dot road closure helps to reduce the effects of roads on elk habitat and increase escapement by reducing road densities to 1.99mi./sq.mi. across the entire project area in the months of October and November.

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. Both action alternatives propose hardwood treatments on 61 acres in alternative 2 and 27 acres in alternative 3. Treatments include fencing selected areas. Hardwoods treatments will enhance current hardwoods that exist, although the treatments occur on a small percentage of the entire riparian habitat.

Table 3-62. HEI General Forest (Summer Range) (Pin #11)

		Alt .1	**Alt.2**	**Alt. 3**
Cover (acres)		4,295	3,638	3,731
Open Rd (mi/sq mi)	3.0	2.4	2.4	2.4
Percent Cover		29.5	25	26
HEI Value Decade 3	**LRMP Goal: 14**	37	16	37

Table 3-63. HEI General Forest Winter Range (Pin#11)

		Alt. 1	Alt. 2	**Alt. 3**
Cover (acres)		2,428	1,972	2,031
Open Rd (mi/sq mi)	Winter 1.0 Summer 3.0	1.96	1.96	1.96
Percent Cover		17.5	13	14
HEI Value Decade 3	**LMRP Goal: 7**	13.5	8	8

Table 3-64. HEI Winter Range (Pin #11)

		Alt. 1	**Alt. 2**	**Alt. 3**
Cover (acres)		331	321	321
Open Rd (mi/sq mi)	Winter 1.0 Summer 3.0	0.8	0.8	0.8
Percent Cover		7	7	7
HEI Value Decade 3	**LRMP Goal: 7**	6.5	6.5	6.5

Forest Plan Consistency

The analysis indicates that the watershed is above HEI standards for all allocations to which it applies. Tables 3-62 through 3-64 display a summary of the effects by alternative for General Forest, General Forest Winter Range and Winter Range. Under Alternative 1, HEI would remain at the current levels with increases occurring as stands develop. Under Alternative 2, HEI would be reduced in GF, GFWR. Under Alternative 3, HEI would be reduced in GF and GFWR .

In all alternatives, HEI would meet minimum standards established in the LRMP for General Forest and General Forest Winter Range. Within Winter Range HEI is currently below standards, although HEI would not be reduced further.

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 affects 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. Table 3-65 lists the habitats and species listed for the Blue Mountains Subprovince.

Table 3-65. Priority habitats and focal bird 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

Priority Habitats	Focal Species	Habitat Attribute
Riparian Woodland	veery	Dense shrub understory
Riparian Woodland	Red-eyed vireo	Deciduous forest high canopy closure
Riparian Woodland	Lewis' woodpecker	Large snags in Ripaian 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. The White-headed woodpecker, a focal species for dry forest habitat, was analyzed and is described above in the Primary Cavity Excavators section. 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

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. Nests in grand fir and Douglas fir. Snags are important for foraging perches and singing perches (Marshall 2003). Habitat for the Olive-sided flycatcher occurs primarily in the north half of the project area within the dry grand fir plant association. Habitat is likely well suited for the Olive-sided flycatcher because of the natural fragmentation of habitats that occurs within the project area do to the scab stringer topography as well as fragmentation that has occurred because of past 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.

Townsend's warbler breeds in a range of coniferous forests, true fir, Douglas fir mixed conifer, and lodgepole pine. Nests in conifer branches and feeds primarily on insects. In the Blue Mnts. Townsend's warbler preferred grand fir and larch with a dense grand fir understory (Marshall 2003). This species has likely benefited from fire suppression activities and the abundance of dense forested conditions. Habitat is present, although limited because of the lack of large tree structure with high canopy closures within the mixed conifer plant associations. Approximately 500 acres of habitat exists within the project area based upon a Wildhab query of the Project Area.

The Varied Thrush is most common in dense older coniferous forests (Csuti). This species is locally common in wet sites throughout the Blue Mtns. 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 1424 acres of habitat exists within the project area based upon a Wildhab query of the Project Area. Reduction in understory vegetation can effect the development of the organic layer.

Dry Forest

The white-headed woodpecker was addressed in the management indicator species section for primary cavity excavators. The Flammulated owl nests in cavities in older ponderosa pine with an open understory. Patches of saplings or open areas of shrubs is important for roosting. Approximately 12,411 acres of habitat exists within the project area based upon a Wildhab query of the Project Area. The quality of this habitat varies. This is within the range of habitat levels that historically existed. HRV analysis indicates the minimum potential habitat acreage of 10,761 existed historically. Even though current habitat is within the desired range the project area remains deficient in open stands dominated by large structure ponderosa pine. Flammulated owls are likely within the Project Area; however, are utilizing less than ideal habitat conditions. 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 is also associated with juniper woodlands and mountain-mahogany stands. Approximately 12,293 of habitat exists within the project are based upon a Wildhab query. This is within the range of habitat levels that historically existed. The minimum potential habitat acreage of 11, 774 acres existed historically. Habitat is well represented for 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. Mountain-mahogany are scattered throughout the project area, although they are generally decadent and do represent significant stands. Habitat is well represented for the Chipping sparrow within the project area.

Steppe Shrublands

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 on the ground 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. Approximately

8,189 acres of habitat exists within the project area based upon a Wildhab query of the Project Area. The habitat is generally in good condition. This is within the range of habitat levels that historically existed. HRV analysis indicates the minimum potential habitat acreage of 7,612 acres existed historically.

Riparian Woodland and Shrub including Aspen

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 along the lower one mile section of Rager Creek (approximately 2 acres) and are fairly healthy. This stand is fenced and browsing from ungulates has been minimal. Conifer encroachment is evident as is the case for the majority of small aspen clones scattered within the project area. There are a few additional remnant Cottonwoods that have been located within the project area, one along Powell Creek and one along Tamarack Creek. Dense shrub patches that would provide habitat for species represented by the Willow flycatcher are scattered and isolated. Willows occur primarily as scattered individuals 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 2004). Historically, Riparian Woodland and Riparian shrub communities likely covered larger areas than what exist today.

Table 3-66. Comparison of Existing Habitat Acres to Historic Range of Acres

Species	HRV min.Ac.	HRV max.Ac.	Existing Ac.	Status
Fammulated Owl	10,918	19,118	13,231	Within range
Olive sided flycatcher	9,678	17,859	9025	Within range
Townsend's warbler	257	513	500	Within range
Varied Thrush	1045	3010	1,424	Within range
Chipping sparrow	11,774	23,489	12,293	Within range
Lewis' woodpecker	8,439	13,997	7,352	Below minimum
Vesper Sparrow	7,612	15,094	8,189	Within range
Black-backed woodpecker	3,061	5,903	4,267	Within range

Tables 3-67 through 3-69 list the amounts of habitat projected to occur in the project area for each of the focal species by alternative.

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. The no action alternative would not directly change the existing acres of habitat. Under this alternative there would be a continued decline in habitat abundance for all species that select open forest and early seral conditions as denser, mid to late seral conditions continue to develop. In the long-term, Alternative 1 results 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 3-66) in the short term.

The red-eyed vireo, veery 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. The no action alternative does not propose aspen restoration activities involving thinning of conifers which are competing with aspen. Aspen would be expected to continue to decline in both mixed conifer and pine habitats.

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 until one or more disturbance events (insects or fire) create open conditions in the future.

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 is displayed below (Table 3-67). Species that are currently above or below HRV, move within or toward HRV as a result of proposed treatments. 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. Though Townsend's warbler and hermit thrush prefer relatively dense forests, the analysis shows an increase in the amount of habitat for these species, which is due to the increase in acreage in the larger size classes in the grand fir and Douglas-fir PAGs.

Table 3-67 Habitat projections (acres) for Alternative 2.

Species	Minimum HRV Acres	Maximum HRV Acres	Post Treatment Ac.	HRV
Flammulated Owl	10,918	19,118	13,231	Within
Chipping sparrow	11,774	23,495	13,730	Within
Lewis' woodpecker	8,439	13,997	8,966	Within
Varied Thrush	1,045	3,010	1,107	Within
Olive-sided flycatcher	9,678	17,859	10,416	Within
Townsend's warbler	257	513	390	Within
Hermit Thrush	1,103	1,743	1,308	Within
Gray flycatcher	7,612	15,094	8,338	Within
Black-backed woodpecker	3,061	5,905	4,387	Within

This alternative proposes 61 ac. of hardwood treatment that includes conifer thinning within aspen and cottonwood stands, hardwood planting and protection. Alternative 2 also proposes 220 acres of commercial harvest and 1,394 acres of precommercial thinning and fuels treatment within riparian habitat conservation areas. 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 may 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 will be constructed to protect aspen sprouts. This would occur in clones within 2 harvest units (10, 51) Release of aspen clones would also occur within 8 noncommercial thinning units (345,347,349,344,342,343). Noncommercial thinning would also occur within one cottonwood gallery (unit 45). These treatments would result in a beneficial effect to species associated with aspen dominated vegetation. 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.

Conclusion: This alternative reduces the decline in habitat conditions for species that use open forest conditions, open shrubland habitat and riparian hardwoods such as aspen.

Alternative 3

This alternative result in increases in habitat for species that select for open forest and early seral conditions, similar to alternative 2,due to stand density reduction and the favoring of early seral species. The abundance of habitat relative to HRV post treatment (within or below) are displayed below (Table 3-68). The changes from existing condition are that species with habitat outside HRV currently, move toward HRV as a result of thinning from below. 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. Though Townsend's warbler and hermit thrush prefer relatively dense forests, the analysis shows an increase in the amount of habitat for these species, which is due to the increase in acreage in the larger size classes in the grand fir and Douglas-fir PAGs.

Table 3-68 Habitat projections (acres) for Alternative 3.

Species	**Minimum Historic Acres**	**Maximum HRV Acres**	**Post Treatment Acres**	**HRV**
Flammulated Owl	10,918	19,118	13,910	Within
Chipping sparrow	11,774	23,495	13,548	Within
Lewis' woodpecker	8,439	13,997	8,788	Within
Varied Thrush	1,045	3,010	1,131	Within
Olive-sided flycatcher	9,678	17,859	10,240	Within
Townsend's warbler	257	513	408	Within
Hermit Thrush	1,103	1,743	1,330	Within
Gray flycatcher	7,612	15,094	8,390	Within
Black-backed woodpecker	3,061	5,905	4,392	Within

This alternative proposes 27 ac. of hardwood treatment that includes conifer thinning within aspen and cottonwood stands, hardwood planting and protection. Alternative 3 also proposes 14 acres of commercial harvest and 1,347 acres of precommercial thinning and fuels treatment within riparian habitat conservation areas. 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 will be constructed to protect aspen sprouts. This would occur in clones within 2 harvest units (10, 51) Release of aspen clones would also occur within 8 noncommercial thinning units (345, 347, 349, 344, 342, and 343). Noncommercial thinning would also occur within one cottonwood gallery (unit 45). These treatments would result in a beneficial effect to species associated with aspen dominated vegetation.

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.

Conclusion: This alternative reduces the decline in habitat conditions for species that use open forest conditions, open shrubland habitats and riparian hardwoods such as aspen.

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 majority of the current LOS stands are dominated by late seral species and lacking the large diameter early seral species composition. Since the mid 1990s 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 will 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. The combined effect of past management activities along with implementation of the alternatives for this project result in landscape level habitat abundance for focal species as displayed in Table 3-69.

Table 3-69. Summary of focal species Primary Reproductive Habitat

	Flammulated Owl	Chipping Sparrow	Lewis' Woodpecker	Varied Thrush	MacGillivray's Warbler	Olive sided flycatcher	Townsend's Warbler	Hermit Thrush	Gray Flycatcher	Black-backed woodpecker
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Alt. 1	13,231	12,293	*7,352	1,424	0	9,025	500	1,504	8,189	4,267
Alt. 2	13,926	13,730	8,966	1,107	0	10,416	*390	*1,308	8,338	4,387
Alt. 3	13,910	13,548	8,788	1,131	0	10,240	408	*1,330	8,390	4,392
HRV-L	10,968	11,774	8,439	1,045	0	8,852	398	1,351	6,193	3,920
HRV-H	19,118	23,495	13,997	3010	0	17859	513	1,743	15,094	5,905
*shaded cells indicate habitat acres below the Historic Range of Variability										

Other forest management activities, such as grazing, mining and recreational use can influence the quality of habitat and use of areas by migratory birds. For example, herbivores can alter the structure and composition of herbaceous and shrubby vegetation, which can influence changes in forage base and nesting cover for some species of birds. For species that forage in open grassy areas, such as blue birds, the effect can be positive. For species that nest in willow thickets, such as willow flycatchers, the effects can be negative. For other species that nest and forage in the overstory, such as white-headed woodpeckers there is little or no direct effect from herbivores on the forest floor.

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.

Botany and Invasive Plant Species

Threatened, Endangered and Sensitive Plant Species

Direction to conserve TES plant species on Ochoco National Forest is found in both the Forest Service Manual (FSM) and in the Ochoco National Forest Land and Resource Management Plan (LRMP). Management objectives within FSM 2670 (1992) include 1) ensuring that species do not become listed as threatened or endangered due to Forest Service actions and 2) maintaining viable populations of all native and desired plant species in habitats distributed throughout their geographic range on National Forest System lands. The Ochoco LRMP (1989; 4-247) directs that field reconnaissance be performed when suitable habitats for sensitive species are suspected to occur in the area of influence of a project. The LRMP also directs that when sensitive species are present within a project area, safeguards will be clearly described in the environmental analysis and project plan, and project personnel will be fully responsible for implementation of these safeguards.

Invasive Plants

National Direction

The Forest Service Manual 2080 (1995) requires that Noxious Weed Risk Assessments be prepared for any project that includes ground-disturbing activities. For projects anticipated to have a moderate to high risk of introducing or spreading noxious weeds, decision documents must identify noxious weed management measures that will be undertaken during project implementation. The Forest Service Guide to Noxious Weed Prevention Practices (2001) presents a large number of desirable weed prevention actions that should be evaluated for efficacy, and compatibility with project objectives, during the process of project planning.

Regional Direction

A USFS Region 6 Invasive Plant Program Record of Decision (ROD) was signed in 2005. This ROD presented a set of prevention standards that, by amendment, were incorporated into the Forest Plans of all national forests within the Pacific Northwest Region.

Forest Direction

Ochoco National Forest is currently managing invasive plant species under the authority and direction of the 1998 Integrated Noxious Weed Management Environmental Analysis and Decision Notice. This EA and DN identify and promote specific actions to be associated the general weed management practices of prevention, early treatment, maintenance, and education. Weed management includes a variety of strategies, depending on the species, and the size and location of the infestation. Available types of treatment include chemical, cultural, mechanical and biological controls.

The Deschutes and Ochoco National Forests and Crooked River National Grassland have put together a set of Invasive Plant Prevention Practices (USFS - USDA Forest Service, 2006) which

are supplemental to the 2005 Region 6 Invasive Plant EIS ROD prevention standards referenced above. It is anticipated that this local guide will be consistently reviewed, and appropriate practices be recommended or required during implementation of Forest and Grassland projects.

Desired Future Condition

Habitat for late seral, rare, and uncommon plant species, and special habitat (such as wetlands and riparian zones) is well distributed and of high quality. For local late seral, rare, and uncommon plant species, connectivity of habitat and availability of vectors for spores, pollen, seed or vegetative propagules would allow genetic exchange between populations, and/or establishment of new populations, both within and beyond the borders of the project area. Local populations would be sufficiently robust and resilient to permit loss of some individuals or habitat, and natural disturbances would not threaten persistence of the species at other than a local scale within the project area.

The extent of non-native, invasive plant species would be in decline. Established rapid response practices for managing small, newly detected sites would be in place, as would effective long-term practices for reducing the extent of known sites. Forest staff, contractors and recreationists would be aware of the primary importance of prevention as a means of limiting the spread of invasive plant species.

Threatened, Endangered or Sensitive Plants

Existing Condition

The USFS Regional Forester's Sensitive Species List (RFSSL) is periodically updated. Such an update was transmitted to R6 field units on January 31, 2008. In accordance with options provided by the Regional Forester, in a letter accompanying the new List (USFS, 2008), the Upper Beaver Vegetation Management Project is using the 2004 R6 Sensitive Species List that was in effect at the date of this project's formal initiation. There are no federally listed Threatened or Endangered plant species known to exist within the project area. With reference to the 2004 RFSSL, the Ochoco National Forest/Crooked River National Grassland Sensitive Plant List includes 27 taxa, either known or suspected to occur on the Forest. Review of Ochoco National Forest GIS indicates that six of these taxa are known to occur within the project area and others have potential habitat within the project area. Sensitive plant taxa with at least a low probability of occurrence within the project area are listed in Table 3-70. More complete information concerning Ochoco National Forest/Crooked River National Grassland Sensitive Plant Species, including local distribution, habitats, and recommendations for survey is included in the Upper Beaver Prefield Review Form (Appendix E, Botany Report, project file).

Table 3-70. Sensitive plant taxa and their probability of occurrence within the Upper Beaver Vegetation Management Project area.

Plant Name	Probability of Occurrence
Achnatherum hendersonii **(10)**	**High**
Achnatherum wallowaensis	**Low**
Artemisia ludoviciana* ssp. *estesii	**Low**
Astragalus diaphanus* var. *diurnus	**Moderate**
Astragalus peckii	**Low**
Astragalus tegetarioides **(1)**	**High**
Botrychium ascendens	**Moderate**
Botrychium crenulatum **(2)**	**High**
Botrychium minganense	**Moderate**
Botrychium montanum **(1)**	**High**
Botrychium paradoxum	**Moderate**
Botrychium pinnatum	**Moderate**

Plant Name	Probability of Occurrence
Calochortus longebarbatus* var. *longebarbatus	**Low**
Calochortus longebarbatus var. *peckii* **(1)**	**High**
Camissonia pygmaea	**Moderate**
Carex backii	**Low**
Carex hystericina	**Moderate**
Carex stenophylla	**Moderate**
Cypripedium parviflorum	**Low**
Dermatocarpon meiophyllizum **(1)**	**High**
Lomatium ochocense	**Moderate**
Scouleria marginata	**Low**
Taxa in bold are documented to occur within the project area. Numbers within parentheses indicate number of sites within project area.	

Field surveys for TES plants were conducted periodically during the months of July, August and September, 2008. A summary of observations follows.

Henderson's needlegrass (*Achnatherum hendersonii*). Field surveys were conducted in 2006 and 2008. One site, TES # 200087 was revisited in early July of 2008 and a marked decrease in apparent population size, relative to June of 2006, was noted. Also noted was a very conspicuous increase in the presence of several non-native annual grasses including *Bromus japonicus, B. briziformis* and, especially, *Ventenata dubia.* It is reasonable to suppose that resource competition between these invasive species and Henderson's needlegrass is negatively affecting the needlegrass. It also appears possible that increasing densities of invasive grasses at the needlegrass sites increases the opportunity for the vegetation at these sites to carry fire. As it is likely that historically, scablands have rarely burned, it is possible that Henderson's needlegrass may respond poorly to incineration. Several new occurrences of the rare needlegrass, totaling about 170 plants, were observed, these extending as much as 250 meters south of the currently mapped distribution of #200087. Most of the area occupied by the newly discovered needlegrass plants was relatively lightly infested with non-native annual grasses.

Bastard milkvetch (*Astragalus tegetarioides*). This species was relocated at its mapped location along the 5800 road. It was quickly determined that the geographic extent of the population did not match that recorded in GIS. The extent of the population was re-measured using GPS technology. The population is estimated to include a total of 200-250 plants occupying about 3 acres which include an old skid trail and habitat transitional between dry ponderosa pine forest and non-forested scabland. Judging from the habitat currently occupied, and their very small, prostrate habit, individuals of this species are successful only on relatively bare, mineral soil, and are intolerant of even shallow (0.5 inches) layers of litter and duff. *Astragalus tegetarioides* is endemic to Oregon where it is known only from Harney County and a single site in Crook County. The population within the Upper Beaver project area (= the only Crook County population) appears to be anomalously disjunct within the full range of the species.

Mountain moonwort (*Botrychium montanum*) and **scalloped moonwort** (*B. crenulatum*). An effort to relocate *Botrychium montanum* and *B. crenulatum* at a documented, co-located site on Powell Creek, was unsuccessful, as was at least one previous effort to locate the species at this site (Mafera, 2008). As mapped, this site is located in a zone of perennial damp seepage banks along an upper portion of the creek. An effort to relocate *Botrychium crenulatum* at a second documented site within the project area was not undertaken. This site has not been recently revisited by Ochoco NF botany staff (Mafera, 2008). As mapped, this site appears to be located in a small meadow near the head of an unnamed tributary to Tamarack Creek. These species are typically associated with damp to wet settings in or at the edge of spruce, fir and lodgepole pine communities.

Longbeard mariposa lily (*Calochortus longebarbatus* var. *peckii*). The single documented site of this species within the project area was not revisited during the 2008 surveys. No new occurrences of this species were detected during the unit-associated field surveys in 2008. This taxon is typically found in vernally moist, low gradient draws and streambeds, and broad meadow basins.

Silverskin lichen (*Dermatocarpon meiophyllizum*). The single known site of this aquatic lichen within the project area was discovered in 2006. This site was not revisited in 2008. No new occurrences of this lichen were encountered during project-related field surveys in 2008. Of the seven sites of this lichen documented on Ochoco NF, this site arguably is unique. It is both the largest population and the most sediment laden. The banks and adjacent terraces of this creek are highly impacted by the trampling of cattle. It is reasonable to expect sediment to be detrimental to aquatic lichens. The relationship between the robustness of this population and its sediment load is unknown.

Effects

TES Plant Species

A summary of this project's anticipated effects on Ochoco National Forest sensitive species is included in Appendix A of the Botany Report (see Upper Beaver project file, Paulina Ranger District). In the discussion below, anticipated effects appear in bold following the treatment of each species.

Alternative 1

Henderson's needlegrass No direct or indirect effects to this species are anticipated under the No Action Alternative. Perhaps the single greatest threat to this species owing to management practices - infestation by invasive plant species - is neither obviously promoted nor reduced under the No Action Alternative. **No impact.**

Longbeard mariposa lily A detrimental, long-term (0-10+ years), indirect effect to this species may be reasonably anticipated under the No Action Alternative. In the absence of disturbances such as thinning and prescribed fire, competition with woody and herbaceous vegetation for space, soil water and nutrients can increasingly reduce the vigor of populations of the longbeard mariposa lily. As the bulk of the single population of this species occurring within the Upper Beaver project area is included within proposed treatment units, the No Action Alternative may contribute to a gradual decline in the numbers and vigor of plants at this site. **May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.**

Bastard milkvetch It is reasonable to anticipate no short-term (0-5 years) negative direct or indirect effects to this species under the No Action Alternative. Competing vegetation and duff and litter accumulation does not currently appear to be a threat to the size and vigor of the population in its relatively open, forest-scab transitional zone habitat. Absence of project-related ground disturbance in and adjacent to the milkvetch site should minimize the rate at which North Africa grass (*Ventenata dubia*) expands its infestation into this site. **No impact.**

Mountain and scalloped moonworts The No Action Alternative is likely to perpetuate a somewhat elevated risk of wildfire damage to these moonwort populations and the small, local plant communities that include them. The sites occupied by these species within the project area appear to be small or narrow groundwater-fed wetlands adjacent to upland forest. Because of their small size, these habitats and their associated communities are likely at risk to severe damage or destruction in the event of an intense wildfire in adjacent fuels-rich forest. **No impact.**

Silverskin lichen No direct or indirect effects to the project area's single included site of this aquatic species are anticipated under the No Action Alternative in the near or foreseeable future

(0-10 years). Any possible project-related increase in stream sediment load would be absent under this alternative. **No impact.**

Alternatives 2 & 3

The anticipated effects of Alternative 2 (the Proposed Action) and Alternative 3, regarding TES plant species, are similar enough that these alternatives are jointly addressed as the Action Alternatives.

Henderson's needlegrass No direct effects to this species are anticipated under either action alternative. This is largely because no part of the several populations of this sensitive grass occurring within the project area is included within any proposed treatment unit. However, as noted below, this project is associated with a high risk of the introduction/spread of invasive plant species within the project area. This would pose an elevated indirect risk to the sensitive needlegrass populations within the project area, particularly with regard to the annual invasives North Africa grass, medusahead, field brome, rattlesnake brome and cheatgrass. No impact.

Longbeard mariposa lily Overall, the Action Alternatives are likely to benefit this species over the next 0-10 years. Under Alternative 2, the two principal subpopulations of the single population of this species within the project area are largely included within unit #240 to the south, and unit # 70 to the north. Unit #70 is not included in Alternative 3. Hence, regarding this species, there is some treatment differential between Alternatives 2 and 3. Assuming that the recommendations included in this report are followed, each of the Alternatives (#2 slightly more than #3) promise modest immediate benefit to the longbeard mariposa lily subpopulations through some reduction of competing vegetation. Counter to this potential benefit, these Alternatives (2 more than 3) carry with them an elevated risk of the introduction of invasive plant species. Notably, no invasive plant species sites are currently documented in the immediate vicinity of the longbeard mariposa lily site. No impact.

Bastard milkvetch The Action Alternatives should have no direct effects on this population. This is largely due to the fact that the boundaries of Activity Unit #33 have been drawn to exclude this population, as it was mapped in the summer of 2008. Given the nature of the habitat currently occupied by this population, it is reasonable to anticipate that thinning and burning around the edges of dry ponderosa pine forest would reduce duff and litter depth, increase the amount of exposed mineral soil and potentially improve habitat quality for this species. Periodic thinning and burning could presumably maintain this habitat. However, currently there appears to be no data or even casual observations concerning the response of this species to thinning combined with prescribed fire. Such a study for this species is in progress on nearby Burns BLM District (Linn, 2008). The results of this effort should provide an improved information base for management of this local population on Paulina Ranger District.

The thinning and burning activities proposed for Activity Unit #33 will likely exacerbate the existing infestation of North Africa grass in this area, and in turn, likely increase the rate a which this invasive grass is able to infest the milkvetch population. May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.

Mountain and scalloped moonworts Due to indirect effects, the Action Alternatives are expected to have a near-term (0-10 years) beneficial effect for these moonworts. The principal benefit anticipated for these species would be a reduction in risk to plants and their habitat due to high intensity wildfire. As noted above, only one of the two moonwort sites documented within the project area appears to occur within a proposed treatment unit. Proposed activities within this activity unit include only the underburning of natural fuels. As noted in the Mitigations section of this document, the meadow associated with the mapped site of this moonwort needs to be excluded from underburning. In the absence of both project-related heavy equipment use and

documented invasive plant sites near this moonwort site, the risk on inadvertent introduction of invasive plants to or near the moonwort site appears to be low. No impact.

Silverskin lichen The Action Alternatives are expected to have a neutral or somewhat detrimental effect on the project area's single included site of this aquatic species, in the near or foreseeable future (0-10 years). The currently documented lichen site is not within any proposed activity units, but occurs about one half mile downstream from a series of a dozen, essentially interconnected activity units that extend most of the length of the creek and its principal tributary. Thinning and underburning are planned within most of these activity units. Alternative 3 includes one fewer activity unit along the upstream water-course (43 acres of thin and underburn) than does Alternative 2. As noted above, this seemingly robust lichen population currently occupies a portion of the creek with a notable sediment load. It is reasonable to assume that short-term increases in this sediment load, which are anticipated under the Action Alternative may reduce habitat quality for this population. May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.

Cumulative Effects

Numerous activities over the past century have affected the physical and biological features of the area included within the Upper Beaver Vegetation Management Project. Some of the more significant of these activities include livestock use, road construction, timber harvests and pre-commercial thinning, prescribed burning and grazing by large mammals. The impacts of wildfire and wildfire suppression activities are locally significant elsewhere on the Ochoco National Forest, but little wildfire activity has occurred within the project area since at least 1994. The large 747 (2002) and Black Canyon (2008) fires burned along the northern border of the project area. At least ten timber sales treating a total of over 5500 acres have occurred within the project area since 1985.

There is a limited ability to reasonably assess the effects of these activities on the several TES plant species documented to occur within the project area. Perhaps first and foremost, it is evident that these activities collectively have, via ground disturbance, provision of seed vectors, and alteration of water tables, promoted the introduction and spread of invasive plant species that is currently altering, and apparently, degrading the current habitats of Henderson's needlegrass, bastard milkvetch and perhaps to a lesser degree, longbeard mariposa lily. Additionally, downcutting of stream channels and resultant alterations of local water tables and augmentation of sediment loads has likely reduced total habitat area available to wet meadow species including the sensitive moonworts (USFS, 2004). While steam downcutting may have similarly reduced total area of riparian habitat available to longbeard mariposa lily, it has been suggested (Dewey, 2008) that, rangewide, downcutting may primarily redistribute the habitat of this taxon.

In the context of cumulative effects, it is anticipated that this project's effects on local TES plant species will relate principally, via ground-disturbing and seed-vectoring activities, to its additive promotion of the local spread of invasive plant species.

Invasive Plant Species

Existing Condition

Aggressive, non-native, invasive plant species can displace native plant communities causing long-lasting management problems. In displacing native vegetation, invasive plant species can increase fire hazards, reduce the quality of recreational experiences, poison livestock, and replace wildlife forage. By simplifying complex plant communities, weeds reduce biological diversity and threaten rare habitats. It should be noted that the terms "noxious weed" and "invasive plant species" are not, in current use, synonymous. The former term is used by the Oregon Department of Agriculture (ODA) and is used in many older USDA/USFS documents. Not all non-native plants that are causing economic and/or ecological damage in the state of Oregon are listed in the

ODA "Noxious Weed Index." Examples of damaging, non-native, non-listed plant species include cheatgrass (*Bromus tectorum*) and North Africa grass (*Ventenata dubia*). The term "invasive plant species" is currently widely used to include all non-native plant species currently causing, or capable of causing, local economic and/or ecological damage, regardless of their status on any particular state, county or federal agency list.

Review of Ochoco National Forest GIS indicates that 12 invasive plant species accounting for a total of 54 sites are documented to occur within the Upper Beaver project area. An additional 10 invasive plant sites occur just outside of the project area boundary. These species and sites are summarized in Table 3-71. More detailed information concerning these invasive plant sites are included in the Upper Beaver Prefield Review Form (Appendix E, Botany Report, project file).

Table 3-71. Summary information for invasive plant sites within and near the Upper Beaver projectr area.

Invasive plant species with sites within Upper Beaver project area:		
Scientific Name	**Common Name**	**Number of Sites**
Centaurea biebersteinii	spotted knapweed	12
Cirsium arvense	Canada thistle	10
Taeniatherum caput-medusae	medusahead	10
Cardaria draba	whitetop	6
Hypericum perforatum	common St. Johnswort	5
Potentilla recta	sulfur cinquefoil	4
Centaurea diffusa	diffuse knapweed	2
Dipsacus fullonum	Fuller's teasel	1
Leucanthemum vulgare	oxeye daisy	1
Linaria vulgaris	butter and eggs	1
Onopordum acanthium	Scotch cottonthistle	1
Phalaris arundinacea	reed canarygrass	1
Invasive plant species with sites no more than 400 meters outside Upper Beaver project boundary:		
Scientific Name	**Common Name**	**Number of Sites**
Cardaria draba	whitetop	2
Cynoglossum officinale	common hound's-tongue	2
Centaurea biebersteinii	spotted knapweed	1
Centaurea diffusa	diffuse knapweed	1
Cirsium arvense	Canada thistle	1
Cirsium vulgare	bull thistle	1
Leucanthemum vulgare	oxeye daisy	1
Linaria dalmatica	Dalmatian toadflax	1

Two new sites of invasive plant species were documented during field surveys in 2008. Field bindweed (*Convolvulus arvensis*) was documented along the upper 5820 road and whitetop (*Cardaria draba*) was detected along the lower 5820 road.

Several invasive species of annual grasses occur within the project area. Included among these are cheatgrass (*Bromus tectorum*), field brome (*Bromus arvensis*, syn. = *B. japonicus*), rattlesnake brome (*Bromus briziformis*), and North Africa grass (*Ventenata dubia*). None of these species is listed as a noxious weed by the Oregon Department of Agriculture. Each of these species is abundant within and beyond the project area on Paulina Ranger District. The very abundance of these species in a mesic to dry landscape is sufficient cause to anticipate that they are in competition with local native plant species for limited resources, especially water. North Africa

grass is of particular concern because of its relatively recent appearance in the Pacific Northwest (Hitchcock and Cronquist, 1973) and evidence suggests that it is actively increasing its density and distribution on Paulina Ranger District. Along with field brome and rattlesnake brome, North Africa grass is most frequently observed on scabby areas and the transitional zones adjacent to them, where tree cover is very low to moderate, and soils are rocky, shallow, and with a very thin or non-existent layer of duff and litter. Observations during 2008 indicate that *Ventenata dubia* is common in these habitats within the project area, up to elevations of about 5000 feet. Few data on management options are available at this time. It appears that the species is not particularly susceptible to management by grazing or mechanical means (Martin, 2000). The effectiveness of management through burning on Paulina Ranger District would appear to be limited by the relatively low fuels volumes associated with the typical habitat of the grass. Additionally, local anecdotal evidence (Scheinost, 2008) suggests that burning is at least a short-term stimulus to *Ventenata dubia*. While activities associated with this project are largely focused on forested areas, there will be project-related travel and disturbances within the habitats of these invasive annual grasses. Unfortunately, there appear to be few practical measures available to significantly reduce the opportunities for project-related spread of these species.

Wildfire, Burn Intensity and Weed Risk

There is anecdotal evidence on Ochoco and neighboring Deschutes National Forests, that with the presence of pre-existing weed populations, wildfire tends to promote the spread of noxious weeds. At this time, it is assumed that weed risk increases in a direct relationship with burn intensity. The relationship between burn intensity and risk of introduction and/or spread of noxious weeds is not clearly documented on these Forests. While there may be a direct relationship between burn intensity and weed seed survivorship, it is currently assumed that this possible risk-lowering factor is more than offset by the increasing level of disturbance associated with increasing levels of burn intensity. As burn intensities increase, survivorship/cover of existing native vegetation declines, reducing, in turn, the effectiveness of local native plant species in their competition with invasive weed species. It is reasonable to predict an increased risk of spread of invasive plants species within burned areas due to 1) ground disturbance and loss/reduction of competitive native vegetation, 2) introduction or spread of weed seed from within or outside of the burned area, by vectors associated with fire suppression efforts and 3) introduction or spread of weed seed from within or outside of the project area, by project and non-project-related vectors in the several years immediately subsequent to the fire.

Effects

Alternative 1

Compared with the Action Alternatives, Alternative 1 offers the lowest risk for introduction and spread of noxious weeds. Under the No Action Alternative, no actions would be taken that would directly promote the spread of invasive plants. Absent, under this Alternative would be the use of heavy equipment in ground-disturbing and/or weed seed-vectoring actions such as thinning, prescribed burning and temporary road construction.

It is notable, however, that at some future date, even the No Action Alternative carries with it some risk of indirectly promoting the introduction and spread of invasive plants. Given current high fuels loadings within many of the proposed treatment units, it reasonable to anticipate a potentially large scale, intense wildfire within or including some portion of the project area in the near future (0-20 years). As noted above, wildfire is associated with its own set of actions and consequences (indirect effects) that promote the introduction and spread of noxious weeds.

It is reasonable to anticipate that under the No Action Alternative, even in the absence of wildfire, acreage of invasive plant infestation within the Upper Beaver Vegetation Management Project area will continue to increase for at least the next 1-5 years. This projection is attributable, at least in part, to 1) the relatively large number of invasive plant species already present (13, not

counting at least 4, non-listed invasive annual grasses) 2) the relatively large collective gross acreage of infestation, 3) presence of ground disturbance agents including livestock and other large mammals and ongoing forest management activities such as prescribed burning 4) presence of diverse weed-dispersal vectors such as recreationists and their assorted motor vehicles and stock, livestock and native wildlife species, forest staff and their motor vehicles.

Alternatives 2 & 3

The anticipated effects of Alternative 2 (the Proposed Action) and Alternative 3, regarding TES plant species, are similar enough that these Alternatives are jointly addressed below as the Action Alternatives.

Under either Action Alternative, this project has been determined to have a HIGH risk for the introduction and spread on invasive plant species. An Invasive Plant Species Risk Assessment is included in the Botany Report (Appendix B of the Botany Report; see Upper Beaver project file). Fuels management activities proposed in the Action Alternatives - thinning, prescribed burning, temporary road construction - will result in soil disturbance and a reduction in vegetative cover and litter. These habitat alterations will promote establishment of invasive plant species. The heavy equipment used in affecting these habitat alterations will, locally at least, cause a high risk of inadvertent dispersal of existing weed propagules within the project area. On the other hand, to the extent that the proposed fuels management activities succeed in reducing the scale and intensity of any near-future wildfires, these activities may reduce the weed risks associated with the suppression efforts and aftermath of such wildfires.

At issue in assessing the effects of the Action Alternatives is the need to predict the extent to which the directly elevated weed risk associated with fuels management activities (soil disturbance, vectors for introduction and spread) is offset by the indirectly reduced weed risk associated with those same fuels management activities (reduced wildfire-induced soil disturbance and loss of competing native vegetation). This resultant net risk estimate could then be compared to the weed risk estimate associated with near-future wildfire in a landscape with unreduced and ever-building fuels levels (the No Action Alternative). Unfortunately, a good process for making these estimates is not available at this time.

In that over 700 more treatment acres are proposed in Alternative 2, relative to Alternative 3, Alternative 2 likely poses a slightly greater risk of weed introduction and spread relative to Alternative 3.

A comparison of the three Alternatives associated with the Upper Beaver project with regard to estimated risk of introcudtion and/or spread of invasive plants vs. future wildfire risk is summarized in Table 3-72. As noted above, occurrence of future wildfire is associated with its own risk of establishment and spread of invasive plant species.

Table 3-72. Summary of invasive plant risk assessment for the Upper Beaver project area.

Comparison measure	Alt. 1	Alt. 2	Alt. 3
Invasives risk (based on # acres disturbed)	**Low**	**Highest**	**High**
Risk of future wildfire (based on acres thinning and other fuels reduction treatments)	**High**	**Lowest**	**Low**

Cumulative Effects

As noted in the analysis of effects to TES plant species, many decades of activities including livestock use, road construction, timber harvests and pre-commercial thinning, prescribed burning and grazing by large mammals, have provided repeated opportunities through ground disturbance, seed vectoring and alteration of local water tables, for the promotion of introduction and spread of invasive plant species. It is anticipated that the activities proposed in this project will provide

further opportunities for this spread, as will reasonably foreseeable future events such as further harvest, thinning, natural fuels burning activities, and wildfire. It is important that the prevention and risk-reduction measures included in this report are followed in order to minimize these opportunities.

Range

The Upper Beaver Creek Vegetation Management project contains all or parts of five grazing allotments. The Bearskull/Cottonwood, Heisler, Wind Creek, and Wolf Creek Allotments were established in 1957 when the Beaver Creek Range was subdivided. The earliest record for the Sunflower Allotment is a stand-alone allotment that dates back to 1930.

The entire analysis area was grazed by both sheep and cattle beginning in the 1880s; this use was unregulated until the establishment of the Ochoco National Forest in 1905 (Hall, 1967). Records are lacking on range management practices during this period, but the unregulated livestock grazing contributed to the loss of top soil, increased amounts of bare and compacted soils, streambank degradation, channel erosion, and the reduction in the amount of desirable riparian vegetation (Bauer and Burton, undated). Fire suppression and livestock grazing contributed to the reduction in the fuels necessary to carry fires across the landscape contributing to an increase in juniper and other conifers (Eddleman et al., 1994).

After the establishment of the National Forest, grazing allotments were divided, and boundaries were changed in an attempt to control livestock and to establish carrying capacities. A significant change in grazing management occurred in the early 1940s when many of the allotments on the Paulina Ranger District were converted from sheep to cattle use. The number of head and the season of use for livestock grazing have been significantly reduced since the 1940s to allow for improvement of range resource conditions.

Impacts from historic unregulated grazing have likely recovered to some degree, but these impacts can still be seen today. Not enough information is known for the majority of the watershed to determine the level or distribution of impacts from livestock influenced soil erosion, compaction, streambank trampling, sediment delivered to streams, and juniper expansion (USFS, Upper Beaver Creek Watershed Analysis, 2003).

Existing Condition

Grazing Management

The Bearskull-Cottonwood Allotment was administratively closed to sheep grazing in January of 2008. A 188 acre portion of the project area (.005%) on Wolf Ridge is within the Bearskull-Cottonwood Allotment. Currently there is no active livestock management.

The Sunflower Allotment has two pastures within the project area which are the Willow (357 or .001% acres within the project area), and 2,018 acres in the Hardscrabble pasture. The Willow and Hardscrabble pastures are grazed early in the season, typically in June, due to the higher forage palatability early in the season and the limited amount of available stock water. Either the Willow or Hardscrabble is typically rested alternately on an annual basis.

The Wind Creek Allotment contains three pastures, all of which have project acres within the project area. The Wind Creek Allotment includes the Bronco (626 acres or .002 % within the project area), South (1,806 acres or .05% in the project area), and North pastures (3,104 acre or .08% in the project area). The Bronco pasture serves as a holding pasture for the South and North pasture when turning the cattle on and coming off the allotment. It is generally used for less than 10 days at the beginning of the grazing season and less than one week at the end of the grazing season. The South pasture is grazed before the North pasture each year in order for cooler

temperatures and more palatable vegetation to encourage livestock to distribute into the uplands rather than into the riparian areas.

Four pastures within the Wolf Creek Allotment are within the project area; those pastures are the Riparian pasture (2,377 acres, .06% of the project area), Nichol Pasture (8,275 acres, .2 % of the project area), Sugar pasture (6,500 acres, .2 % of the project area), and Sugar Holding Pasture (488 acres, .01 % of the project area). Pastures within the project area are all east of Wolf Creek within the Upper Beaver Creek Watershed. The Wolf Creek allotment is managed under a simple deferred rotation grazing system. Each year at least one of the pastures within this allotment is not used until after the vegetation is seed ripe. Either the Riparian or Sugar pasture is grazed first; whichever one is not grazed first is grazed after the Nichol pasture. The Nichol Pasture is grazed second because of water availability and later maturing forage in the higher elevations. The Sugar Holding Pasture is used less than a week to gather cattle coming off the forest in the fall.

The Heisler Allotment is entirely within the Upper Beaver Watershed and as a result the four pastures within the allotment, Bear/Rager (1,336 acres within the project area), North (2488 acres), East (3,335 acres), and South (2,488 acres) are all 100% within the project area. Cattle are rotated through the pastures the same way almost every year; this is due to the location of the forage and available water throughout the grazing season. The cattle start in the South pasture, move to the East pasture, rotate to the North pasture, and end in the Bear/Rager pasture coming off the forest around mid-September.

Livestock control and distribution is primarily dependant on the forage quality and quantity, location, availability, fences, herding practices, water development, salting, and pasture rotation. There is approximately 89 miles of allotment boundary and pasture fences within the project area to support livestock distribution and control. Most of the fences were built in the 1940s and are in poor shape as they have significantly outlived the typical life expectancy of a barbed wire fence. There are approximately 33 water developments located in the project area, most of which are in fair to poor condition. Table 3-73 summarized livestock rotation schedules in the project area allotments.

Table 3-73. Bearskull-Cottonwood, Heisler, Sunflower, Wind Creek, Wolf Creek Allotment grazing rotation schedules.

Allotment	Pasture	Grazing Rotation					Comments
		May	June	July	August	September	
Bearskull-Cottonwood							Closed allotment, no grazing.
Heisler	South	05/25--	---	--07/05			
	East			07/06	--08/05		
	North				08/06--	--08/31	
	Bear/Rager					09/30-09/31	
Sunflower	Willow		06/01-06/30				Only one pasture is grazed
	Hardscrabble		06/01-06/31				annually the other is rested
Wind Creek	Bronco		06/01--06/10				
	South			06/11--	--08/01		
	North				08/02--	--09/20	
	Bronco					09/21-09/25	
Wolf Creek	Riparian		06/01-06/30				
	Nichol			07/01--	--08/31		
	Sugar					09/01-09/30	
	Sugar Holding					09/21-09/30	

Upland Vegetation

Upland vegetative conditions, as analyzed in the Draft Southside Allotments EA and Sunflower Allotment EA, were generally in satisfactory condition. Upland vegetation consists of bunchgrass and shrub communities on the scab (top of ridges) portion of the scab-stringer landscape, as well as juniper-shrub community along the top or edge of the ridge, depending on soil depth and historic fire regime. Non-forested areas account for the largest portion of the project area,

approximately 24% of the described landscape (Upper Beaver Vegetation Management EIS Sensitive Plant Species BE). The mid slope (stringer) in the lower elevation communities is generally dry ponderosa pine forest, with moist pine, Douglas fir, and moist fir with pinegrass and elk sedge undestories increasing with increases in elevation. Due to the suppression of fire and reduction in thinning and harvest activities in recent years, many of the forested stands have been dominated by dense stands of smaller trees (Upper Beaver Vegetation Management EIS Silvicultural Report). The increase in canopy cover has reduced the understory grass and shrub production and reduced the amount of available forage to livestock and wildlife. In some areas the increase in dense stands of smaller trees has created a barrier to livestock movement and distribution.

Most grass species (bluebunch wheatgrass, Idaho fescue, Sandberg's bluegrass, Kentucky bluegrass predominate) within the project area are palatable to livestock (Hall, 1989). Invasive annual grasses, such as cheatgrass, Japanese and rattlesnake brome have persisted in the project area since the 1950s (USFS, Draft Southside Allotments EA, 2008). North African grass, also known as Ventenata, is also an aggressive invasive annual found primarily in scab vegetation communities. Invasive annual grasses in the project area are generally not palatable to livestock because they have cured and become undesirable to livestock prior to turnout. Due to the little documentation of such annuals from the first part of the 20th century more studies would be needed to determine the amount and speed of spread (USFS, Upper Beaver Creek Watershed Analysis, 2003).

Riparian Vegetation

The project area can generally be characterized by stringers of vegetation, mostly following streams, surrounded by scablands; riparian vegetation occurs throughout the project area in a variety of settings (Upper Beaver WA, 2003). The majority of riparian vegetation is found along springs, seeps, wet meadows, and along streams. Within the stringers of forested area, there is a riparian zone of varying width adjacent to the stream. Riparian vegetation is generally composed of sedges and hardwood species as the forest canopy, water table, and channel morphology allow.

Stock water in the project area is a limiting factor and areas with water, and consequent riparian vegetation, are natural areas for livestock congregation. Historic grazing contributed to the removal of deciduous woody vegetation and compaction of riparian terraces. Livestock grazing levels have been significantly reduced from historic levels and riparian vegetation has since improved (Hall, pers. comm., 2007). However, livestock congregation in areas with surface water continues to be a management challenge from the standpoint of herbaceous utilization, woody riparian use, and bank alteration. Wildlife also uses the same areas with surface water and has an impact on the site. Wildlife use of deciduous woody vegetation has often led to woody vegetation recruitment problems (Upper Beaver Creek WA, 2003).

Riparian vegetation conditions as analyzed in the Draft Southside Allotments and Sunflower Allotment EAs varied substantially from non-functioning to satisfactory by pasture, stream, and even between stream reaches. The variation could be partially due to forested communities across the project area invading and overstocking riparian areas and meadows utilizing available resources and creating canopy cover that shades out herbaceous and woody riparian species and ultimately reducing the amount of available forage. In upland sites as canopy cover by trees increases past 40% cover, shrubs and herbaceous species decrease in both density and production (Hall, 1986) and the same trend could be expected in riparian areas where there is more available water and resources. Disturbance from low severity high frequency fire is also missing from these stream systems. These fires would have helped maintain the hardwoods by reducing young conifer survival and encouraging sprouting (Brown, 2000). Olson (2000) found that keeping fire out of the riparian ecosystem will continue to alter structure and vegetation composition.

Effects

Alternative 1

No vegetation treatments would be implemented under this alternative. Vegetation would continue to evolve towards a later seral plant community dominated by forested types and juniper woodland. In the vegetation communities found in the scab areas juniper would continue to increase causing a decrease in the shrub, grass, and forb species. Understory grasses and shrubs in the stringer areas would also decrease in production (pounds per acre) 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 (Upper Beaver Vegetation Management Project Aquatic Species Resource Report and Biological Evaluation). Overall the forage available to livestock would decrease over time from what is currently available. As forage in the uplands decreases, livestock would be expected to occupy and utilize areas with more available and palatable forage, such as meadows and riparian areas to a greater degree. A decrease in forage would require an adjustment to the duration of the grazing season or number of permitted head to meet Forest Plan Standards and Guidelines. Standards for streambank alteration and livestock utilization in the riparian areas would also be more difficult to meet with the decrease in riparian species vigor and recruitment.

Increased forested areas and stand densities would increase the fuel load and increase fire susceptibility and potential fire severity (Upper Beaver Vegetation Management Project Fire and Fuels report). The fuel load in the no action alternative would accumulate and would be more susceptible to severe wildfire. A severe wildfire would reduce forage for a considerable amount of time (3 years or more depending on resource condition) and could make a site vulnerable to invasive species. Loss of forage on a large scale (pasture or allotment) and required range rest period would cause a large financial hardship to permittees. Wildfire could result in the loss of range improvements, including fences and water developments, which would also impact permittees financially.

Under this alternative no activities would take place that could potentially impact or influence existing range improvements.

Alternatives 2 and 3

Under alternatives 2 and 3, a variety of vegetation management activities would take place within the project area. These alternatives include commercial and precommercial thinning, hardwood treatment, juniper cutting, and prescribed burning. Such vegetation treatments favor herbaceous plants and often enhance forage production (pounds per acre), accessibility, palatability, and correspondingly increase upland use by livestock (Wyman et al., 2006). These alternatives would have an increasingly positive effect on forage production in upland and riparian areas. The attraction of livestock to areas that have been burned often enables temporary rest of riparian areas until vegetation recovers (Wyman et al., 2006). Following removal of overstory competition and under burning, forage species would be expected to increase in vigor the first growing season and expand spatially for at least the following five to ten years.

Range condition of the uplands would continue to improve due to the increase in forage available and permitted livestock numbers and season of use remaining constant. Accumulations of slash from thinning activities would hinder livestock movement through the treated areas unless the slash was treated by underburning or piling. See Table 3-74 for a summary of activities proposed within grazing allotments.

Table 3-74. Activities proposed in grazing allotments by action alternative in the Upper Beaver Vegetation Management project area.

Alternative	Activities within Allotments (acres)						
	Commercial Thin	Precommercial Thin	Underburn	Wolf Ridge Natural Fuels Underburn	Hardwood Treatment	Juniper Removal	No proposed activities
2	2674	6657	4233	1046	62	2299	17728
3	2206	6807	3941	1046	28	2279	18395

Activities within some RHCAs (see Chapter 2, Description of Action Alternatives, and Table 3-54 in the Aquatic Species section) would likely attract livestock because removing small trees and surface and ladder fuels would remove barriers to livestock movement (Upper Beaver Vegetation Management, Aquatic Species Specialist Report). 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 the growth of grasses and shrubs. 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. Livestock are also expected to be drawn out of riparian areas to graze where treatments have improved upland forage.

In treated upland areas the newly sprouted vegetation would increase in forage palatability for the first 3 -5 years. This in turn would make it easier to attract cattle away from riparian areas to the uplands, which might alleviate grazing pressure and trampling in RHCAs. Upward trends in riparian condition are expected to continue due to changes in the range utilization standards in the Forest Plan, Draft Southside Allotment Environmental Analysis, and Joint Aquatic and Terrestrial Programmatic Biological Assessment April 2006-April 2009.

Under this alternative no activities would take place which could potentially impact or influence existing range improvements. See mitigation measures.

The action alternatives would allow for more representation of grass and shrub community types on the landscape and would reduce the forested component in the scab-stringers and riparian areas for the next 10-20 years or longer depending on the site. Ultimately the species performance, site availability, and species availability will influence the direction and pace of vegetation change (Whisenant, 1999). The annual production (in pounds per acre) available as forage for livestock and wildlife would increase significantly (depending on the site) over time due to activities to reduce tree density and canopy cover.

Thinning in the riparian areas would reduce competition and shade that retards hardwood growth and would increase the grass component and available forage

Thinning trees can result in an upward range trend without change in animal management (Weaver 1957a, 1957b, 1967b).

Cumulative Effects

The cumulative effects analysis area for livestock grazing is a small portion of the Bearskull-Cottonwood Allotment within the project area, all pastures within the Heisler and Wind Creek Allotment, the Riparian, Sugar, and Nichol pastures within the Wolf Creek Allotment, and the Willow and Hardscrabble pastures in the Sunflower Allotment.

Past, ongoing and reasonably foreseeable actions are summarized in Table 3-84.

Timber management activities in the past have affected stand conditions in the Project Area. Past harvest concentrated on removal of large mature trees. 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 build-up of needle litter on the forest floor.

Fire was historically primary controlling factor for the vegetation within this project area. Fire suppression efforts have been effective across the project area since the turn of the 21st Century. With infrequent fire return intervals, plant communities tend to burn more severely and are replaced by vegetation different in composition, structure, and age (Johnson, et al. 1994). Fire has been mimicked or put back into much of the landscape within the project area between harvest, thinning, and burning activities that took place in the 1980's and 1990's. In the lower elevations low intensity fire has occurred within the last 15 years (50% of the project area, Upper Beaver Vegetation Management Project Fire and Fuels Report), in the higher elevations about 21% of the project has not had fire present for 50 years or more. Where fire has not occurred in the last 50 years the risk is higher for severe fires and substantial loss of forage in a wildfire situation. With increased fire frequency (reduced fire return intervals) vegetation tends more and more to become dominated by grasses, forbs, and shrub vegetation rather than tree species. Plant vigor is improved by fire and plant community diversity, but forage production and palatability for ungulates are often improved as well (Adams, 1989).

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 cited). 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 (Skoulin et al., 1976; Seidel et al., 1990; Karl 1991) or has been reduced (Currie et al., 1978; McLean and Clark 1980; Eissenstat et al., 1982; Krueger, 1983; Allen and Bartolome, 1989; Karl 1991; Kingery and Graham, 1991).

Present and reasonably foreseeable future actions occurring within the Upper Beaver Vegetation Management project specific to range management will be reconstruction of fences in poor condition, as well as reconstruction of water developments that need assistance to get back to excellent or good condition. Such actions would continue to help with livestock distribution.

Road maintenance and reconstruction generally benefits livestock grazing by potentially making it easier for permittees to administer their permit such as providing easier access to repair improvements, or distribute salt.

Past activities and occurrences have shaped both the existing resource conditions and the current livestock use patterns within the analysis area. Cumulatively under Alternatives 2 and 3, it is expected that the entire project area would:

- Result in a more open upland that is more accessible to livestock than the no action alternative.
- Contribute to a shorter duration to vegetative recovery than does the no action alternative, in particular, recovery of riparian areas.

Transportation

The Upper Beaver project area is located within the Oregon Department of Fish and Wildlife's (ODFW) Ochoco Hunting Unit and the Rager Travel Management Area (Rager TMA), which seasonally restricts motor vehicle use to those roads marked on the ground with a reflectorized green dot. Annually, the regulated public closure begins 3 days prior to general rifle buck-deer season and ends on the last day of general rifle cow-elk season. During this period, vehicle use on or within 300 feet of these "open" green dot roads is allowed for camping, game retrieval, and other forest activities unless otherwise restricted. All other roads, trails, and cross country travel

by motor vehicle is prohibited, except by special permit issued by Paulina Ranger District for private landowner, permittee, or emergency access.

The Rager TMA is managed by the Ochoco National Forest, Oregon State Police, and ODFW to provide a less vehicle-intensive hunting experience. The area is signed at all major entry points, listed in the ODFW hunting synopsis, and well-advertised in the Paulina community and at Rager Ranger Station. Table 3-75 lists the open green dot roads for motor vehicle use during the restricted period. Forest Service jurisdiction roads are designated as National Forest System Road (NFSR) followed by the road number.

Table 3-75. Rager Travel Management green dot roads.

ROAD NUMBER (NFSR)	ROAD LENGTH (Mi)
4200000	0.68
5800000	7.62
5800160	0.20
5810000	4.16
5820000	9.04
5820190	1.63
5830000	6.60
5830400	0.50
5830660	0.55
5840000	10.54
5840100	0.20
5850000	0.18
	TOTAL = 41.90 Miles
Roads within Rager Ranger Station are open during the Green Dot period.	

In the early 1900s the Forest Service built a road called the Summit Trail, crossing the forest from west to east. Segments of this trail follow NFSR 5840 within the project area. Pack trails were built in the settlement years that allowed access for livestock grazing, forest management, and connections to the Summit Trail. The existing road system was primarily developed in the last half of the 1900s to provide more efficient access to the timber resources, grazing lands, and recreation sites administered by the Ochoco National Forest. Today the road system provides similar multiple-use access to the public, including developed and dispersed recreation opportunities. The current road management policy directs the Forest Service to maintain a safe, environmentally sound road network that is responsive to public needs and affordable to manage (FSM, Title 7700; January 2001).

The Sugar Creek Timber Sale is the only active operation within the Upper Beaver project area on National Forest System land. This sale includes about 30 acres in the vicinity of Sugar Creek Campground and Day Use Area. Currently, there is no active logging on private land in the local area. Log trucks from the Sugar Creek Timber Sale will use NFSR 58 and S.E. Beaver Creek Road as a haul route. Willow Pine Timber Sale is active in the Sunflower Creek sub-watershed which, is south of this project area. Timber sales that have closed in the last 10 years are Dippy Beaver, June 2004; TNT, September 2000; and Aqua, 1999. In the future, it is likely that commercial land management and other multiple use activities will continue, requiring maintenance and use of the road system.

National Forest System Roads within the project area are categorized by maintenance levels (ML). The level of service and standards of maintenance are defined by each category, listed in Table 3-76. The Forest Service maintains a part of the road system, called Highway Safety Act Roads (HSA), to a higher safety standard. Typically, these roads are within the Maintenance Level 3-5 category.

Table 3-76. Road maintenance levels within the Upper Beaver project area.

MAINTENANCE LEVEL (ML)	DESCRIPTION
ML 1	Roads that currently are closed to vehicular traffic.
ML 2	Roads open for use by high clearance vehicles.
ML 3	Roads maintained for travel in standard passenger cars by prudent drivers. HSA road.
ML 4	Roads providing a moderate degree of comfort and convenience at moderate travel speeds. HSA road.
ML 5	Roads providing a high degree of comfort and convenience at higher travel speeds. HSA road.

There are decommissioned roads in the project area. These roads have been removed from NFSR status by past land management projects. Typically, the road prism and/or entrance have been disguised to eliminate use by motor vehicles. A decommissioned route reverts to the existing land management allocation for that area, and could be used in the future as a temporary road.

Non-system temporary roads, referred to as unclassified roads or user-created, are likely to exist within the project area. Unclassified roads may be used as temporary roads or designated skid trails during vegetation management operations, if appropriate. Following these activities the roads will be closed to motor vehicles, surface stabilized, and allowed to naturally re-vegetate. A project-specific road analysis has not been undertaken for the Upper Beaver project area; however, a forest wide road analysis recently was completed on ML 3 through ML 5 roads (*Road Analysis Report, Forest-Wide Assessment, Ochoco NF, Deschutes NF, and Crooked River National Grassland; January 2003*). Any change to existing NFSR status is not planned. Table 3-77 summarizes the existing condition of roads in the project area.

Table 3-77. National Forest System roads, temporary / unclassified roads, and commercial haul route mileages in the Upper Beaver project area.

JURISDICTION/ROAD STATUS	MILES
NFSR ML1	49.11
NFSR ML2	76.62
NFSR ML3	0.73
NFSR ML4	3.51
NFSR ML5	5.26
Decommissioned	44.96
*Nonsystem Temporary / Unclassified	3.30
Commercial Use Roads Outside Planning Area	4.17
* Other unclassified roads may exist within the project area.	

Highway Safety Act roads in the Planning Area include: NFSR 42, 58, 5800050, 5800141, 5800142, 5800143, and 5800145. NFSR 58 will carry the majority of commercial traffic for this Planning Area, and has segments of asphalt and gravel surfacing. NFSR 42 is asphalt surfaced, with less than one mile of length within the Planning Area. NFSR 5800050 provides access to Sugar Creek Campground. The remaining HSA roads listed above are residential or administrative roads within the Rager Ranger Station compound.

The forest-wide road analysis report mentioned a higher risk of weed spread potential along the following roads: NFSR 58, 5800050, 5800141, 5800143, and 5800145. There are no roads analyzed within the Planning Area that were rated as a high concern for unique wildlife features or habitat characteristics.

ML 2 status roads make up a majority of the Planning Area road system. They range in condition from native surfaced, high clearance vehicle-designed; to aggregate surfaced with turnouts. NFSR 5810, 5820, 5830, and 5840 are aggregate surfaced roads that will collect a majority of the

commercial vehicle traffic. The aggregate on these roads is showing signs of excessive wear and thin surface depths. NFSR 58 within the Rager Ranger Station compound is prohibited for commercial use vehicles without an authorization defining use limitations. NFSR 5840 is unsuitable for commercial use vehicles rated over 16,000 lb. GVW without required reconstruction of aggregate surface rock at selected drain dip locations (*Ochoco National Forest, Commercial Road Rules document; May, 2006*).

During recent field reconnaissance of a portion of the road system, evidence of road prism damage or structural deficiencies was noted. NFSR 58, from Mile Post 9.94 to 14.19, has sections of asphalt pavement that are deteriorating and showing signs of sub-grade damage. NFSR 5830 at the Heisler Creek crossing shows evidence of an undersized culvert and road shoulder sloughing, MP 3.60, and similar conditions at a Heisler Creek Tributary, MP 3.88. NFSR 5830200 shows signs of tributary stream culvert plugging and/or road surface water damage at MP 1.62, 1.82, 3.29, 3.42 - 3.50, 3.68, and 3.94. The entire road length of 4.46 miles needs roadside brushing. NFSR 5830600 has ditch-line failure from MP 1.77 - 2.01, and evidence of an undersized culvert at the Beaverdam Creek crossing, MP 2.01. The entire road length of 2.32 miles needs roadside brushing. It is recommended that the roadway drainage conditions be repaired if significant timber sale log volume is hauled on these roads. Some Local ML 2 and ML 1 (closed) roads, including NFSR 5800201, will require reconstruction of drainage features to allow commercial haul.

Currently, there are 135.23 miles of National Forest System roads within the Upper Beaver project area (sum of ML1 through ML5). This area encompasses 57.81 square miles. System road density equals 2.34 miles per square mile. The open road system (sum of ML2 through ML5) length is 86.12 miles, and the corresponding density equals 1.49 miles per square mile (Table 3-78). There are no private roads within the planning area. Unauthorized road length is unknown.

Table 3-78. Upper Beaver project area NFSR densities.

ROAD STATUS	ROAD DENSITY (mi/mi^2)
System Roads (ML1–5)	2.34
Open System Roads (ML2-5)	1.49

Recreation

Existing Condition

Developed Recreation

There are three developed recreation sites within the Upper Beaver project area: Sugar Creek Campground, Sugar Creek Day Use Area, and Salter's Cabin Campground. Sugar Creek Campground is a fee site open to the public from May 1 through November 30. It is gated and closed the remainder of the year due to a bald eagle winter roosting area near the campground. This is a 17-site campground with tables, fire rings, vault toilets, and information boards.

This campground normally has from 800 to 1200 visitors per year depending on the weather and the amount of hunting tags given out in the fall for this area. This campground was enlarged and upgraded in 1992. No major changes have been made since that time, except for the 2008 Sugar Creek Vegetation Management Project, which thinned approximately 40% of the overstory trees due to forest health reasons. The Sugar Creek Day Use Area is adjacent to the campground and creek and is a non-fee site. A picnic shelter with tables, a vault toilet, and a .6-mile paved interpretive trail are the main focus of this site; Sugar Creek Day Use Area is used frequently during the summer months by family reunions. Salter's Cabin Campground is a one-site non-fee campground with a picnic table, rock fire ring, vault toilet, and a small historic cabin once used by salters and riders hired by local ranchers. This small site is used heavily by local families especially during hunting seasons.

Dispersed Camping

There are approximately 49 dispersed campsites within this project area; 47 have been recorded with a GPS unit and two sites are non-verified at this time. They are used mostly by the public during the fall hunting seasons. Dispersed campsites are maintained when time and funding allows; however, they are not regularly monitored.

Trails

There are no developed trails within this project area; however there is one trailhead, at Dusty Camp, that is a portal into the Black Canyon Wilderness Area. The Black Canyon Trail, #820, drops off Wolf Ridge at this trailhead and into the Owl Creek Basin and Wilderness Area through dense mixed conifer forests with scattered ponderosa pines and grassy openings.

Effects

No effects would occur to any of the developed recreation sites within the Upper Beaver Project Area. There may be some short-term effects to a very small number of dispersed camping sites, depending on when project activities would be scheduled. Access to some of these sites may be temporarily blocked to maintain public safety. No project activities would affect the Dusty Camp trail parking area and trailhead. A separate document has been written for a guideline on how to implement project activities that are adjacent to the Summit National Historic Trail, following the Environmental Assessment written for this historic site and also those guidelines listed in the Ochoco National Forest Land and Resource Management Plan for this management area.

Wilderness

The Upper Beaver project boundary overlaps the Black Canyon Wilderness boundary by about 7 acres. There are no activities proposed in the wilderness, and project activities would not change the character of the wilderness in any way.

Unroaded Areas

At the closest points, the Upper Beaver project boundary is about 3 miles from the Cottonwood Creek Roadless Area and about 2 miles from the Rock Creek Roadless Area. Project activities would not change the character of the Roadless areas in any way.

Scenery

Existing Conditions

The Upper Beaver project area contains Forest roads and corridors that are included within the management guidelines for the MA-F26 Visual Management Corridors, Ochoco National Forest Land and Management Plan. These roads include the major travel routes to the Black Canyon Wilderness Area (portions of Forest road 58, the majority of Forest road 5820, and a portion of Forest road 5840). There are also Visual Quality Objectives (VQO) for the Summit National Historic Road, (Management Area F7), Developed Recreation (Management Area F13), and Dispersed Recreation (Management Area F14- within actual dispersed sites only).

Effects

Effects to VQO for the Summit National Historic Road would be prevented by project design criteria, as described in Chapter 2 of this document.

Developed Recreation

No project activities are proposed adjacent to or within a visual corridor of the Sugar Creek Campground and Day Use Area.

Dispersed Recreation (within actual dispersed sites only)

The following proposed Upper Beaver activity units contain dispersed campsites:

- Tractor Harvest: Units 2, 9, 51, and 57.
- Pre-Commercial Thinning Units: 17, 187, 192, 219, 289
- Underburn Units: 78, 115, 139, 155
- Juniper Thinning Unit: 324

Visual Management Corridors

See the "Management Areas and Roads Summary" for road segments under this management area within the Upper Beaver project area.

Heritage

Existing Condition

In 2008 there were 225 known archaeological sites within the Upper Beaver Vegetation Management Project on National Forest land. One hundred and forty-seven of these sites (65%) are prehistoric in nature, and are defined as those possessing cultural materials or features that were made and or used prior to 1804. Historic archaeological sites are defined at those possessing cultural materials or features that were made and or used before approximately 1958. In 2008 there were 53 known historic sites (24% of total) within the Upper Beaver Vegetation Management Project Area. There is a third category of archaeological sites, listed under "other" where not enough information is currently known about the site in order to determine its cultural affinity or age. There are currently 25 of these sites (11% of total) known to occur within the project area.

Table 3-79. Numbers of archaeological sites within the Upper Beaver Vegetation Management Project in comparison to the total number of sites on the Paulina Ranger District.

	Prehistoric	Historic	Other	Total
Total number of sites on National Forest Lands within the Upper Beaver Project Area	147	53	25	225
Total number of sites on the Paulina Ranger District	616	332	103	1051

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 prehistoric sites within the Project Area have undergone decades of disturbance to their surface and subsurface from livestock grazing, logging, road building, both natural and prescribed burning across the landscape, and surface collecting of artifacts by Forest visitors.

The types of specific damage mentioned in site records from past management activities include the following:

- The trampling and displacement of surface prehistoric artifacts by livestock congregating at watering places (streams, springs, developed ponds, watering troughs).
- The displacement and destruction of surface and subsurface prehistoric artifacts from timber harvesting operations and road construction.
- The removal of carved aspen bark by past logging operations and fuel reductions.

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 Upper Beaver Vegetation Management activities.

Forest Service Standards and Guidelines, and federal laws and regulations that apply for Heritage Resources are found in the Ochoco National Forest Resource Management Plan, in the Forest Service manual, section 2360, in federal regulations 36 CFR64 and 36 CFR800, and in various federal laws including the National Historic Preservation Act of 1966 (as amended), the National Environmental Policy Act, and the National Forest Management Act. In general, the existing management direction asks the Forest to consider the effects on Heritage Resources when considering projects that fall within the Forest's jurisdiction. Further direction indicates that the Forest would determine what cultural resources are present on the Forest, evaluate each resource for eligibility to the National Register of Historic Places, and protect or mitigate effects to those resources that are eligible.

Under Forest Service Manual Chapter 1560: External Relations: State, Tribal, County, and Local Agencies: 1563.01.d – Treaty Rights: The United States entered into over 3000 treaties with Tribes prior to 1871. Each of these treaties is unique but, in general, tribes retained certain rights to hunt, fish, graze, and gather on the lands ceded to the United States. The Forest Service must administer lands in a manner that protects Tribes' rights and interests in the resources reserved under treaty. Treaty rights are subject to limited State and Federal regulation, where such regulation is nondiscriminatory and reasonably necessary to the conservation of a species or resource.

Current day tribal use of this Project Area include the harvesting of roots, bulbs, and other vegetation for food, medicinal, and ceremonial purposes, and also hunting. These uses are protected for the tribes who signed the 1855 Treaty with the Tribes of Middle Oregon. This treaty, signed by Wasco and Sahaptin-speaking Indians living along the mid-Columbia River and its tributaries, ceded title to ten million acres of land to the United States but reserved the right to continue using the land for traditional purposes.

Effects

The Areas of Potential Effects (hereafter referred to as the Project Area) to Heritage Resources from the Upper Beaver Vegetation Management Environmental Analysis are the places where timber harvesting, temporary road building, thinning and grapple piling, and fuels reduction activities would take place.

Alternative 1

All known prehistoric and historic sites would remain in their current condition for the present time. Natural elements (weather, wild land fires, animal disturbance) would continue to degrade the features of these sites that contribute to their significance.

Alternatives 2 and 3

Most sites within the watershed that encompasses this project have been altered in the past from a combination of natural and man made activities. For this proposed project, action alternatives have design elements in place for the protection of all known archaeological sites both adjacent to

and within a proposed unit. An adverse impact could occur to unknown sites from ground disturbance during the proposed project activities; however, all activities would then stop until further mitigation measures could be developed.

A report has been created for the State Historical Preservation Officer which includes design criteria, per proposed unit, for those locations where cultural materials are either within or immediately adjacent to an area proposed for ground disturbing activities. This list of design criteria will also be made available to the project planners so that these sites will be avoided during unit design and layout. In addition, an Area To Protect (ATP) symbol will be placed on the purchaser map to protect these areas during project implementation.

Air Quality

The Oregon Department of Environmental Quality is responsible for assuring compliance with the Clean Air Act. In 1994, the Forest Service, in cooperation with the Oregon Department of Environmental Quality, the Oregon Department of Forestry and the Bureau of Land Management, signed a Memorandum of Understanding (MOU) to establish a framework for implementing an air quality program in Northeast Oregon. The MOU includes a prescribed fire emission limit of 15,000 tons of PM 10 (particulate matter less than 10 microns in diameter) per year for the national forests of the Blue Mountains (Malheur, Ochoco, Umatilla, and Wallowa-Whitman). Prescribed burning on these forests is authorized by the Oregon Department of Environmental Quality thru the State of Oregon smoke management program. Site specific fuels data is entered into a regional database along with observations of environmental conditions taken while burning. This data is used to determine the amount of emissions produced by prescribed fires and compliance with the MOU.

Slash piles from whole tree yarding would be available for market. As the market for biomass increases, more fuel will be removed from the forest, reducing the smoke from prescribed fires.

Due to the location of the project area, prevailing winds and the short duration and low volume of smoke from prescribed fire, smoke from burning in Upper Beaver would not likely effect Class I wilderness areas or urban Special Protection Zones. The nearest Class I wilderness is the Strawberry Mountain Wilderness, 45 miles to the east. The nearest Special Protection Zone is Bend, 80 miles to the west, into the prevailing winds. Smoke from prescribed fires sometimes pools in the Paulina Valley. Prescribed burning would be suspended during persistent inversion conditions to avoid having smoke pool in the Paulina Valley for more than a few days. Smoke from prescribed fires could impact hunter camps, especially in the late evening and early morning hours as smoke pools in draws and valleys.

A high percentage of wildfire smoke (by mass) is within the PM 2.5 particle class size, which are respirable particles less than 2.5 micrometers in diameter. Table 3-80 compares the production of PM 2.5 between Condition Class 3 (heavy surface fuels and ladder fuels) and Condition Class 1, which is characteristic of a unit that has been harvested, thinned and burned. Wildfire conditions have lower fuel moistures than prescribed fire conditions.

Table 3-80. Smoke production, PM 2.5, in lbs/acre by Condition Class.

Fire Regime 1 Condition Class 3 Wildfire conditions	Fire Regime 1 Condition Class 1 Wildfire conditions	Fire Regime 1 Condition Class 1 Prescribed fire conditions
532 lbs/acre	349 lbs/acre	240 lbs/acre

Economics

Affected Environment

For the purposes of describing socio-economics effects on the economy, the economy was considered 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 Crook, Grant, and Wheeler Counties (Zone of Influence or Zone). The major population centers within the Zone and their population figures based on the 2000 census are: Prineville (10,075), John Day (1,519) Prairie City (902) and Burns/Hines (4,100) (U.S Department of Commerce, Bureau of Census, Decennial Census of Population and Housing, 2001). The total population for the 3-county area during the 2000 Census totaled 28,682. Populations and change for the region and by each individual county are displayed in Table 3-81.

Table 3-81. Central Oregon Population Growth.

County	*Population		Change	Percent
	2000 Census Data	2008 Estimation		
Crook	19,182	23,023	3,841	20.0%
Wheeler	1,550	1,319	-231	-14.7%
Grant	7,950	6,916	-1,034	-13.0%
Totals	28,682	31,258	2,576	9.0%

*Source: US Census Bureau, Population Division, 2009

Jobs

According to the U.S. Bureau of Labor Statistics, estimated civilian labor force in 2008 was:

- Crook, 9,916, down 12 percent since the 2000 census;
- Wheeler, 625, up 15 percent since the 2000 census, and
- Grant, 3,408, up 11 percent since the 2000 census

Whereas the labor force in Oregon as a whole increased 8.5 percent since the 2000 census.

According to the Oregon Employment Department, the three largest sectors in Crook County as of March, 2009 were trade, transportation and utilities (1,370); government (1,210); and manufacturing (820). With the closure of the remaining sawmills, employment in the lumber and wood products has severely decreased since 2000. In August 2006 there were 1,110 people employed in this sector. In March 2009 in Wheeler County the three largest sectors were government (140); trade, transportation and utilities (35), and leisure and hospitality (30). In 2006 in Wheeler County the three largest sectors were government (200), trade (50), and finance/insurance/real-estate (20). In Grant County in 2006 the three largest sectors were government (1,101), trade (500), and finance/insurance/real-estate (430). As of March, 2009 the three largest sectors in Grant County were government (980); trade, transportation and utilities (360), and retail trade (260). (Oregon Employment Department 2009).

Unemployment rates in the individual counties as of March, 2009 were:

- Crook, 21.8 percent;
- Wheeler, 11.5 percent, and
- Grant, 18.8 percent.

The unemployment rate in Oregon as a whole was 12.9 percent (U.S Department of Commerce, Bureau of Census, Decennial Census of Population and Housing, 2001).

Although the past decade (1990-2000) has seen a significant reduction in employment within the lumber and wood products industry, the lumber and wood products industry is still an important contributor to the local economies. In Crook County (2000), 1,510 people were employed in the lumber and wood products industry. This accounted for 25 percent of all wage and salary employment in the county, and represented the third highest paying job in the county. Since then, with the closure of additional sawmills, employment in the lumber and wood products has decreased. As of October 2007, there were 1,010 people employed in this sector. This accounted for 14 percent of all wage and salary employment in the county, a decrease of 12 percent. Moreover, almost all these jobs are located in the logging and secondary wood products sectors, not the higher paying sawmill sector. In Grant County, 370 people were employed in the lumber and wood products industry. This accounted for 14 percent of all wage and salary employment (because of the limited industry base in the manufacturing sector, the State does not separate out the lumber and wood products from the other manufacturing employment. This number represents all manufacturing employment), and represented the third highest paying job in the county. As of October 2007 250 individuals were still employed. Wheeler County has no manufacturing sector industries (U.S Department of Commerce, Bureau of Economic Analysis, 2001, Labor Trends, October 2007).

The economy of Crook County is the most robust in the Zone. However with the recent economic downturns nationwide, Crook County has seen a decline especially in wood products manufacturing. In the spring of 2009, for example, the county's unemployment rate increased by 1.3 percent, up to 16.1 percent. A year earlier the rate was less than half the current unemployment rate, at 7.9 percent. The unemployment rate in February, 2009 was the highest since 1990. The industry with the largest job loss was manufacturing, due entirely to a decline in wood product manufacturing (-70 in April 2009; -60 in May 2009). The total manufacturing job loss since the beginning of 2009 was 120 jobs. The other private industry that lost the most jobs was wholesale trade. Overall the county recorded 920 fewer jobs in March 2009 compared the same month the previous year.

Wheeler County's unemployment rate in March 2009 was 11.5 percent. The number of unemployed in March, 2009 rose to 75, compared to 41 a year earlier. Over two years, Wheeler County's private sector gained 15 jobs – pushing its growth into double-digit territory at 11.1 percent. Government shed five jobs overall, with a loss of 10 in local government offsetting a gain of five in state government.

Job and Personal Income Effects

Timber harvest (lumber and wood products) and road work (road construction, reconstruction, and decommissioning) 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) and Phillips (2004 pers. comm.). The jobs associated with prescribed fire and noncommercial thinning are based on local observations and do not include indirect and induced jobs.

Table 3-83 shows the annual estimated job and income impacts by alternative. These estimates are for commercial forest products, noncommercial thinning, piling of small woody debris (slash), road construction, road reconstruction, road decommissioning, and prescribed fire (see table E-2 for these outputs). 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; United States Court of Appeals, 9th circuit Memorandum, 2006).

Timber harvest jobs and income shown in Table 3-83 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 in Table 3-83 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 (Phillips 2005). 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 3-83 is likely overstated.

Over half of the timber jobs displayed in Table 3-83 are associated with primary manufacturing (sawmills), and since there is no certainty on where this manufacturing would occur (may not be processed even within the zone); it is not possible to predict where many of these jobs would exist.

Table 3-82. Summary of Activities and Outputs by Alternative.

	Alternative 2	Alternative 3
Fuel Reduction Activities (acres)		
Prescribed Fire	4,233	3,942
Activity Fuels Treatment	8,714	8,518
Grapple Piling	2,045	1,902
Wolf Ridge Natural Fuels Treatment	1,046	1.046
Summit Trail Fuel Break	309	309
Total	**16,347**	**15,717**
Noncommercial Activities (acres)		
Precommercial thinning	**6,727**	**6,867**
Road Management (miles)		
Construction		
Reconstruction		
Decommissioning		
Estimated Volume from Commercial Harvest (million board feet)	2.0	1.65

Table 3-83. Annual Employments and Income Maintained or Created

	Alt. 1	Alt. 2	Alt. 3
Jobs (Direct), commercial harvest	0	156	115.5
Jobs (Indirect), commercial harvest		78	58
Total Jobs commercial harvest		234	173.5
Personal Income (Direct), timber harvest ($1000)	0	6,537	4,840
Jobs, road work	0	8.8	4.6
Income, road work ($1000)	0	.28	.15
Jobs, noncommercial thinning	0	14.9	16.3
Jobs, slash piling		2.3	7.3
Jobs, prescribed fire	0	25.3	31.6

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 County, it is likely that many of the logging jobs that would be supported under Alternatives 2 and 3 would in fact be associated with Crook County's 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. 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 and3

Alternatives 2 and 3 propose commercial harvest activities and would contribute to the local, regional, and State economies. Table 3-82 displays the expected level of harvest in million board feet and table 3-83 the number of timber and related jobs that would be created or maintained by alternatives 2 and 3. The estimated jobs would occur over several (3 -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 either Grant 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 but it may be outside the area. 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 alternative 2 or 3.

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. Alternatives 2, and 3, which provide commercial wood products in addition to economic activities associated with the other management activities, along with these same overall economic trends, will 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 Alternatives 2 and 3, would not be measurable.

Cumulative Effects

The Upper Beaver project is one of several projects planned or ongoing within and adjacent to the project area. Table 3-84 includes those that are in the planning process and those that have been wholly or partially implemented, as well as other natural or human-caused events that have affected the landscape; effects of these projects are considered in the cumulative effects analysis disclosed in Chapter 3 of this EIS.

Current and On-going Actions:

- Grazing on Forest Service lands within the planning area; and
- Firewood cutting.

Table 3-84. Past, Present, and Reasonably Foreseeable Future Actions and Events.

Project/Event Name	General Description of Activities or Event	Status
Existing road maintenance and reconstruction	Upper Beaver project area	Ongoing
Culvert replacement on Rds 5810, 5830 (2000)	Sugar Creek, Tamarack Creek, Beaverdam Creek	Past event
Culvert replacement on Rd. 5830 (2003)	Rager Creek	Past event
Potential Culvert replacement on Rd. 5810, and 5810100 (2010)	Sugar Creek	Planned
Central Oregon large wildfires, including Hash Rock Fire (2000), 747 Fire (2002), Maxwell Fire (2006)	Natural or human-caused wildfire events that burned through thousands of acres of timber with varying degrees of intensity and tree mortality	Past events
Sugar Creek Timber Sale	Sugar Creek Campground vicinity	Implemented
Wheeler Aspen (2009)	9 acre commercial harvest of trees less than 21 dbh from an aspen stand on the upper slope of Wolf Mountain adjacent to road 5840. Harvest will utilize ground-based equipment. Noncommercial thinning of conifers less than 9" dbh would follow harvest along with construction of a fence to protect the aspen from browsing.	Planned
Runway Timber Sale (2008)	Upper Beaver project area	Implemented

Project/Event Name	General Description of Activities or Event	Status
Older timber sales noted in district records (1972 to 1983) include: Buckhorn, Powell Creek, and Snow Course.	Upper Beaver project area – These sales primarily focused on removing large high value trees, which were deemed at risk to insect mortality.	Implemented
Existing road maintenance, reconstruction and temporary road construction.	Upper Beaver project area	Planning
Bearskull/Cottonwood, Heisler, Wind Creek, Wolf Creek, Southside and Sunflower allotments	Upper Beaver project area grazing allotments.	Ongoing
Dispersed recreation	Camping, OHV riding, site seeing (vehicle), horseback ridding, deer/small game hunting, biking, hang and cross country hiking.	Ongoing
Upper Beaver Creek Vegetation Management EIS (2010)	Commercial and Non-Commercial Thinning and Fuels Reduction.	Planning
Upper Beaver Creek Winter Range Seasonal Restriction: Dec.1 to March 31 Forest Plan MA-20 (FP pp. 4-83)	Road and trail use will be limited to one mile of open access per section. Approximate date for seasonal restriction to take affect is Dec.1 of 2010.	Ongoing
Rager Cooperative Travel Management Area program (Green Dot system)	Open road and motorized trail densities are reduced during the deer-hunting season that reduces open road/motorized trail densities.	Ongoing
Ochoco National Forest Access and Travel Management (2010)	Ochoco National Forest is currently evaluating its travel management policies and direction provided by the Washington Office of the Forest Service. The proposed new travel management direction would identify a system of roads and trails for motorized travel and eliminate cross country motorized travel except on designated routes (see OHV).	Planning
Deschutes and Ochoco Invasive Plant EIS (2010)	Deschutes and Ochoco National Forests are currently preparing an EIS addressing invasive plants on both the Deschutes and Ochoco Forests with completion expected later in 2009 or early 2010.	Planning

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."

State and Local Laws

Implementation of all alternatives would be consistent with State and local laws, land use, and environmental policies.

National Environmental Policy Act (NEPA)

NEPA establishes the format and content requirements of environmental analysis and documentation. The entire process of preparing this environmental assessment was undertaken to comply with NEPA.

National Forest Management Act (NFMA)

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. Table 3-85 briefly identifies the applicable standards and guidelines and how the alternatives are consistent. If the alternatives are not consistent with the standards and guidelines, a brief description of the needed Forest Plan amendment is included. In addition, the requirements at United States Code 1604(g)(3) were reviewed and the proposed activities are consistent.

Alternative 1 is the no action alternative and is not included in Table 3-85 because no management activities would occur.

All of the action alternatives are consistent with long-term management objectives as discussed in the Forest Plan as amended. However, alternative 2 would require an amendment. The amendment is briefly discussed in the alternative description in Chapter 2 and in Table 3-85.

Forest Plan Amendment

The Forest Plan (p. 4-251) states that vegetative management (except livestock use) will not be allowed within MA-F6 Old Growth, until further research is available on the needs of the dependent species. Alternative 2 includes commercial thinning, precommercial thinning, hand piling, and underburning in the Beaverdam, Bear, and Sugar Creek OGMAs. These activities are proposed to improve the longevity of large ponderosa pine on south and west facing slopes. The activities are consistent with the emphasis for the OGMA, which is to provide habitat for wildlife species dependent on old growth stands. A Forest Plan amendment is needed because the activities are not consistent with the standard and guideline that indicates vegetative management is not allowed.

Timing – The Forest Plan has been in effect since 1989. This amendment is occurring during the second decade of the plan period and is less likely to be significant. The proposed activities are expected to be implemented within the next 5-7 years.

Location and Size – The project area contains three OGMAs. Alternative 2 includes activities on 557 acres out of 814 within OGMAs; commercial thinning would take place on 66 acres. The proposed activities would maintain existing large trees.

Goals, Objectives, and Outputs – 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 any of the action alternatives because of the low number of acres being treated and the objectives of maintaining large trees.

Management Prescription – The amendment applies only to this project and would not apply to future decisions. 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 would be treated and options for future management would be maintained.

Table 3-85 Applicable Forest Plan Direction.

Forest Plan	Alternative 2	Alternative 3
MA-F1 Black Canyon Wilderness. The project boundary includes about seven acres of the Black Canyon Wilderness. Use is managed to maintain a natural setting and preserve solitude.	No activities are proposed in the wilderness. Adjacent activities include precommercial thinning and underburning to create a shaded fuel break along the Summit Historic Trail; these activities would not affect the natural setting of the Black Canyon Wilderness.	No activities are proposed in the wilderness. Adjacent activities include precommercial thinning and underburning to create a shaded fuel break along the Summit Historic Trail; these activities would not affect the natural setting of the Black Canyon Wilderness.
MA-F6 Old Growth Areas. Vegetative management will not be allowed until further research is available on the needs of the dependent species (Forest Plan. P. 4-251). Three allocated old growth areas are located within the project area.	A total of 557 acres of vegetation management activites, including 66 acres of commercial thinning, are proposed in the three Old Growth Management Areas. Implementation of Alternative 2 would require a Forest Plan amendment.	No activities proposed in Old Growth Management Areas.
MA-F7 Summit Historic Trail. Vegetation may appear manipulated in widely dispersed areas in order to enhance cultural and recreational resources, but will generally not dominate the landscape.	A total of 476 acres of vegetation management activities would take place along the Summit Historic Trail. The intent of the treatments is to reduce the risk that wildfire would affect the trail's historic value.	Same as Alternative 2.
MA-F12 Eagle Roosting Area. Provide winter roosting habitat for migrating bald eagles from December through April.	Harvest and associated treatments would occur on approximately 75 acres. Selected merchantable trees less than 21 inches in diameter would be cut and removed. Precommercial thinning with associated prescribed fire would occur on an additional 84 acres. Thinning treatments would reduce understory conifer stocking and improve large tree vigor. Prescribed fire would reduce accumulated and harvest-related ground fuels. Reduced stand density and prescribed fire would reduce the potential for high intensity fire thus reducing long-term risk. Outside of the designated eagle roosting areas, both action alternatives propose similar treatments in other suitable and potential roosting areas that will help maintain large tree roosting opportunities.	Harvest and associated treatments would occur on approximately 65 acres. Selected merchantable trees less than 21 inches in diameter would be cut and removed. Precommercial thinning with associated prescribed fire would occur on an additional 94 acres. Effects of activities would be as described for Alt. 2.

Forest Plan	Alternative 2	Alternative 3
MA-F13 Developed Recreation. 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). The project area includes 57 acres within the developed recreation management area in the Wiley Flat and Elkhorn campgrounds. Direction for developed campgrounds specifies management of ponderosa pine stands to encourage large trees and open park-like stands.	Commercial thinning, precommercial thinning and prescribed fire would occur in and around the campgrounds; commercial thinning with associated activities would take place on about 1 acre; precommercial thinning without commercial thinning would take place on about 2 acres. The campgrounds would be lightly thinned while maintaining cover and screening. Created slash would be treated by hand-piling concentrations and underburning. The fire prescription would seek to reduce scorching of residual trees and shrubs. Shrub cover would be revitalized due to a more open canopy and stimulated sprouting following prescribed burning. Fewer large trees would die as a result of competition stress reducing potential hazard trees in a developed recreation site and reducing potential for high intensity fire.	Same as Alternative 2.
MA-F14 Dispersed Recreation. Provide and maintain a near-natural setting for people to utilize while pursuing outdoor recreation experiences (Forest Plan, p. 4-72). The project area includes 51 sites that were identified as dispersed recreation sites.	Commercial thinning, precommercial thinning and fuel treatments are designed to improve forest health, stand vigor and reduce fuels hazards. Hazard trees would be removed. Evidence of activities will be noticeable during and immediately following implementation. Activities would be designed to avoid equipment use on camping sites.	Same as Alternative 2.
MA-F20 Winter Range. Manage for big game winter range habitat (Forest Plan, p. 4-82).	Activities in Winter Range would include about 34 acres of commercial thinning with associated activities, 622 acres of underburning not associated with other activities, 706 acres of juniper removal with underburning, and 173 acres of precommercial thinning with underburning. HEI would not change in Winter Range. HEI would meet standards established in the Forest Plan.	Activities in Winter Range would include about 29 acres of commercial thinning with associated activities, 597 acres of underburning not associated with other activities, 730 acres of juniper removal with underburning, and 176 acres of precommercial thinning with underburning. HEI would not change in Winter Range. HEI would meet standards established in the Forest Plan.
MA-F21 General Forest Winter Range. Manage for timber production with management activities designed and implemented to recognize big game habitat needs (Forest Plan, p. 4-84).	Activities in General Forest Winter Range would include about 22 acres of hardwood treatments, 858 acres of commercial thinning with associated activities, 1078 acres of underburning not associated with other activities, 1234 acres of juniper removal with underburning, and 1988 acres of precommercial thinning with underburning. HEI would be reduced in General Forest Winter Range. HEI would meet standards established in the Forest Plan.	Activities in General Forest Winter Range would include about 20 acres of hardwood treatments, 745 acres of commercial thinning with associated activities, 1080 acres of underburning not associated with other activities, 1234 acres of juniper removal with underburning, and 2077 acres of precommercial thinning with underburning. HEI would be reduced in General Forest Winter Range. HEI would meet standards established in the Forest Plan.
MA-F22 General Forest. 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).	Activities in General Forest would include about 1237 acres of commercial thinning with associated activities, 2006 acres of underburning not associated with other activities, 989 acres of natural fuels treatments, 302 acres of juniper removal with underburning, and 3622 acres of precommercial thinning with underburning. HEI would be reduced in General Forest. HEI would fall below standards established in the Forest Plan in the short term.	Activities in General Forest Winter Range would include 1109 acres of commercial thinning with associated activities, 1969 acres of underburning not associated with other activities, 989 acres of natural fuels treatments, 285 acres of juniper removal with underburning, and 3748 acres of precommercial thinning with underburning. HEI would not change in General Forest. HEI would meet standards established in the Forest Plan.

Forest Plan	Alternative 2	Alternative 3
MA-F26 Visual Management Corridors. 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 (Forest Plan, p. 4-95). The project area includes approximately 1,491 acres in visual management corridors along Road 16. The visual quality objective is partial retention.	Proposes commercial thinning on 343 acres, precommercial thinning on 4289 acres, juniper removal on 29 acres, and underburning on 286 acres within the visual management corridor. Thinning treatments would promote development of open park-like stands dominated by ponderosa pine, reduce dwarf mistletoe infected trees, maintain the presence of western larch and remove conifers from aspen stands located in the corridors. Prescribed fire and grapple piling would reduce ground fuels. Stands located in riparian areas would have higher residual stocking.	Proposes commercial harvest on 195 acres, precommercial thinning on 366 acres, juniper removal on 29 acres, and underburning on 286 acres within the visual management corridor. Prescribed treatments have the same objective as Alternative 2 and would have similar results.
Forest-wide. Protect active bird of prey nests from human disturbance until nesting, feeding, and fledgling are completed. Nesting areas are divided into primary and secondary zones. In the primary zone, maintain the present habitat characteristics (Forest Plan, pp. 4-248-249).	A primary buffer of 330 feet will be flagged around each nest site and a seasonal restriction (March 1 to August 1), within 660 feet of active raptor nests, would be implemented. No commercial harvest would occur within primary buffers for known nests. 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. Waivers would only be valid for the year in which they are granted.	Same as Alternative 2.
Forest-wide. Protect active and historic goshawk nest sites. Seasonal restrictions will be required for activities near sites that may disturb or harass pair while brooding and nesting (Eastside Screens, App. B, p. 13).	400-acre post fledgling areas have been identified around known nest sites. Harvest activities within post-fledgling areas will not remove late and old structure trees or snags, except those deemed to be a safety concern. Seasonal restrictions would be employed for disturbance activities from March 1 to August 31 of each year (within ½ mile nest site for habitat modifying activities, or ¼ mile for disturbance only activities). Post-treatment monitoring would be conducted to determine if objectives were met, and to verify continued occupancy and reproduction in mapped goshawk territories.	Same as Alternative 2.
TM-1b. Prohibit timber harvest in RHCAs except to acquire desired vegetation characteristics where needed to attain Riparian Management Objectives. Apply silvicultural practices in a manner that does not retard attainment of Riparian Management Objectives and that avoids adverse effects on inland native fish (INFISH, p. A-7).	220 acres of commercial harvest is proposed in portions of RHCAs. Conifer thinning would stimulate growth of remaining trees, reduce the risk of mortality, develop future large wood sources and improve long term shade development. A small amount of sediment may occur but not be measurable in the short term if a rain event occurs immediately following treatment; fish can move to another part of the stream if disturbed; remaining vegetation and duff would filter sediment; long term sedimentation would be reduced, and long-term improvement in shade and recruitment of large wood is expected.	Includes 14 acres of commercial harvest in portions of RHCAs in the same drainages as Alternative 2 Results are the same for treated RHCAs.

Forest Plan	Alternative 2	Alternative 3
FM-1 Design fuel treatment so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to long-term ecosystem functions or inland native fish (INFISH, P. A-111).	This alternative proposes underburning within RHCAs. No intentional ignition would occur within 100 feet of channel. Streamside vegetation and large wood would be retained to filter sediment. A small amount of sediment may occur in the short term if a rain event occurs immediately following treatment. Remaining vegetation and duff provide sediment filter. Fire use would stimulate growth of ground vegetation. Long term sedimentation would be reduced.	This alternative proposes underburning within RHCAs. Objectives and effects of prescribed burn would be the same as Alternative 2.
FM-4 Design prescribed burn projects and prescriptions to contribute to the attainment of Riparian Management Objectives. *Short term effects must not be great enough to jeopardize the RMOs, avoidance of all short-term effects should not be allowed to preclude management changes or restoration actions necessary for the long-term recovery of habitats and/or populations. (USDA 1995 letter)	The proposed action would reduce fuel loading to approximate historic levels and maintain or enhance the growth of riparian hardwood species by reducing competition from conifers. Fire use would be prescribed to retain large down wood.	Same as in Alternative 2.
Forest Wide. Snag and down wood log levels to be maintained are described in the Regional Forester's Forest Plan Amendment No. 2.	Dead trees and down wood would not be included in commercial timber sales. Due to requirements to cut hazardous trees snags levels would be reduced in harvest units and along haul routes. A small amount of snag recruitment is expected where prescribed fire is used. Overall, continued mortality is expected in both treated units and untreated units although recruitment will decrease in thinned units.	Same as in Alternative 2.
Pileated Woodpeckers The Forest Plan indicates that the allocated Old Growth Management Areas are intended to provide reproductive habitat for pileated woodpeckers. Maintain a minimum average of two hard snags per acre, greater than or equal to 10 inches DBH in designated feeding areas.	No snags would be cut except where required to meet safety standards.	No treatments are proposed within the Old Growth Management Areas.
Equivalent Harvest Area. Current Forest Plan threshold of EHA is 35 in all watersheds in the project area.	All of the EHA values are below the 25 EHA low risk value. The highest EHA values in the fifth order watersheds range from 10.1-15.3. These are found in 2012 after the 3 years of harvest has been completed. The sixth order watersheds also show values below the 25% low risk EHA threshold values. The highest values seen are 2012 for Lower Beaver 10.3 and in 2013 for Upper Beaver 13.6. These low EHA values indicate that there will be low risk to increased stream bank instability and water quality from the management activities proposed.	All of the EHA values are below the 25 EHA low risk threshold value in both the fifth order and sixth order watersheds. The highest EHA values in the fifth order watershed range from 11.6-15.9 while in the sixth order watershed they range from 12.6-13.5. These low EHA values indicate that there will be low risk to stream bank stability and water quality from the management activities proposed.
FW-1. Design and implement fish and wildlife habitat restoration and enhancement actions in a manner that contributes to attainment of the Riparian Management Objectives.	Restoration of aspen stands, maintenance and improvement of riparian shrub cover, long term development of large trees, and channel restoration are expected to improve riparian conditions.	Same as Alternative 2.

Forest Plan	Alternative 2	Alternative 3
Forest-wide. Project activities will be planned to reduce soil compaction and displacement to the lowest reasonable level. Strive to reduce compaction and displacement of the total activity area to get as close to 90 percent of the activity area in a noncompacted/nondisplaced condition. The minimum will be 80 percent (Forest Plan, P. 4-196).	Unit specific mitigations to reduce compaction and displacement have been identified. These include design of logging system, avoidance of specific areas, and restoration where needed. See Appendix 2 for unit specific soil disturbance projections and expected tillage needs.	Unit specific mitigations to reduce compaction and displacement have been identified. These include design of logging system, avoidance of specific areas, restoration where needed. See Appendix 2 for unit specific soil disturbance projections and expected tillage needs.
Forest-wide. Maintain viable populations or all threatened, endangered, and sensitive plant and animal species (Forest Plan, P. 4-120).	A Biological Evaluation has been prepared for the project. This project will have no effect to endangered species, and may affect, but not likely to adversely affect threatened species. This alternative may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to any populations of sensitive species.	Same as Alternative 2.
Forest-wide. Protect fragile sites such as shallow soil areas (scablands) and natural meadows (Forest Plan, p. 4-121).	Design elements were incorporated into the project to protect fragile sites. Ground based equipment would be restricted in scablands, meadows, and RHCAs, with the exception of building new or temporary roads.	Design elements were incorporated into the project to protect fragile sites. Ground based equipment would be restricted in scablands, meadows, and RHCAs. No new or temporary roads would be built in RHCAs or scablands.
Forest-wide. Prevention of invasive plant introduction, establishment, and spread will be addressed in fuels and vegetation management plans (2005 ROD for Preventing and Managing Invasive Plants, Standard 1).	Prevention measures have been developed and incorporated as design elements in Chapter 2.	Same as Alternative 2.

National Historic Preservation Act

A cultural resource inventory has been completed for the Upper Beaver project. Activities in Alternative 2 have been designed to protect known archaeological sites through design modification and avoidance. Applying design criteria (see Chapter 2) would result in treating fewer overall acres. Alternative 2 would have a "Historic Properties Avoided" determination under the terms and conditions of the 2004 Programmatic Agreement among the USFS Region 6, ACHP and SHPO, Stipulation III (B) 2. This does not require a 30-day consultation period with the Oregon SHPO but a review and approval by the Forest Archaeologist.

Like Alternative 2, proposed activities in Alternative 3 would have a "Historic Properties Avoided" determination under the terms of the 2004 Programmatic Agreement among the USFS Region 6, ACHP and SHPO, Stipulation III (B) 2. This also does not require a 30-day review period with the Oregon SHPO. Potential conflicts would be resolved by applying heritage design criteria to avoid the qualities which make these sites eligible. In some cases units or treatments may be modified during layout to meet heritage objectives.

During implementation, the district archaeologist would coordinate with various specialists to achieve heritage objectives and apply the heritage design criteria. For both Alternative 2 and 3, cultural resource management would result in treating fewer acres in order to protect and avoid historic properties. The cultural resource report will be completed and reviewed by the Forest Archaeologist by September 30, 2009.

Range of Finding(s) of Effect for EIS alternatives:

Alternative 1 - No Action - No Historic Properties Affected, Stipulation III (B) 1.

Alternative 2 – "Historic Properties Avoided" determination, Stipulation III (B) 2 with approval from the Forest Archaeologist.

Alternative 3 – "Historic Properties Avoided" determination, Stipulation III (B) 2 with approval from the Forest Archaeologist.

The Forest has notified interested Tribes and persons. Letters describing the proposal were sent to the Confederated Tribes of the Warm Springs Reservation, Confederated Tribes of the Umatilla Reservation, Burns Paiute Tribe and The Klamath Tribe in April of 2008. Proposal letters were also sent to the Archaeological Society of Central Oregon (ASCO). No responses or comments were received from the neighboring Tribes or ASCO. The Forest Specialist certified that this project would comply with Section 106 of the National Historic Preservation Act under the terms and conditions of the 2004 Programmatic Agreement for the State of Oregon.

US Fish and Wildlife Service and NOAA Fisheries

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 were, and continue to be, no Lynx Analysis Unit's 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 Upper Beaver project area.

Clean Water Act

The alterantives would comply with the Clean Water Act, as amended. This Act establishes a non-degradation policy for all federally proposed projects. The alternatives meet 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 Shotgun and Wildcat 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 non-commercial thinning activities were designed so that they do not reduce shade. 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.

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.

Civil Rights and Environmental Justice

Civil Rights legislations, especially the Civil Rights Act (CR) of 1964, Title VI, prohibits 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 (EJ), 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. EJ focuses on minority, low income groups, and subsistence lifestyles (including Indian Tribes). The purpose of involving these groups (EJ) and analyzing the effects upon them is to determine whether adverse civil rights impacts (CR) are anticipated, or whether disparate or disproportionate impacts associated with the alternatives is anticipated on any of these groups (CR/EJ).

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. In fact the vegetation treatments in Alternatives 2 and 3, will provide for easier access to firewood (landing/harvest units) which should positively effect 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, PCT, reforestation and animal damage control, millwork, etc., will have positive effects on the categories of individuals and population groups these laws and regulations are intended to protect. In addition alternatives 2 and 3 will 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 be ample access throughout the project area. The actions in Alternatives 2 and 3 will not have any measurable impacts on Tribal interest. The project is not located in a minority community nor would it affect residents of low or moderate income. Any impacts will not affect any specific subset of the American population at a disproportionately higher rate than others.

In addition, 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. See also socioeconomic report.

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). For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics. Actions under Alternatives 2 and 3 would be implemented using design criteria that protect **soil productivity**. Any decrease in long-term soil productivity resulting from actions would be negligible.

As provided for by the Forest Plan, minimum management requirements guide implementation of the action alternatives. Adherence to these requirements ensures that long-term productivity of the land is not impaired by short-term uses. Monitoring specified in this EIS and the Forest Plan validates that the management requirements and mitigation are effective in protecting long-term productivity.

Unavoidable Adverse Effects

The following is a description of adverse effects that are unavoidable with implementation of action alternatives. For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics.

- **Wildlife habitat** for certain species would be adversely affected to varying levels with implementation of the action alternatives. The wildlife section of Chapter 3 of this EIS discloses those effects.
- **Air quality** would be adversely affected on a temporary/seasonal basis as a result of proposed prescribed burning and dust from roads and activities.
- **Scenic quality** would be affected adversely for some observers by the various levels of vegetation treatment and other actions proposed.
- **Fire/fuels hazard** would be increased in the next five to ten years in some areas as a result of slash created by vegetation treatment. With proposed disposal treatments, this hazard would be reduced or eliminated. There exists a higher potential for catastrophic wildfire under Alternative A versus the action alternatives.
- **Soils** could be eroded where vegetation and soils are disturbed. Compaction could occur where vehicles and equipment are used. Adherence to site-specific design criteria would minimize this effect.
- **Heritage resources** could be disturbed or destroyed where human or natural activities take place.

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. For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics.

There are no **irreversible commitments** of resources associated with any of the alternatives analyzed.

Irretrievable commitments of resources include the following:

- **Soil productivity** and **timber productivity** would be lost where road construction is planned under Alternatives B and C (about 5.66 miles).

CHAPTER 4. CONSULTATION AND COORDINATION

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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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APPENDIX 1 – PROPOSED UNITS AND ACTIVITIES

Table A1-1. Units and activities proposed in Alternative 2.

Unit	Acres	Rx 1	Rx 2	Rx 3	Rx 4	Logging System	Description
1	23.2	HTH	PCT	UB		T	Conifer thin and underburn around hardwoods
2	86.8	HTH	PCT	UB		T	Variable density/old growth Rx
2	19.6		PCT	UB			Conifer thin and underburn around alder/willow
2	8.7			UB			
3	73.0	HTH	PCT	UB		T	
4	40.2		PCT	UB			
5	7.8	HTH	PCT	UB		T	
6	23.1	HTH	PCT	UB		T	
6	3.5		PCT	UB			
8	111.4	HTH	PCT	UB		T	
9	19.6	HTH	PCT	UB		T	
10	37.0	HTH	PCT	UB		T	Conifer thin and underburn around aspen; fence for cattle
11	112.3		PCT	UB			
13	37.8	HTH	PCT	UB		T	
14	46.5	HTH	PCT	GP	UB	T	
15	26.8	HTH	PCT	GP	UB	T	
16	187.7	HTH	PCT	UB		T	Variable density/PFA Rx
16	75.2			UB			
17	40.7		PCT	HP			
18	12.6	HTH	PCT	UB		T	
19	39.6	HTH	PCT	UB		T	
20	118.5	HTH	PCT	UB		T	
20	11.0		PCT	UB			
21	126.1	HTH	PCT	UB		T	
21	25.0			UB			
22	97.3	HTH	PCT	UB		T	
22	26.4		PCT	UB			
24	6.0	HTH	PCT	GP	UB	T	
24	189.1	HTH	PCT	GP	UB	T	
25	34.7		PCT	UB			
25	21.0	HTH	PCT	UB		T	
26	32.4			UB			
27	134.4	HTH	PCT	UB		T	
28	57.3	HTH	PCT	UB		T	
29	13.6	HTH	PCT	UB		T	
30	19.3	HTH	PCT	UB		T	
31	12.5	HTH	PCT	UB		T	
32	57.2	HTH	PCT	UB		T	

Unit	Acres	Rx 1	Rx 2	Rx 3	Rx 4	Logging System	Description
33	42.0	HTH	PCT	GP	UB	T	
33	40.4		PCT	GP	UB		
35	28.7	HTH	PCT	UB		T	
36	13.3	HTH	PCT	UB		T	
37	11.2		PCT	GP	UB		
38	29.9	HTH	PCT	UB		T	
39	8.6	HTH	PCT	UB		T	
40	12.8	HTH	PCT	UB		T	
41	8.4	HTH	PCT	UB		T	
42	16.5	HTH	PCT	UB		T	
43	10.3	HTH	PCT	UB		T	
44	22.5	HTH	PCT	UB		T	
44	4.4		PCT	UB			
45	7.3		PCT	HP	UB		PCT for hardwood release - cottonwoods
46	14.4	HTH	PCT	HP		T	
48	31.5	HTH	PCT	UB		T	
49	26.2	HTH	PCT	UB		T	
50	72.0	HTH	PCT	UB		T	
50	1.9		PCT	UB			
51	66.2	HTH	PCT	GP	UB	T	Build exclosure around existing willow and aspen
53	9.0	HTH	PCT	UB		T	
53	1.7		PCT	UB			
54	32.0	HTH	PCT	UB		T	
55	76.6	HTH	PCT	UB		T	
56	21.3	HTH	PCT	UB		T	
56	13.7			UB			
57	6.2	HTH	PCT	UB		T	
58	25.6	HTH	PCT	GP	UB	T	
59	49.8	HTH	PCT	GP	UB	T	
61	28.1		PCT	UB			
63	23.7			UB			
64	41.7	HTH	PCT	UB		T	
65	102.7	HTH	PCT	GP	UB	T	
67	309.3		PCT	HP			Summit Trail Fuel Break
68	55.5			UB			
69	130.5		PCT	UB			PCT individual trees up to 16"
70	43.4		PCT	UB			PCT individual trees up to 16"
71	45.6		PCT	UB			PCT individual trees up to 16"
72	7.2			UB			
75	104.6			UB			
76	95.1			UB			
77	4.3			UB			
78	6.9			UB			
79	174.5			UB			
81	175.8			UB			

Unit	Acres	Rx 1	Rx 2	Rx 3	Rx 4	Logging System	Description
82	131.5			UB			
84	79.1			UB			
86	68.6			UB			
89	126.2			UB			
90	310.1			UB			
91	23.8			UB			
92	28.1			UB			
93	22.1		PCT	UB			
95	12.0			UB			
96	15.3		PCT	UB			
97	4.9			UB			
98	37.5		PCT	UB			
99	50.6			UB			
100	39.7			UB			
102	13.3			UB			
103	20.9			UB			
104	110.7			UB			
105	115.9			UB			
106	45.6			UB			
107	31.2			UB			
108	33.0			UB			
109	112.8			UB			
112	12.1			UB			
113	300.6			UB			
114	137.4			UB			
115	5.6			UB			
117	173.2			UB			
118	7.3		PCT	UB			
119	45.4			UB			
120	63.0			UB			
121	18.4			UB			
122	214.3			UB			
123	13.2			UB			
124	4.1			UB			
126	18.1			UB			
131	172.4			UB			
132	6.2			UB			
133	21.4		PCT	UB			
134	26.2			UB			
135	34.1			UB			
139	158.2			UB			
140	100.6			UB			
143	48.6			UB			
145	36.0			UB			
146	6.0			UB			
147	46.5			UB			

Unit	Acres	Rx 1	Rx 2	Rx 3	Rx 4	Logging System	Description
151	7.8			UB			
152	10.4			UB			
153	50.9			UB			
154	114.9	HTH	PCT	UB		T	
155	8.8			UB			
156	120.7			UB			
157	6.8			UB			
158	5.0			UB			
159	36.9			UB			
161	29.7			UB			
162	291.6			NAT			
163	491.3			NAT			
164	7.3			NAT			
165	1.3			NAT			
166	6.7			NAT			
167	0.5			NAT			
168	0.5			NAT			
169	1.1			NAT			
170	7.3			NAT			
171	6.9			NAT			
172	22.6			NAT			
173	20.8			NAT			
174	2.4			NAT			
175	19.3			NAT			
176	10.9			NAT			
177	1.0			NAT			
178	4.3			NAT			
179	19.8			NAT			
181	11.1			NAT			
182	1.8			NAT			
184	109.6			NAT			
185	7.4			NAT			
186	23.6		PCT				
187	18.3		PCT				
188	10.2		PCT				
189	16.6		PCT				
190	10.0		PCT				
191	9.1		PCT	UB			
192	12.7		PCT				
193	19.4		PCT	UB			
194	5.1		PCT				
195	4.8		PCT				
196	10.7		PCT				
197	5.7		PCT				
198	17.7		PCT				
199	23.4		PCT				

Unit	Acres	Rx 1	Rx 2	Rx 3	Rx 4	Logging System	Description
200	11.6		PCT				
201	8.5		PCT				
202	59.7		PCT				
203	15.4		PCT				
204	44.2		PCT				
205	17.9		PCT				
206	37.5		PCT				
207	25.8		PCT				
208	21.1		PCT				
209	13.2		PCT				
210	6.2		PCT				
211	17.6		PCT				
212	7.9		PCT	UB			
213	15.8		PCT				
214	38.7		PCT				
215	8.2		PCT				
216	6.3		PCT				
217	20.9		PCT				
218	5.4		PCT				
219	17.9		PCT				
220	30.9		PCT				
221	15.5		PCT	UB			
222	10.9		PCT	UB			
223	57.1		PCT	UB			
224	54.1		PCT	UB			
225	27.4		PCT	UB			
226	83.9		PCT	UB			
227	23.6		PCT	GP	UB		
228	31.5		PCT	GP	UB		
229	52.1		PCT	GP	UB		
230	18.2		PCT	UB			
231	21.0		PCT	UB			
232	67.6		PCT	GP	UB		
233	19.4		PCT	UB			
234	32.8	HTH	PCT	UB		T	
234	17.1		PCT	UB			
235	43.7		PCT	UB			
236	31.5		PCT	UB			
237	45.6		PCT	UB			
238	13.9		PCT	UB			
239	32.3		PCT	UB			
240	25.8		PCT	UB			
241	63.2		PCT	GP	UB		
242	43.6		PCT	UB			
243	50.2		PCT	UB			
244	16.3		PCT	UB			

Unit	Acres	Rx 1	Rx 2	Rx 3	Rx 4	Logging System	Description
245	177.4		PCT	UB			
246	38.5	HTH	PCT	UB		T	
247	110.1		PCT	UB			
248	9.7		PCT	GP	UB		
249	180.9		PCT	UB			
250	42.7		PCT	UB			
251	6.1		PCT	GP	UB		
252	50.6		PCT	GP	UB		
253	42.0		PCT	GP	UB		
254	102.2		PCT	GP	UB		
255	9.4		PCT	UB			
256	8.6		PCT	UB			
257	102.4		PCT	UB			
258	73.5		PCT	UB			
259	32.7		PCT	UB			
260	18.4		PCT	UB			
261	129.9		PCT	UB			
262	20.6		PCT	UB			
263	17.3		PCT	UB			
264	93.2		PCT	UB			
265	44.9		PCT	GP	UB		
266	37.3		PCT	UB			
267	80.1		PCT	UB			
268	11.2		PCT	GP	UB		
269	56.0		PCT	UB			
270	40.9		PCT	UB			
271	68.8	HTH	PCT	UB		T	
272	25.7		PCT	UB			
273	46.0		PCT	GP	UB		
274	24.6		PCT	GP	UB		
275	78.3		PCT	UB			
276	25.4		PCT	UB			
277	14.0		PCT	UB			
278	28.3		PCT	UB			
279	55.7		PCT	UB			
280	32.0		PCT	UB			
281	9.5		PCT				
282	108.5		PCT	UB			
283	56.0		PCT	UB			
284	84.4		PCT	UB			
285	49.6		PCT	UB			
286	28.4		PCT	UB			
287	28.6		PCT	UB			
288	63.3		PCT	UB			
289	134.0		PCT	UB			
290	12.4			UB			

Unit	Acres	Rx 1	Rx 2	Rx 3	Rx 4	Logging System	Description
291	35.4		PCT	UB			
292	31.3		PCT				
293	66.5		PCT	UB			
294	18.4		PCT	UB			
295	13.9		PCT	UB			
296	32.5		PCT	GP	UB		
297	120.1		PCT	UB			
298	43.7		PCT	UB			
299	86.3		PCT	UB			
300	34.3		PCT	UB			
301	6.6		PCT	UB			
302	3.3		PCT	UB			
303	37.8	HTH	PCT	UB		T	
304	58.7		PCT	UB			
305	27.8		PCT	UB			
306	66.4		PCT	UB			
307	29.0			UB			
308	18.2		PCT	UB			PCT to 4" dbh to avoid excessive slash
309	80.6			UB			
310	41.0		PCT	UB			
311	26.8		PCT	UB			
312	127.5		PCT	UB			
313	66.2		PCT	UB			
314	232.0		PCT	GP	UB		
315	27.5	HTH	PCT	UB		T	
316	7.3		PCT	GP	UB		
317	184.0		PCT	GP	UB		
318	12.6		PCT	UB			
319	71.2		PCT	GP	UB		
320	82.4		PCT	GP	UB		
321	123.7		PCT	GP	UB		
322	55.7		PCT	GP	UB		
323	16.2		PCT	GP	UB		
324	355.2		JUT	UB			
325	17.2		JUT	UB			
326	98.8		JUT	UB			
327	26.2		JUT	UB			
328	64.9		JUT	UB			
329	35.8		JUT	UB			
330	179.4		JUT	UB			
331	360.1		JUT	UB			
332	93.1		JUT	UB			
333	39.2		JUT	UB			
334	202.4		JUT	UB			
335	32.8		JUT	UB			
336	76.1		JUT	UB			

Unit	Acres	Rx 1	Rx 2	Rx 3	Rx 4	Logging System	Description
337	117.3		JUT	UB			
338	248.1		JUT	UB			
339	142.3		JUT	UB			
340	116.8		JUT	UB			
341	92.5		JUT	UB			
342	4.0		HWD				Conifer thin; plant aspen/willow; individual cages
343	1.6		HWD				Conifer thin; plant aspen/willow; individual cages
344	4.1		HWD				Conifer thin; fence for cattle
345	9.7		HWD				Conifer thin and underburn; fence for cattle
346	5.8		HWD				Plant willow; 1-acre big game exclosure plus individual cages
347	5.9		PCT	UB			Conifer thin and underburn; fence for cattle/big game
348	34.1		HWD				Conifer thin and plant hardwoods; 3 1-acre big game exclosures
349	2.0		HWD				Conifer thin, plant aspen/willow. Individual cages.
350	32.6		PCT	GP	UB		
351	25.3		PCT	GP	UB		
352	34.0			UB			
353	26.9		PCT	UB			
354	25.4		PCT	UB			

APPENDIX 2 – UNIT-BY-UNIT SOIL INFORMATION

Table A2-1. Activity, soil disturbance and mitigation by unit.

Unit	Size (acres)	Alt. 2 Logging System	Alt 3 Logging System	Slopes %1	Existing Soil Disturbance (%)	Tillage Potential	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
1	23	T	T	0 - 15	23	M	2	23	Stay on existing trails. No net increase. Till 1 to 2 acre. Meets standards
2	87	T	NH	5- 30	25	M	4 to 5	21	Stay on existing trails. No net increase. Till 4 to 5 acre. Meets standards
3	73	T	T	5 - 25	25	L	0	25	Stay on existing trails, no net increase over 25%. Meets standard.
5	8	T	T	5 - 15	25	M	1	17	Stay on existing trails, no net increase over 25%. Till 1 acre. Meets standard.
6	27	T	T	10-20	15	L	0	15	Keep disturbance below 20%. Meets standard.
8	111	T	T	5- 15	10	M	0	17	Keep disturbance below 20%. Meets standard.
9	20	T	T	5 - 10	25	M	1 to 2	25	Stay on existing trails, no net increase over 25%. Till 1 acre. Meets standard.
10	37	T	PCT	0 - 10	22	L	0	22	Stay on existing trails, no net increase. Meets standard.
13	38	T	T	0-10	25	L	0	25	Stay on existing trails, no net increase. Meets standard.
14	47	T-GP	T-GP	0-15	25	L	0	25	. Stay on existing trails. No net increase. Meets standard.
15	27	T-GP	T-GP	5-20	24	L	0	24	. Stay on existing trails. . No net increase. Meets standard.
16	263	T	T	5 - 25	25	M	5 to 10	20	Stay on existing trails, no net increase over 25%. Till 5 to 10 acres. Meets standard.
18	13	T	T	5-10	25	M	1	25	Stay on existing trails, no net increase.. Keep disturbance below 25%. Till 1 acre. Meets standard.
19	40	T	T	0 - 10	25	L	0	25	Stay on existing trails, no net increase over 25%. Meets standard.
20	129	T	T	0 - 15	22	L	0	22	Stay on existing trails. No net increase.. Meets standard..
21	151	T	T	5 - 15	23	L	0	23	Stay on existing trails. No net increase. . Meets standard..
22	124	T	NH-PCT	0 - 10	21	M	1 to 2	21	Stay on existing trails. Cross side channels at right angles where needed, use log crossings. Till 1 to 2 acres. No net increase. . Meets standard.
24	195	T-GP	T-GP	5 - 15	15	L	0	15	Keep disturbance below 20%. Meets standard.

Unit	Size (acres)	Alt. 2 Logging System	Alt 3 Logging System	Slopes %1	Existing Soil Disturbance (%)	Tillage Potential	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
25	56	T	T	0 - 15	22	L	0	22	Stay on existing trails. No net increase. . Meets standard.
27	134	T	T	5 - 25	21	M	1 to 2	20	Stay on existing trails. No net increase. Till 1 to 2 acres. Meets standard.
28	57	T	T	5 - 30	25	L	0	25	Stay on existing trails. No net increase. . Meets standard..
29	14	T	T	5 - 10	25	L	0	25	Stay on existing trails. No net increase. . Meets standard..
30	19	T	T	0 - 10	23	L	0	23	Stay on existing trails, no net increase over 20%. Meets standard.
31	13	T	T	0 - 5	25	M	1	20	Stay on existing trails. No net increase. . Meets standard..
32	57	T	NH-PCT	15 - 35	25	L	0	25	Stay on existing trails. No net increase. . Meets standard..
33	90	T-GP	T-GP	0 - 15	22	L	1 to 2	21	Stay on existing trails. No net increase. Till 1 to 2 acres. Meets standard.
35	29	T	T	0 - 35	24	L	0	24	. Stay on existing trails. No net increase. Meets standard.
36	13	T	T	0 - 15	22	L	0	22	Stay on existing trails, no net increase over 22%. Meets standard.
37	11	PCT-GP	PCT-GP	5 - 15	21	L	0	21	Stay on existing trails. No net increase. Meets standard.
38	30	T	T	5 - 25	27	L	0	27	Stay on existing trails. No net increase. Meets standard.
39	9	T	T	5 - 10	22	L	0	22	Stay on existing trails. No net increase. . Meets standard.
40	13	T	NH-PCT	5- 20	25	L	0	25	Stay on existing trails. No net increase. . Meets standard.
41	8	T	T	0 - 5	10	L	0	15	Keep disturbance below 20%. Meets standard.
42	17	T	T	10 - 35	24	L	0	24	Keep disturbance below 24%. No net increase. Meets standard.
43	10	T	T	0 - 5	25	L	0	25	Stay on existing trails. No net increase. . Meets standard.
44	27	T	NH-PCT	5 - 20	23	L	0	23	Stay on existing trails. No net increase. . Meets standard.
45	7	T	NH-PCT	5 - 20	21	M	0	21	Stay on existing trails. No net increase. . Meets standard.
46	14	T	T	0 - 10	40	H	0	40	Stay on existing trails. No net increase. This is an administrative site. Rager Compound. Standard does not apply.
48	32	T	T	5 - 15	25	L	0	25	Stay on existing trails. No net increase over 25 %. . Meets standard.
49	26	T	T						
50	74	T	T	5 - 15	23	L	0	23	Stay on existing trails. No net increase over 25 %. . Meets standard.

Unit	Size (acres)	Alt. 2 Logging System	Alt 3 Logging System	Slopes %1	Existing Soil Disturbance (%)	Tillage Potential	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
51	66	T-GP	T-GP	5 - 10	24	M	2 to 3	20	Stay on existing trails. No net increase over 24 %. . Meets standard
53	11	T	T	5- 15	25	L	0	25	Stay on existing trails. No net increase over 25 %. . Meets standard
54	32	T	T	5- 15	23	L	0	23	Stay on existing trails. No net increase over 23 %. . Meets standard
55	77	T	T	5 - 20	25	L	0	25	Stay on existing trails. No net increase over 25 %. . Meets standard
56	35	T	T	5- 15	25	M	1 to 3	20	Stay on existing trails. No net increase. Till 1 to 3 acres. Meets standard
57	6	T	NH-PCT	0 - 5	23	L	0	23	Stay on existing trails. No net increase over 23 %. . Meets standard
58	26	T	T	0 – 5	25	H	1 to 3	20	Stay on existing trails. No net increase. Till 1 to 2 acres. Meets standard
59	50	T-GP	T-GP	0 - 5	25	H	2 to 4	20	Stay on existing trails. No net increase. Till 1 to 2 acres. Meets standard
61	28	T	NH-PCT						
64	42	T	T	5 - 10	22	L	0	22	Stay on existing trails. No net increase over 22 %. . Meets standard
65	103	T-GP	T-GP	5 - 15	22	L	0	22	Stay on existing trails. No net increase over 22 %. . Meets standard
154	115	T	T	5 - 10	21	L	0	21	Stay on existing trails. No net increase over 21 %. . Meets standard
227	24	PCT-GP	PCT-GP	5 - 15	22	M	0	22	Stay on existing trails. Grapple pile only No net increase over 22 %. . Meets standard
228	32	PCT-GP	PCT-GP	5 - 10	24	L	0	24	Stay on existing trails. Grapple pile only No net increase over 21 %. . Meets standard
229	52	PCT-GP	PCT-GP	5 - 15	21	L	0	21	Stay on existing trails. No net increase over 21 %. . Meets standard
232	68	PCT-GP	PCT-GP	5 - 15	24	L	0	24	Stay on existing trails. Grapple pile only No net increase over 24 %. . Meets standard
234	33	T	T	5 - 10	25	L	0	25	Stay on existing trails. No net increase over 21 %. . Meets standard
241	63	PCT-GP	PCT-GP	5- 15	35	M	0	35	Stay on existing trails. Grapple pile only No net increase over 35 %. . Meets standard
246	39	T	T	5 - 20	25	M	0	25	Stay on existing trails. No net increase over 25 %. . Meets standard

Unit	Size (acres)	Alt. 2 Logging System	Alt 3 Logging System	Slopes %1	Existing Soil Disturbance (%)	Tillage Potential	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
251	6	PCT-GP	PCT-GP	5- 15	22	M	0	22	Stay on existing trails. Grapple pile only No net increase over 22 %. . Meets standard
252	51	PCT-GP	PCT-GP	10 - 25	25	L	0	25	Stay on existing trails. Grapple pile only No net increase over 25 %. . Meets standard
253	42	PCT-GP	PCT-GP	5 - 20	22	L	0	22	Stay on existing trails. Grapple pile only No net increase over 22 %. . Meets standard
254	102	PCT-GP	PCT-GP	5 - 15	23	L	0	23	Stay on existing trails. Grapple pile only No net increase over 23 %. . Meets standard
265	45	PCT-GP	PCT-GP	5- 10	24	M	2 to 3	20	Stay on existing trails. Grapple pile only No net increase. Till 2 to 3 acres. Meets standard
268	11	PCT-GP	PCT-GP	5 - 20	24	L	0	24	Stay on existing trails. Grapple pile only No net increase. . Meets standard
271	69	T	T	5 - 10	25	L	0	25	Stay on existing trails. No net increase over 25 %. . Meets standard
273	46	PCT-GP	PCT-GP	5 - 25	22	L	0	22	Stay on existing trails. Grapple pile only No net increase over 22 %. . Meets standard
274	25	PCT-GP	PCT-GP	5 - 20	21	L	0	21	Stay on existing trails. Grapple pile only No net increase over 21 %. . Meets standard
296	33	PCT-GP	PCT-GP	5- 15	24	L	0	24	Stay on existing trails. Grapple pile only No net increase over 24 %. . Meets standard
314	232	PCT-GP	PCT-GP	5 - 10	21	L	0	21	Stay on existing trails. Grapple pile only No net increase over 21 %. . Meets standard
315	28	T	T	0 -5	25	L	0	25	Stay on existing trails. No net increase over 23 %. . Meets standard
316	7	PCT-GP	PCT-GP	5- 15	24	M	0	24	Stay on existing trails. Grapple pile only No net increase over 24 %. . Meets standard
317	184	PCT-GP	PCT-GP	5- 20	25	L	0	25	Stay on existing trails. Grapple pile only No net increase over 24 %. . Meets standard
319	71	PCT-GP	PCT-GP	5 - 15	25	L	0	25	Stay on existing trails. Grapple pile only. No net increase over 25 %. . Meets standard
320	82	PCT-GP	PCT-GP	5 - 40	21	L	0	21	Stay on existing trails. Grapple pile only No net increase over 21 %. . Meets standard
321	124	PCT-GP	PCT-GP	5 - 40	21	L	0	21	Stay on existing trails. Grapple pile only No net increase over 21 %. . Meets standard.
322	56	PCT-GP	PCT-GP	5 - 20	24	H	0	24	Stay on existing trails.. No net increase. Meets standard
323	16	PCT-GP	PCT-GP	5 to 10	23	L	0	23	Stay on existing trails. Grapple pile only No net increase over 23 %. . Meets standard.

Unit	Size (acres)	Alt. 2 Logging System	Alt 3 Logging System	Slopes %1	Existing Soil Disturbance (%)	Tillage Potential	Tillage Estimate (acres)	Post Activity Soil Disturbance (%)	Unit-specific Analysis
350	33	PCT-GP	PCT-GP	5 to 10	24	L	0	24	Stay on existing trails. Grapple pile only No net increase over 24 %. . Meets standard.
351	25	PCT-GP	PCT-GP	5 to 20	30	L	0	30	Stay on existing trails. Grapple pile only No net increase over 30%. . Meets standard.

Logging System
HSL – Unevenaged Management
HTH – Commercial Thinning
HIM – Improvement Cut
GP – Grapple Pile
M – Mobile Yarder
S – Skyline system
T – Tractor yarding
L-H – Horse logging

Tillage Potential
L – Low (not good candidate for tillage because soil and physical features)
M – Moderate
H – High

APPENDIX 3 – PLANT ASSOCIATION GROUPS

Table A3-1. Plant Associations and Plant Association Groups (PAG) in the Upper Beaver project area.

Species	PAG	Scabland	Acres
Psme/Cage	Dry Doug Fir		1018
Psme/Caru	Dry Doug Fir		1509
Psme/Syal	Dry Doug Fir		508
Psme/Syor	Dry Doug Fir		646
Psme/Shrub Dry	Dry Doug Fir		243
Juoc/Feid-Agsp	Juoc Woodland		1239
Juoc/Low sage	Juniper Steppe	Yes	1345
Juoc/Cele/Feid-Agsp or Cage	Juniper Woodland		110
Juoc/Arri Scab	Juniper Steppe	Yes	5009
Pipo/Agsp	Dry Pine		450
Pipo/Feid	Dry Pine		1731
Pipo/Caru	Moist Pine		178
Pipo/Putr/Cage	Dry Pine		3189
Pipo/Artr	Dry Pine		55
Pipo/Artr/Feid-Agsp	Dry Pine		60
Pipo/Putr/Caro	Dry Pine		30
Pipo/Putr-Feid-Agsp	Dry Pine		220
Pipo/Cele/Cage	Moist Pine		863
Pipo/Cele/Pone	Dry Pine		481
Pipo/Cele/Feid-Agsp	Dry Pine		392
Pipo/Syal	Moist Pine		1422
Pipo/Syor	Dry Pine		474
Abgr/Cage	Dry Abgr		1792
Abgr/Caru	Dry Abgr		3750
Abgr/Brvu	Wet Abgr		24
Agsp-Posa3-Scab	Scabland Grass	Yes	450
Posa3-Daun	Scabland Grass	Yes	91
Potr2/Salix Bottomland	Riparian		1
Quaking Aspen	Hardwood Forest		
Dry Meadow	Meadows		24
Moist Meadow	Meadows		12
Wet Meadow	Meadows		4
Arar/Agsp-Feid+C21	Scabland Shrub	yes	937
Artrv/Feid-Agsp	Upland Shrub		212
Putr/Feid-Agsp	Upland Shrub		4
Arri/Posa3-scab	Scabland Shrub	yes	5812
Arar/Posa3	Scabland Shrub	yes	856
Alpine/subalpine sage	High Elev Shub		5
Artrs/Cage:Alpine	High Elevation Shrub		4
Willow Type	Riparian Shrub		31
Lake, Pond	Riparian		1

APPENDIX 4 – PROJECT AREA MAPS

- Map 1 – Project Vicinity
- Map 2 – Management Areas
- Maps 3a and 3b – Alternative 2 Treatments in RHCAs
- Maps 4a and 4b – Alternative 3 Treatments in RHCAs
- Maps 5a and 5b – Alternative 2 Commercial Thinning
- Maps 6a and 6b – Alternative 2 Non-Commercial Treatments
- Maps 7a and 7b – Alternative 2 Fuels Treatments
- Maps 8a and 8b – Alternative 3 Commercial Thinning
- Maps 9a and 9b – Alternative 3 Non-Commercial Treatments
- Maps 10a and 10b – Alternative 3 Fuels Treatments