United States Department of the Interior

BUREAU OF LAND MANAGEMENT
MEDFORD DISTRICT OFFICE
3040 Biddle Road
Medford, Oregon 97504
email address: or110mb@or.blm.gov

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

1792(OR115)
OR-11505-02

JUL 26 2005

Dear Sir or Madam:

Attached is the recently completed Environmental Assessment (EA) for the Slick Sand Timber Sale and Landscape Restoration Environmental Assessment (EA) #OR-115-05-02. This EA evaluates the Butte Falls Resource Area, Medford District Bureau of Land Management (BLM) proposal for timber harvest on up to 392 acres and restoration projects located in the West Fork Evans Creek Watershed. Proposed treatments include commercial thinning of dense timber stands, individual tree selection, regeneration harvest to establish young conifers, and site preparation activities such as piling and burning or under burning to treat logging slash. Restoration projects include fuels density management, culvert replacement for fish passage, roadside stabilization, pump chance restoration, and road-related projects (e.g., road upgrades, road closures, road decommissioning). The project is within Matrix and Riparian Reserve land use allocations. The timber sale would help meet the Medford District annual sale quantity goals established through the Medford District Resource Management Plan and the Northwest Forest Plan.

This document is available for public review and comment for a period of 30 days. The effective date for the beginning of the comment period will be the date of publication of the notice of the EA availability in the *Medford Mail Tribune*. Notice will also appear in the *Upper Rogue Independent*. However, the date of publication in the *Medford Mail Tribune* will prevail as the effective date for this decision.

As I make my decisions regarding this project, I will consider all pertinent site-specific comments. Most useful comments are those clearly articulating site-specific issues or concerns. Comments received after the 30-day period will not be considered.

If you have questions or comments concerning this project, please contact Jean Williams or John Bergin, at (541)618-2385 or (541)618-2265 respectively. Comments may also be mailed to Bureau of Land Management, 3040 Biddle Road, Medford, OR 97504 or e-mailed to or110mb@or.blm.gov (be sure to include "Attention: Jean Williams").

Any comments received, including names and addresses of respondents, will be available for public review at the Medford District BLM Office; 3040 Biddle Road; Medford, Oregon during regular business hours (8:00 am to 4:30 pm), Monday through Friday. If you wish to withhold your name and address or both from public review or from disclosure under the Freedom of Information Act, you must state this at the beginning of your written comment. Your request will be honored to the extent allowed by law. All submissions from organizations or businesses and from individuals identifying themselves as representatives or officials of organizations or businesses will be made available for public inspection in their entirety.

We appreciate your interest and involvement in this project.

Sincerely,

Karen Gillespie
Acting Field Manager
Butte Falls Resource Area

Attachment – EA (250 pp)

US Department of the Interior
Bureau of Land Management
Medford District
Butte Falls Resource Area

Slick Sand Timber Sale and Landscape Restoration Environmental Assessment

EA Number OR115-05-02

Project Location: T32S, R3W, Sections 30, 31
T32S, R4W, Section 35
T33S, R3W, Sections 5, 7, 8, 9, 17, 18, 19, 20, 21, 29, 31, 33
T33S, R4W, Sections 1, 11, 13, 25

The Butte Falls Resource Area is proposing timber harvest on up to 392 acres located in Upper West Fork Evans Creek 6th field subwatershed. Proposed silviculture treatments are regeneration harvest, selection harvest, density management, and thinning in progeny test sites. Road work associated with the proposed silviculture treatment activities is road renovation and new temporary spur road construction. Landscape restoration projects are fuels density management; culvert replacement for fish passage; roadside stabilization; pump chance renovation; and road improvement, full decommissioning, and partial decommissioning. This project is within Matrix and Riparian Reserve land use allocations. The timber sale would help meet the Medford District annual sale quantity goals established through the Medford District Resource Management Plan and the Northwest Forest Plan.

Karen Gillespie Date
Acting Butte Falls Field Manager

Contents

1.0 Purpose of and Need for Action **1**
1.1 Introduction 1
1.1.1 Proposed Action 1
1.1.2 Description of Project Area 1
1.2 Purpose 2
1.2.1 Objectives 2
1.3 Need 2
1.3.1 Forest Management 5
1.3.2 Restoration 5
1.4 Legal Requirements 6
1.4.1 Conformance with Land Use Plans and Other Documents 6
1.4.2 Relationship to Statutes, Regulations, and Other Plans 7
1.5 Scoping and Identification of Issues 7
1.5.1 Scoping 7
1.5.2 Issues 7
1.5.3 Issues Considered but not Analyzed in Detail 8
1.6 Decisions to be Made 9

2.0 Alternatives **11**
2.1 Introduction 11
2.2 Proposed Projects 11
2.2.1 Forest Management 11
2.3 Description of the Alternatives 14
2.3.1 Alternative 1 - No Action 14
2.3.3 Alternative 3 15
2.3.4 Alternative 4 17
2.4 Project Design Features 18
2.4.1 Wildlife 18
2.4.2 Riparian Reserves 18
2.4.3 Archeology 19
2.4.4 Special Status Plants 19
2.4.5 Noxious Weeds 19
2.4.6 Equipment Use 19
2.4.7 Roads and Quarries 19
2.4.8 Fuel Hazard Reduction 20
2.4.9 Timber Harvest 20

3.0 Affected Environment **31**
3.1 Introduction 31
3.1.1 Land Use Allocations and Restrictions 31
3.2 A Picture of the Watershed containing the Proposed Project 32
3.3 Forest Condition 35
3.3.1 Methodology 35
3.3.2 Assumptions 35
3.3.3 Affected Environment 35
3.3.4 Environmental Consequences 38
3.4 Soil 49
3.4.1 Methodology 49
3.4.2 Assumptions 49
3.4.3 Affected Environment 49
3.4.4 Environmental Consequences 52
3.5 Hydrology 58
3.5.1 Methodology 58
3.5.2 Assumptions 58
3.5.3 Affected Environment 58
3.5.4 Environmental Consequences 63
3.6 Riparian Reserves, Fisheries, and Aquatic Habitat 69

3.6.1 Methodology . . . 69
3.6.2 Assumptions . . . 69
3.6.3 Affected Environment . . . 69
3.6.4 Environmental Consequences . . . 75
3.7 Fuels . . . 85
3.7.1 Methodology . . . 85
3.7.2 Assumptions . . . 85
3.7.3 Affected Environment . . . 85
3.7.4 Environmental Consequences . . . 90
3.8 Wildlife . . . 98
3.8.1 Methodology . . . 98
3.8.2 Assumptions . . . 99
3.8.3 Affected Environment . . . 99
3.8.4 Environmental Consequences . . . 103
3.9 Summary of Effects on Other Resources . . . 109
3.9.1 Introduction . . . 109
3.9.2 Effects of Alternatives on Air Quality . . . 110
3.9.3 Effects of Alternatives on Botany . . . 110
3.9.4 Effects of Alternatives on Noxious Weeds . . . 110
3.9.5 Effects of Alternatives on Cultural Resources . . . 111
3.9.6 Effects of Alternatives on Economics . . . 111
3.10 Environmental Justice . . . 111
3.11 Relationship between Short-Term Uses and Long-Term Productivity . . . 111
3.12 Unavoidable, Irreversible, and Irretrievable Effects . . . 112

4.0 List of Preparers . . . 112

Appendices . . . 121
Appendix A - Silvicultural Prescriptions . . . 123
Appendix B - Soil . . . 151
Appendix C - Fuels and Air Quality . . . 159
Appendix D - Wildlife . . . 165
Appendix E - Botany . . . 187
Appendix F - Noxious Weeds . . . 199
Appendix G - Cultural Resources . . . 203
Appendix H - Economics . . . 205

1.0 Purpose of and Need for Action

Chapter 1 provides an introduction to the Environmental Assessment (EA) for the proposed Slick Sand Timber Sale and Landscape Restoration Project. The proposed action is summarized and the project area is defined. Project objectives are listed and the need for this proposal is outlined.

1.1 Introduction

This EA will analyze the impacts of proposed forest management and restoration activities on the human environment in the Upper West Fork Evans Creek 6th Field subwatershed. The EA will provide the decisionmaker, the Butte Falls Field Manager, with current information to aid in the decisionmaking process. It will also determine if impacts are significant and whether an Environmental Impact Statement is needed or if a Finding of No Significant Impact is appropriate.

1.1.1 Proposed Action

The Butte Falls Resource Area, Medford District Bureau of Land Management (BLM), proposes to implement forest management activities and restoration projects within the Upper West Fork Evans Creek 6th Field subwatershed. Proposed forest management activities are regeneration harvest to reestablish young conifer stands; individual tree selection; commercial thinning of dense timber stands; progeny test site renovation; and site preparation or slash disposal activities, such as underburning or piling and burning, to treat logging slash. Proposed restoration projects are fuels density management; culvert replacement for fish passage; mulching, seeding, and fertilizing for roadway stability; renovating pump chances; and decommissioning, blocking, and improving roads.

1.1.2 Description of Project Area

The project area, including the proposed Slick Sand Timber Sale, is located northwest of Medford, Oregon in the Upper West Fork Evans Creek 6th Field subwatershed (see Maps 1 and 2). The project area contains 16,006 acres and the BLM administers 9,515 of those acres. BLM-administered land is intermixed with privately-owned land, creating a mosaic of ownership patterns (see Table 1-1). The projects is located in T32S, R3W, Sections 30, 31; T32S, R4W, Section 35; T33S, R3W, Sections 5, 7, 8, 9, 17, 18, 19, 20, 21, 29, 31, 33; and T33S, R4W, Sections 1, 11, 13, 25.

Table 1-1. Land Ownership/Jurisdiction within the Slick Sand Project Area

Land Owner/Jurisdiction	Acres	Percent
Bureau of Land Management	9,515	59
Industrial Forest Land	6,341	40
Umpqua National Forest	150	1
Totals	**16,006**	**100**

1.2 Purpose

The purposes of the proposed actions are to contribute toward meeting objectives identified in the Medford District Resource Management Plan, Northwest Forest Plan, and West Fork of Evans Creek Watershed Analysis. This includes contributing to the Medford District's decadal Probable Sale Quantity, as identified in the Medford District Resource Management Plan, providing forest products for the local economy, and meeting existing laws and regulations. It also includes treating and restoring overstocked stand conditions while reducing fuels hazard, removing a barrier to fish passage by replacing a culvert, reducing erosion and potential sediment by revegetating currently exposed soils along road cutbanks, renovating pump chances to improve water sources for fire suppression, and renovating or improving roads within the project area.

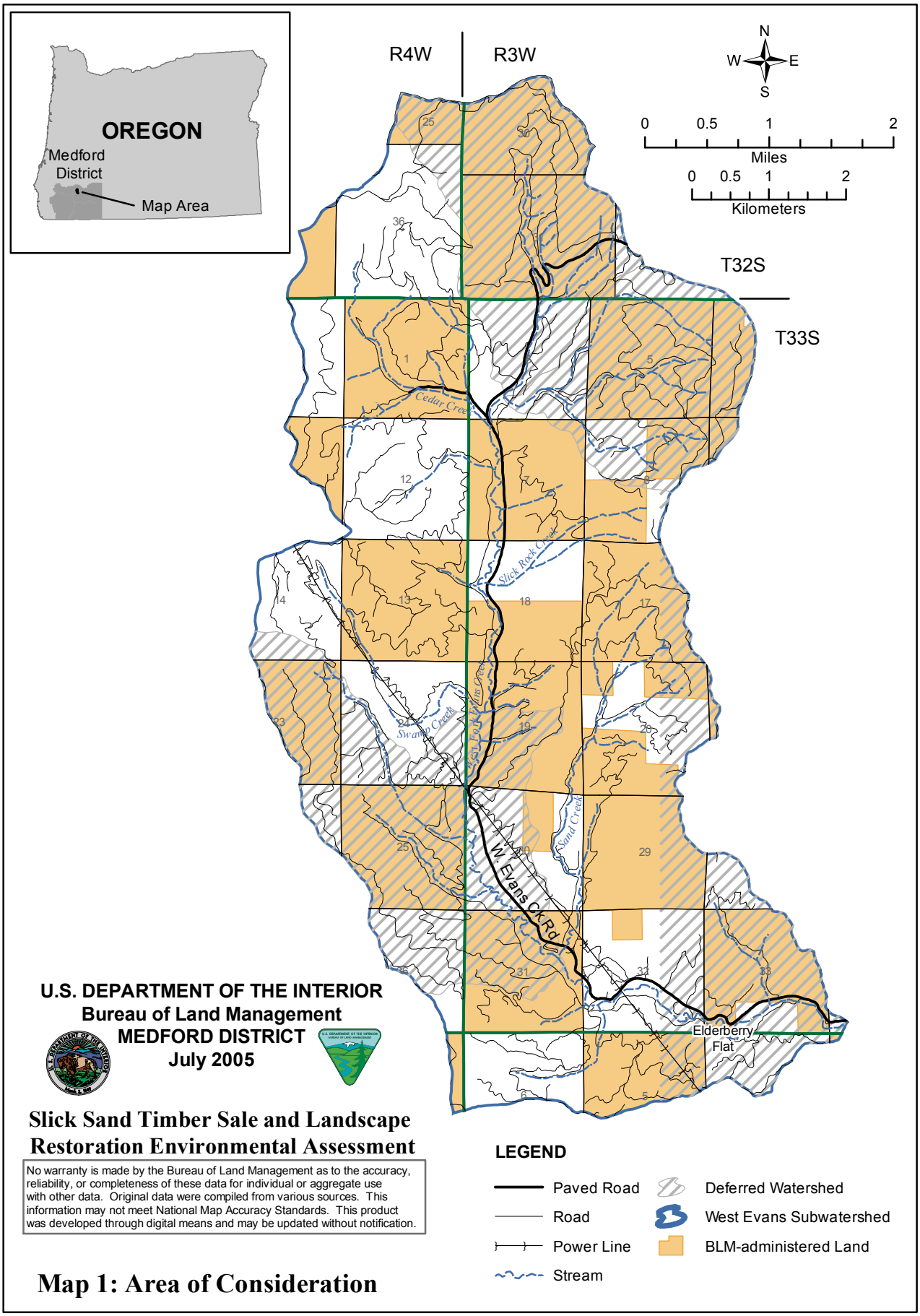
1.2.1 Objectives

The following objectives were identified by the interdisciplinary project team. Where possible, the source of the objective is shown. Sources include: Medford District Record of Decision and Resource Management Plan ROD/RMP), Northwest Forest Plan (NWFP), and West Fork of Evans Creek Watershed Analysis (WA).

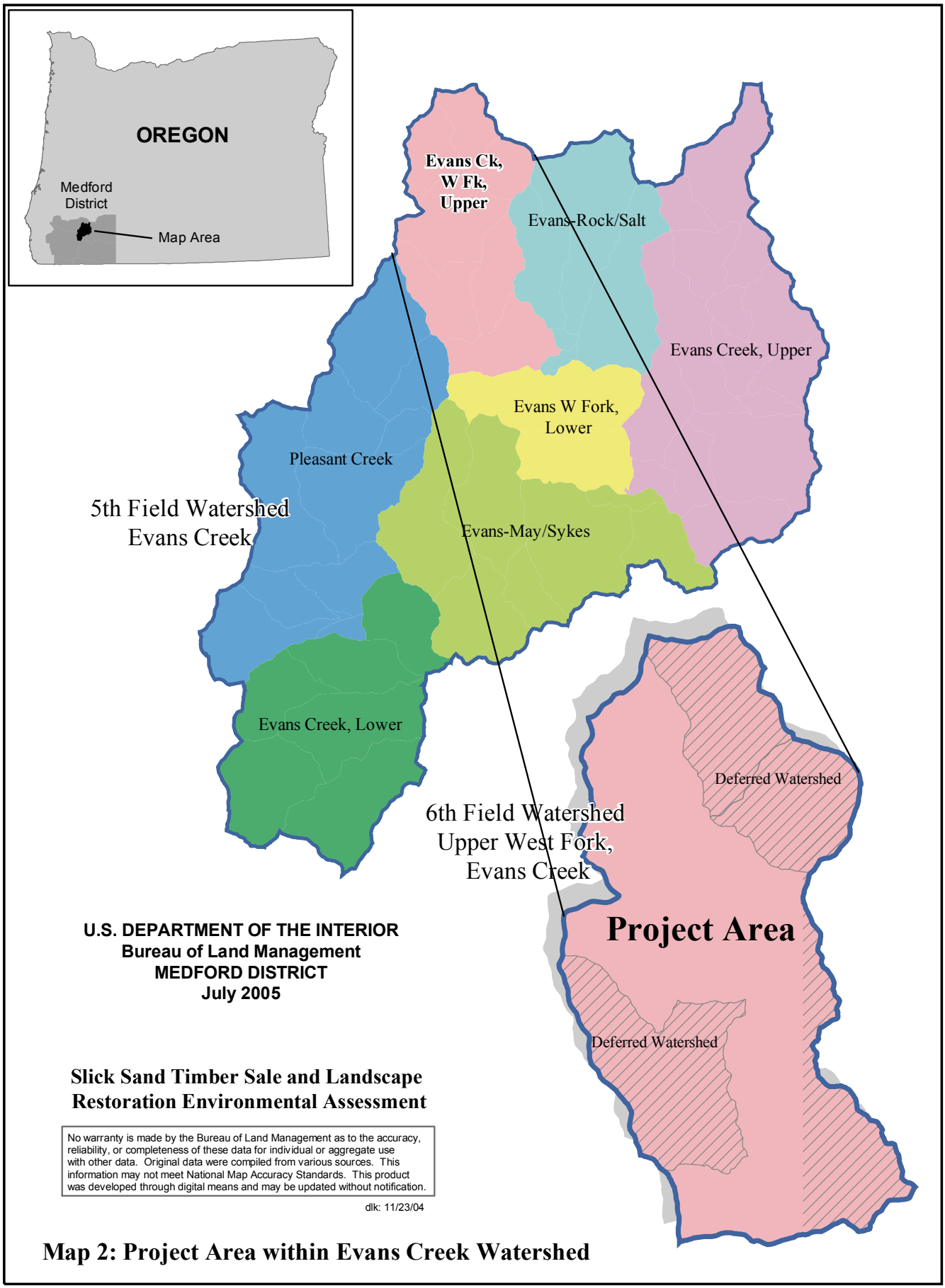
1. Supply a sustainable source of forest commodities from matrix lands to provide jobs and contribute to community stability. Forest commodities include timber, firewood, and special forest products (ROD/RMP, p. 38; WA, p. 35) by
   - Applying a modified, even-aged treatment to produce stand conditions that include wood of desired quality, quantity, and value (ROD/RMP, p. 181);
   - Applying structural retention treatments to meet structural, functional, and growth objectives (ROD/RMP, p. 183); and
   - Applying commercial thinning (density management) treatments to increase recoverable timber production and meet structural diversity objectives (ROD/RMP, p. 185) (See Section 2.2.1 for treatment descriptions).
2. Improve forest ecosystem health, diversity, and resiliency (WA, p. 38) by:
   - Providing for important ecological functions, such as dispersal of organisms; carryover of some species from one stand to the next; and maintenance of ecologically valuable structural components such as down logs, snags, and large trees, and habitat for a variety of organisms associated with both late-successional and younger forests (ROD/RMP, p. 38 and 39; NWFP, p. C-40 and 41).
   - Applying treatments which accelerate the attainment of old growth characteristics within riparian reserves.
3. Provide connectivity (along with other allocations such as Riparian Reserves) between Late-Successional Reserves (ROD/RMP, p. 38; NWFP, p. C-44; WA, p. 31) by
   - Retaining at least 15 percent of land within the Evans Creek 5th field watershed in a late-successional condition (ROD/RMP, p. 39)
4. Improve habitat for coho salmon, steelhead, and trout (ROD/RMP, p. 49; WA, p. 34) by
   - Removing fish barriers
   - Reducing sediment delivery rates to stream channels (NWFP, p. B-11; WA, p. 34).

1.3 Need

The underlying need for this proposal is for a sustainable supply of timber and forest products while providing a healthy forest ecosystem. This need will be addressed through the following forest management and restoration projects.



Map 1: Area of Consideration



Map 2: Project Area within Evans Creek Watershed

1.3.1 Forest Management

Many forest stands in the project area are overstocked with more trees than the site has water, nutrients, and growing space to sustain. Overstocked stands have a greater potential for severe stand-replacing wildfires. To reduce competition-related mortality and wildfire risk, and to increase tree vigor and growth, the number of trees per acre needs to be reduced. By decreasing stand densities, more water, nutrients, and growing space would be available for the remaining trees. Older forest stands that have declining growth rates or are deteriorating due to insects, disease, or other factors would be treated using a two-aged regeneration harvest method. This method would provide for the establishment and growth of conifer species while retaining structural and habitat components, such as, large trees, snags and coarse woody debris.

Small plantations resulting from the progeny test tree program of the early 1980s are scattered throughout the Butte Falls Resource Area. Two of these progeny test sites are located in the Slick Sand project area. White Sands and Sandbar Battle Progeny Test Sites, planted in 1980 and 1981 respectively, are greatly overstocked with more than 500 trees per acre. In both areas, portions of the sites are planted in ponderosa pine in a similarly dense condition. To reduce competition-related mortality and wildfire risk, and to increase tree vigor and growth, the number of trees per acre needs to be reduced. By decreasing stand densities, more water, nutrients, and growing space would be available for the remaining trees.

1.3.2 Restoration

1.3.2.1 Fuels Density Management

Fire suppression and past forest management practices have altered the natural level of vegetation. This has created overstocked stands with higher tree densities. The mostly contiguous stands of late-successional forest have shifted to a patchy mosaic of young stands, thereby increasing the susceptibility of the project area to the effects of fire.

Fuels density management areas are those which would benefit from silvicultural intervention to promote the development of healthy late-successional characteristics and establish a defensible area for use during extended fire suppression activities and possibly reduce the overall size of a wildfire.

1.3.2.2 Culvert Replacement for Fish Passage

A culvert on an unnamed tributary to West Fork Evans Creek is undersized and constrains stream flow. The culvert limits the migration of cutthroat trout upstream. Unimpaired fish passage is needed for salmonids to complete life history requirements. In watersheds where summer stream temperatures are elevated, it is especially important for fish to have unimpaired access to small tributaries that provide refuge from warmer waters. The Medford District ROD/RMP (p. 87) directs upgrading existing road culverts that pose a substantial risk to riparian conditions. These culverts must accommodate at least a 100-year flood and provide and maintain fish passage at road crossings of existing and potential fish-bearing streams (USDA and USDI 1994, p. C-33).

1.3.2.3 Roadside Stabilization

Unvegetated cutbanks along roads are eroding and sediment from those cutbanks is entering nearby stream channels. Hydromulching would revegetate the cutbanks and stabilize the soils. Erosion and the resulting sedimentation would be reduced. This would benefit water quality and contribute to improved fish habitat.

1.3.2.4 Pump Chance Renovation

Pump chances provide pools of water for use during fire suppression. Pump chances in the project area are overgrown, access is inadequate, inlets and outlets are not functioning properly, and the

pools are filling with gravel and soil. Renovating these pump chances would meet the need for adequate water sources in the project area for fire fighting purposes.

1.3.2.5 Road Projects

The soils in the West Evans Creek 6th Field subwatershed are highly erodible. Roads are a major source of sediments and road density is high. To reduce erosion and subsequent sedimentation, roads need to be upgraded and renovated. Roads no longer needed or used should be decommissioned to reduce road density.

1.4 Legal Requirements

1.4.1 Conformance with Land Use Plans and Other Documents

The actions proposed and analyzed in this EA were developed to be consistent with the management objectives for public lands identified in the following documents:

1.4.1.1 Medford District Record of Decision and Resource Management Plan (RMP), June 1995

The *Medford District Record of Decision and Resource Management Plan* responds to the need for a healthy forest and rangeland ecosystem with habitat that will contribute toward and support populations of native species, particularly those associated with late-successional and old growth forests. The RMP responds to the need for a sustainable supply of timber and other forest products that will help maintain the stability of local and regional economies, and contribute valuable resources to the national economy on a predictable and long-term basis. The RMP contains the same land use allocations and standards and guidelines as the NWFP, but also responds to issues specific to the Medford District.

1.4.1.2 Northwest Forest Plan (NWFP), April 1994

The *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* provides extensive standards and guidelines, including land allocations, which comprise a comprehensive ecosystem management strategy.

1.4.1.3 Survey and Manage (S&M), March 2004

The *Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* amends a portion of the 1994 NWFP by removing the Survey and Manage Mitigation Measure Standards and Guidelines. Sections I through VIII and XII of the NWFP were removed in their entirety while Sections IX through XI were retained.

1.4.1.4 Aquatic Conservation Strategy (ACS), March 2004

The *Record of Decision Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource Management Land for Nineteen National Forests Within the Range of the Northern Spotted Owl* clarifies the provisions of the NWFP related to the Aquatic Conservation Strategy. This decision "clarifies the proper spatial and temporal scale for evaluating progress toward attainment of ACS objectives and clarifies that no project-level finding

of consistency with the ACS objectives is required." The decision specifies "projects must be considered in a long-term, fifth-field watershed or larger scale to determine the context for project planning and National Environmental Policy Act (NEPA) effects analysis."

1.4.2 Relationship to Statutes, Regulations, and Other Plans

- **Oregon and California Act (O&C) 1937** – Requires the BLM to manage O&C lands for permanent forest production, in accord with sustained-yield principles. Management of O&C lands must also protect watersheds, regulate streamflow, provide for recreational facilities, and contribute to the economic stability of local communities and industries.
- **Federal Land Policy and Management Act (FLPMA) 1976** – Defines BLM's organization and provides the basic policy guidance for BLM's management of public lands.
- **National Environmental Policy Act (NEPA) 1969** – Requires the preparation of environmental impact statements for Federal projects which may have a significant effect on the environment.
- **Endangered Species Act (ESA) 1973** – Directs Federal agencies to ensure their actions do not jeopardize threatened and endangered species.
- **Clean Air Act (CAA) 1990** – Provides the principal framework for national, state, and local efforts to protect air quality.
- **Archaeological Resources Protection Act (ARPA) 1979** – Protects archeological resources and sites on federally-administered lands. Imposes criminal and civil penalties for removing archaeological items from federal lands without a permit.
- **Clean Water Act (CWA) 1987** – Establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.
- **Medford District Integrated Weed Management Plan 1998** - Provides a proactive ecosystem-based approach to reduce populations of alien plant species to a level which will allow for the restoration of native plant species, and provide for overall ecosystem health. Control measures may include cultural or preventative (seed testing, vehicle washing), physical (handpulling, competitive planting, burning), biological (insects), and chemical (herbicide), and may be found in greater detail in the Northwest Area Noxious Weed Control Program EIS, December 1985.

1.5 Scoping and Identification of Issues

1.5.1 Scoping

Scoping was conducted by means of a letter mailed to 20 individuals, businesses, organizations, and government agencies on May 14, 2004. The letter requested comments concerning issues to be addressed within the project area. A total of six comment letters were received from adjacent land owners, Headwaters, Oregon Natural Resources Council, Klamath Siskiyou Wildlands Center, and Motorcycle Riders of America.

1.5.2 Issues

Based on input from the public and the interdisciplinary team plus information contained in the WA and RMP, the following issues were identified. These issues provide a basis for comparing the environmental effects of the alternatives and aid in the decisionmaking process. The major issues brought forward were used to formulate alternatives, identify appropriate design features, or analyze environmental effects. The following major issues were identified:

1.5.2.1 Issue 1: Fish (habitat conditions)

The West Fork Evans Creek 6th Field subwatershed provides habitat for coho salmon, steelhead, and cutthroat trout. Fish habitat in the project area is in poor condition. The streams lack clean gravels, coarse woody debris, and functioning riparian vegetation (ODFW 1994; ODFW 1995). Granitic sands have filled pools, reduced cover and spawning habitat, and reduced the aquatic insect populations. The majority of the riparian stands in the project area are early to mid-seral stage and do not provide adequate shade or coarse woody debris for adjacent streams. A culvert on BLM road #33-3-18.2 blocks the migration of an isolated population of cutthroat trout.

1.5.2.2 Issue 2: Fragile Soils

The watershed contains highly erodible granitic soils prone to erosion and slides. The movement of soils from roads, cutbanks, and off-highway vehicle trails into West Fork Evans Creek has contributed to degraded fish habitat.

1.5.2.3 Issue 3: Forest Condition

High stand densities in the project area have resulted in slow or stagnant growth rates. Many forest stands contain more trees than the site can sustain. These high densities result in declining tree vigor and growth, increased tree mortality, and increased susceptibility to insect attack, root disease infection, and stand-replacing wildfires.

1.5.2.4 Issue 4: Hydrologic Condition (including water quality and quantity)

West Fork Evans Creek is on the Oregon Department of Environmental Quality 303(d) list of water quality limited streams for exceeding the water temperature standard. Road density in the watershed is high. Roads and off-highway vehicle trails are major sources of sediments. The Transient Snow Zone is subject to rain-on-snow events that contribute to increases in the magnitude and frequency of peak flows.

1.5.2.5 Issue 5: Old Growth Habitat

Old growth stands have a high level of structure development and provide diverse habitats and biological conditions not found in younger stands. In Evans Creek 5th field watershed, old growth stands have been modified by past timber management while others have had no or very minimal past management actions. Timber management has simplified the conditions within the modified old growth stands by affecting the structure, species composition, vegetative growth, and biological processes and functions.

Public comments received during scoping identified protecting the high biological integrity provided in old growth stands as a concern. The public defined areas of high biological integrity (including old growth stands) as areas where fire hazard, noxious weed, watershed function, soil stability, and fish and wildlife problems are nonexistent or minimal. These problems are typically nonexistent or minimal in intact old growth forest stands. Intact old growth stands are stands that "have not been entered by logging or that have been lightly entered such that the structural and functional features of the forest are essentially unchanged" (PRMP 1994, 3-34). Modified old growth stands are more likely to exhibit these problems but still provide some of the habitat and ecological functions provided in the unmanaged old growth stands.

1.5.3 Issues Considered but not Analyzed in Detail

The following issues were discussed by the interdisciplinary team. It was determined these issues were beyond the scope of this project or would be considered or discussed under other topics during the environmental analysis process.

1.5.3.1 Off-Highway Vehicles (OHVs)

OHV use occurs on the highly erodible granitic soils in this watershed. The West Fork of Evans Creek Watershed Analysis recommended the implementation of a recreation management plan for the watershed. This issue is beyond the scope of this project and should be addressed as part of an OHV or recreation management plan for the entire area.

1.5.3.2 Cumulative Effects

Cumulative effects will be included in the Environmental Consequences discussion regarding the impacts of the proposed alternatives on the resources found in the project area.

1.5.3.3 Deferred Watersheds

Deferred Watersheds will be discussed in the Hydrology section of the analysis.

1.5.3.4 Transient Snow Zone

The Transient Snow Zones issue was incorporated into Issue 4, Hydrologic Conditions.

1.6 Decisions to be Made

The following decisions will be made through this analysis:

- To determine if a FONSI is appropriate, or should an Environmental Impact Statement (EIS) be prepared if the proposed action would result in a finding of significant impacts to the human environment. If impacts are significant, to determine if the project proposals could be modified to mitigate the impacts so an EIS would not be necessary.
- To harvest or not harvest trees on BLM-administered lands within the project area and, if so, at what level, where, and when.
- To implement or not implement proposed restoration projects (fuels density management; mulching, seeding, and fertilizing for cutbank stability; renovating or improving pump chances; decommissioning, blocking, and improving roads; and replacing a culvert for unimpaired fish passage) on BLM-administered lands within the project area and, if so, which projects, at what level, and where.

2.0 Alternatives

Chapter 2 provides a description of the proposed projects. Project Design Features that serve as the basis for resource protection for implementation of projects are included. The alternatives are defined and a comparison between alternatives is provided.

2.1 Introduction

Three action alternatives were developed to respond to the issues identified in Chapter 1. In addition, a No Action Alternative (Alternative 1) was included to provide a baseline for comparison. The three action alternatives explore a range of management options for forest management and restoration projects.

The alternatives address issues identified by the public during scoping and by a team of interdisciplinary specialists. The alternatives represent reasonable ways to meet the need for a sustainable supply of timber and forest products and still provide for a healthy forest ecosystem.

2.2 Proposed Projects

2.2.1 Forest Management

Lands proposed for forest management in the project area were designated as Matrix lands under the Northwest Forest Plan. Matrix lands are Federal lands outside of reserves and special management areas in which most timber harvest and other silvicultural activities will be conducted. “Matrix lands in the Medford District are divided into the northern general forest management area, the southern general forest management area, and connectivity/diversity blocks” (USDI 1995a, 73). No connectivity/diversity blocks are present within the project area.

2.2.1.1 Regeneration Harvest

Regeneration harvest is a two-aged harvest method that leaves 6-25 large green trees, snags and down wood as biological legacies to provide habitat components over the next management cycle. The understory is planted with seedlings.

To maximize volume growth and yield, regeneration harvesting would occur in older forest stands that have declining growth rates or are deteriorating due to insects, disease or other factors.

Harvest within the **Southern General Forest Management Area** would retain 16-25 large green trees per acre greater than 20 inches in diameter at breast height. Retained trees would be the most vigorous trees and would be selected based on tree crown ratio and form. The spatial distribution of these trees would vary from individual trees to groups. Healthy understory ponderosa pine, sugar pine, incense cedar, and Douglas-fir trees free of insects, disease, or damage would be left. Wildlife snags and coarse woody debris would be designated for retention. All other trees would be removed leaving a canopy closure of 25 to 40 percent. Slash would be underburned or piled and burned. Conifer seedlings would be planted following harvest.

Harvest within the **Northern General Forest Management Area** would retain 6-8 trees per acre greater than 20 inches in diameter at breast height. Retained trees would be the most vigorous trees and would be selected based on tree crown ratio and form. Spatial distribution of these trees would vary from individual trees to groups. Healthy understory ponderosa pine, sugar pine, incense cedar, and Douglas-fir trees free of insects, disease, or damage would be left. Wildlife snags and coarse woody debris would be designated for retention. All other trees would be removed leaving a canopy closure of 10 to 15 percent. Slash would be underburned or piled and burned. Conifer seedlings would be planted following harvest.

After the initial slash disposal is completed, the site would be evaluated to determine if additional fuels treatments are needed.

2.2.1.2 Selection Harvest

Selection harvest is "a method of uneven-aged management involving the harvesting of single trees from stands (single-tree selection) or in groups (group selection) without harvesting the entire stand at any one time." (ROD/RMP, 112)

This treatment would remove poor vigor trees from all diameter classes. Stand densities would be reduced and site resources (water, sunlight, nutrients, and growing space) would be available for the remaining trees. The desired basal area and tree crown ratio and form are the primary factors used to determine which trees would be left or removed. The stand structure would be multi-aged and multi-layered. Canopy closure would range from 40 to 60 percent following treatment. The resulting slash would be piled and burned.

2.2.1.3 Density Management

Density management involves the "cutting of trees for the primary purpose of widening their spacing so that the growth of remaining trees can be accelerated." (ROD/RMP, 104)

Density management harvest can be used to improve forest health, to open the forest canopy, or to accelerate the attainment of old growth characteristics if maintenance or restoration of biological diversity is the objective.

This treatment targets the removal of individual trees to maintain or enhance forest diversity and growth. Removal of smaller trees and trees in direct competition with healthy dominant and codominant trees would redirect the site resources (water, sunlight, nutrients, and growing space) toward the development and maintenance of large healthy trees. Canopy closure would range from 40 to 60 percent following treatment. Slash would be piled and burned.

2.2.1.4 Progeny Test Site Renovation

In 2 progeny test sites, 50 percent of the Douglas-fir would be cut and removed. Other species suitable for release would be targeted in order to create species diversity. In the pine portions of the site, cutting and removal would favor the Douglas-fir, leaving 20 to 30 percent of the pine. Following thinning, the remaining trees would be pruned up to approximately eight feet. Fuel material would be removed from the site or piled and burned. All fence material would be removed from both sites.

2.2.1.5 New Temporary Spur Road Construction

Temporary spur roads would be constructed to allow operator access to harvest units. These temporary roads would be constructed on or near ridge tops. After harvesting is completed, the roads would be fully decommissioned in the same season as used.

2.2.1.6 Road Renovation

Prior to road use for forest management activities, road surfaces and ditch lines would be bladed; catch basins would be cleaned or enlarged; corrugated metal pipes would be flushed; brush growing near pipe inlets or outlets would be removed; pipe inlets and outlets would be cleaned; and brush, limbs, and trees would be removed along roadways to improve sight distance and allow for proper road maintenance. All drainage structures, including corrugated metal pipes, water dips, and ditch relief outlets, would be inspected and required work performed so water flow would not be impeded.

2.2.2 Restoration

2.2.2.1 Fuels Density Management

Fuels density management areas are those which would benefit from silvicultural intervention to promote the development of healthy forest conditions and characteristics, reduce fire behavior activity within treated stands during initial attack or ignition phase, and establish a defensible area.

Limiting factors, such as checkerboard ownership, limited conductivity of ridgelines, and heavy off-highway vehicle use in the lower elevations, reduce the capabilities of completing effective fuels reduction treatments throughout the project area. The ridgelines surrounding the Sand Creek drainage area (north of Elderberry Flat Recreation Area) provide for an opportunity to treat larger continuous blocks of BLM-administered lands within the project area. Treating continuous areas could allow for the establishment of a defensible area which may be used during extended fire suppression activities, possibly reducing the overall size of a high intensity wildfire.

Fuels density management areas would be treated based on an analysis of existing stand conditions and structure. The primary benefit would be the promotion of healthy forest conditions and characteristics, while modifying the vertical stand structure to decrease the probability of the initiation of crown fire activity within the treated area.

Noncommercial conifer trees, hardwoods, and shrubs less than 7″ diameter at breast height (DBH) would be cut. The resulting slash would be hand-piled and burned. Underburning would occur in approximately 40 acres following initial slashing and hand pile burn treatments to reduce surface fuel loadings. Maintenance thinning of all units would occur within three to seven years of the initial fuels treatments based on the amount of continued growth. Hand pile burning would occur from mid October to mid March. Underburning would occur January to May 1.

2.2.2.2 Culvert Replacement for Fish Passage

A culvert on a tributary to West Fork Evans Creek on BLM road #33-3-18.2 is currently blocking the migration of cutthroat trout. This culvert would be replaced with a larger pipe arch, bottomless arch, or similar structure. Installation of the new structure would remove the outfall and eliminate the scour hole at the end of the existing culvert. Vegetation growing in the fill surrounding the existing culvert would be removed.

Heavy equipment would operate almost entirely outside the channel. In-channel work, when water is flowing, would be in accordance with Oregon Division of State Lands and US Army Corps of Engineers Removal-Fill Permit requirements. The stream would be temporarily dewatered during construction. Activities would strive to maintain preconstruction downstream flow conditions.

To avoid bank scour at culvert inlets and outlets, banks may be armored with rip rap. The largest rocks would be placed at the toe of the slope; the smallest would be placed at the top of the slope. In addition, toe slope rocks would be graded with the largest ones placed nearest the culvert.

Construction would require all project site roads to be closed to the public for up to 3 weeks between June 15 and September 15.

2.2.2.3 Roadside Stabilization

Eroding roadside cutbanks would be revegetated and stabilized on approximately 12 miles of road. Hydromulch would be applied to the cutbanks using a slurry mixture containing a specified native seed, fertilizer, mulch, limestone, tackifier, gypsum plaster, and water.

2.2.2.4 Pump Chance Renovation

Pump chances are primarily used for initial wildfire attack and would be renovated to hold

a minimum of 500 gallons of water. Accumulations of gravels, soil, and vegetation would be excavated and moved to an appropriate disposal site. Rock would be added to access ramps as needed. The access ramp to the pool would be brushed to allow access by 4,000-gallon water tenders. Water inlets and outlets to the pool would be repaired or cleared of vegetation and debris to allow the flow of water through the pump chance. Three sites have been identified for renovation.

2.2.2.5 Road Projects

Road Improvement

Approximately six miles of existing roads would be upgraded to reduce erosion and sediment deposits into streams. Road drainage would be improved and deteriorated surfacing would be replaced. Some culverts would be replaced with larger ones to meet 100-year flood standards. Additional culverts would be installed on existing roads to improve drainage.

Full Decommissioning

Roads determined through an interdisciplinary process to have no future use would be sub-soiled (or ripped), seeded with native grasses or others as appropriate, mulched, and planted to reestablish vegetation. Cross drains, fills in stream channels, and potentially unstable fill areas would be removed to restore natural hydrologic flow. Roads would be closed with a device similar to an earthen barrier or equivalent. Roads would not be maintained in the future.

Partial Decommissioning

Decommissioning would be based on resource protection goals identified in the West Fork of Evans Creek Watershed Analysis and Medford District Resource Management Plan directives. One mile of existing road would be closed to vehicles on a long-term basis, but may be used again in the future. The road would be left in an “erosion-resistant” condition by establishing cross drains and removing fills in stream channels and potentially unstable fill areas. Exposed soils would be treated to reduce sedimentation. The road would be closed with a device similar to an earthen barrier.

2.3 Description of the Alternatives

2.3.1 Alternative 1 - No Action

2.3.1.1 Forest Management

No forest management activities would occur. If this alternative was selected, no silviculture treatments and no road renovation, improvement, or closures would occur within the project area at this time. Only normal programmed road maintenance would be performed.

Future harvesting in this area would not be precluded and could be analyzed under a subsequent EA. Harvest would occur at another location within Matrix lands under separate NEPA analysis in order to meet harvest commitments identified in the ROD/RMP (p. 73). Selection of the No Action Alternative would not constitute a decision to reallocate these lands to noncommodity uses.

2.3.1.2 Restoration

No restoration projects would occur. If this alternative was selected, proposed restoration projects to reduce fuels and provide defensible areas in case of fire would not occur. Pump chances used for wildfire suppression would not be renovated. Stream improvements designed to improve fish habitat (culvert replacement) and reduce sediment (roadside stabilization) would not occur.

2.3.2 Alternative 2

Vegetation treatments are based on stand age and recommendations found in the ROD/RMP. Regeneration harvest is recommended in Matrix stands meeting RMP criteria for regeneration harvest in Southern and Northern GFMA. Density management is recommended in stands less than 80 years old where high stocking levels exist. This alternative is designed to provide the highest level of timber harvest while meeting ROD/RMP and watershed objectives.

2.3.2.1 Forest Management

Regeneration Harvest

- Southern GFMA - 125 acres
- Northern GFMA - 65 acres

Selection Harvest

- 30 acres

Density Management

- 160 acres

Progeny Test Site Renovation

- 12 acres

New Temporary Road Construction

- 1.2 miles

2.3.2.2 Restoration

Fuels Density Management

- Slash, handpile, and burn - 580 acres
- Slash and underburn - 35 acres

Culvert Replacement for Fish Passage

- 1 culvert

Roadside Stabilization

- 12 miles

Pump Chance Renovation

- 3 pump chances

Road Projects

- Improve - 6 miles
- Full decommission - 3 miles
- Partial decommission - 1 mile

2.3.3 Alternative 3

Vegetation treatments are based on actual stand conditions. Known owl sites would be protected. Density management would be provided in riparian areas to accelerate late-successional characteristics.

2.3.2.1 Forest Management

Regeneration Harvest

- SGFMA - 35 acres
- NGFMA - None

Selection Harvest

- 90 acres

Density Management

- 155 acres

Progeny Test Site Renovation

- 12 acres

New Temporary Road Construction

- 1 mile

2.3.2.2 Restoration

Fuels Density Management

- Slash, handpile, and burn - 585 acres
- Slash and underburn - 35 acres

Culvert Replacement for Fish Passage

- 1 culvert

Roadside Stabilization

- 12 miles

Pump Chance Renovation

- 3 pump chances

Road Projects

- Improve - 6 miles
- Full decommission - 3 miles
- Partial decommission - 1 mile

2.3.4 Alternative 4

Vegetation treatments designed to address issues identified in public scoping – protect areas of highest biological integrity (old growth habitat, riparian areas and unentered Matrix lands greater than or equal to 150 years old).

Old growth habitat consists of stands at least 180-220 years old with moderate high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; high incidence of large trees and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground (USDI 1995).

2.3.2.1 Forest Management

Regeneration Harvest

- None

Selection Harvest

- 25 acres

Density Management

- 150 acres

Progeny Test Site Renovation

- 12 acres

New Temporary Road Construction

- 0.6 miles

2.3.2.2 Restoration

Fuels Density Management

- Slash, handpile, and burn - 590 acres
- Slash and underburn - 45 acres

Culvert Replacement for Fish Passage

- 1 culvert

Roadside Stabilization

- 12 miles

Pump Chance Renovation

- 3 pump chances

Road Projects

- Improve - 6 miles
- Full decommission - 3 miles
- Partial decommission - 1 mile

2.4 Project Design Features

The following Project Design Features (PDFs) are included in the design of forest management and restoration projects in Alternatives 2 through 4. These PDFs are a set of the Best Management Practices (BMPs) identified in the Medford District RMP and resource protection measures identified by the EA interdisciplinary team. The PDFs would serve as a basis for resource protection in the implementation of any projects and will be considered in the analysis of impacts in Chapter 3.

2.4.1 Wildlife

- Seasonally restrict harvest activities from March 1 to September 30 within 0.25 miles of known northern spotted owl sites (within 0.5 miles for helicopter operations). The seasonal restriction would be waived if nonnesting is determined. If any new owls are discovered in harvest units following the sale date, activities would be halted until mitigation options could be determined.
- Seasonally restrict broadcast burning and site preparation from March 1 to July 15 within 0.25 miles of known active northern spotted owl nests. The seasonal restriction would be waived if nonnesting is determined.
- Protect additional raptor species, if any are located. Apply the appropriate buffers and seasonal restrictions based on species, proposed treatment, site-specific environmental conditions, and protection recommendations.
- Maintain all snags except those which need to be felled for safety reasons. Those snags felled for safety reasons would be left on-site.

2.4.2 Riparian Reserves

- Store all hazardous materials and petroleum products in durable containers placed outside of Riparian Reserves. Locate so an accidental spill would be contained and not drain into the stream system.
- Refuel equipment in locations outside Riparian Reserves.
- Handlines occurring within Riparian Reserves would be located in logical locations and where topography breaks occur.
- Fire-retardant chemicals would not be used within Riparian Reserves during fuels treatment projects.
- Ground-based equipment would not be used within Riparian Reserves unless used for lining from existing roads and landings.
- To ensure existing shade levels along streams are maintained, vegetation treatment would not occur in the following areas: within 50 feet of fish-bearing, perennial streams and within 25 feet of non-fish-bearing, intermittent streams.
- Hand piles would not be stacked within 50 feet of fish-bearing, perennial streams and within 25 feet of non-fish-bearing, intermittent streams. Piles would not be placed in channel bottoms.
- Fuels would not be treated within inner gorge slopes 35 percent or greater along streams.
- No direct ignition would occur within the 25 or 50 foot no-treatment zones during underburn operations. Ignition outside the 25 or 50 foot buffers would be allowed to back into the no-treatment buffer, as long as the burn is low intensity and mid- and upper level canopies are not at risk.
- Firelines constructed within Riparian Reserves would be less than 2 feet wide, built same season as burn operations, and rehabilitated immediately following final mop-up. Handline rehabilitation would consist of waterbar construction and vegetation placement within the handline in order to minimize sediment flow into water bodies. All firelines would be constructed manually using hand tools and chainsaws. Waterbars would be installed based on slope and soil type.

- No foam agents would be used within 50 feet of fish-bearing, perennial streams and within 25 feet of non-fish-bearing, intermittent streams during prescribed burning and mop-up activities.

2.4.3 Archeology

- Apply mitigating measures to areas containing known archeological sites. Buffers would be determined based upon proposed treatment, site-specific environmental conditions, and protection recommendations.
- If an archeological site is discovered during the project, work will stop and the BLM will be notified within 12 hours.

2.4.4 Special Status Plants

- Protect known Special Status vascular plant, lichen, bryophyte, and fungi sites. Buffers would be determined based upon species, proposed treatment, site-specific environmental conditions, and protection recommendations.
- If a special status plant is discovered during the project, work will stop and the BLM will be notified within 12 hours.

2.4.5 Noxious Weeds

- Ensure seed, straw, and mulch are free of weed reproductive plant parts, as per the North American Weed Free Forage Certification Standards.
- Inspect all vehicles and equipment that will travel off system roads for noxious weed seeds and plant parts prior to entry onto BLM-administered lands and deem free of said contaminants.

2.4.6 Equipment Use

- Require a Spill Prevention, Control and Countermeasure Plan prior to operation. The Plan will include, but not be limited to, identification of hazardous substances to be used in the project area and purchaser's representatives responsible for supervising initial containment action for releases and subsequent cleanup.

2.4.7 Roads and Quarries

- Seasonally restrict all rock hauling, timber hauling, and landing operations on native surface or inadequately rocked roads whenever soil moisture conditions or rain events could result in road damage or the transport of sediment to nearby stream channels, generally October 15 to May 15.
- Restrict all road renovation, closure, and improvement work from October 15 to May 15, or when soil moisture exceeds 25 percent.
- Block or barricade identified roads after use and before beginning of rainy season (generally by October 15).
- Apply native seed and mulch to all roads identified for full decommissioning in the same operational season they are decommissioned.
- Restrict the application of dust abatement materials, such as lignin, Mag-Chloride, or approved petroleum-based dust abatement products, during or just before wet weather, and at stream crossings or other locations that could result in direct delivery to a water body (typically not within 25 feet of a water body or stream channel).

- Place waste stockpile and borrow sites resulting from road construction or reconstruction in a location where sediment-laden runoff can be confined, at least one site potential tree length (160 feet) from a stream.
- When removing culverts, pull slopes back to the natural slope, or at least 1:1, to minimize sloughing, erosion, and the potential for the stream to undercut streambanks during periods of high streamflows.
- Construct silt fences 25 and 50 feet below culvert replacement sites to trap sediment and prevent it from entering nearby stream channels.
- Dewater the stream during culvert replacement to minimize the movement of sediment downstream.
- Seasonally restrict (generally October 15 to May 15) all quarry development and rock crushing operations whenever soil moisture conditions or rainstorms could cause the transport of sediment resulting from quarry operations to nearby stream channels.
- Construct silt fences or other preventative structures (diversion ditches, settling ponds) as needed to prevent the potential for runoff from quarry operations into nearby stream channels.
- Plant grass seed, native vegetation, or both within the same operating season to stabilize exposed soil in overburden areas from quarry operations.
- If explosives are necessary in quarry development, require a detailed blasting plan to minimize the amount of rock material outside the designated quarry perimeter.

2.4.8 Fuel Hazard Reduction

- Provide a minimum 25 foot no-treatment core on each side of the stream channel for all management activities occurring adjacent to non-fish-bearing streams.
- Use a grapple rake with a dangle attachment or a movable linkage attached to the boom of an excavator for slash piling in order to minimize impacts to the soil and damage to residual trees. In addition, walk the excavator over slash when possible.
- Provide an approved prescribed fire plan prior to ignition of all prescribed burn units in compliance with Prescribed Fire Handbook H-9214-1. The prescribed burn plan would contain measurable objectives, a predetermined prescription, and an escape fire plan to be implemented in the event of an escape.
- To prevent fire escapes and to minimize damage to residual vegetation/trees, burning would occur when weather and fuel conditions allow for lower fire intensities (typically late fall through spring).
- Conduct prescribed burning in compliance with Oregon Department of Forestry's Smoke Management Plan. Smoke emission control could also include conducting mop-up as soon as possible after ignition is complete, covering hand piles to permit burning during the rainy season, and burning lighter fuels with lower fuel moistures to facilitate rapid and complete combustion, while burning larger fuels with higher moisture levels to minimize consumption.

2.4.9 Timber Harvest

- Minimize the total number of skid roads by designating skid roads with an average of 150 foot spacing. Avoid creating new skid roads and utilize existing roads, where feasible, in order to minimize ground disturbance.
- Construct new temporary roads on ridge tops wherever possible.
- Surface all haul roads, including shoulders and excess width.
- Restrict all tractor yarding, soil ripping, and excavator piling operations from October 15 to May 15, or when soil moisture exceeds 25 percent.
- In granitic soils, restrict all cable yarding from October 15 to May 15, or when soil moisture exceeds 25 percent.

- Treat activity slash as necessary to reduce or eliminate additional fuel loading.
- Restrict tractor and mechanical operations to slopes generally less than 20 percent on granitic soils and 35 percent on other soil types. In areas where it is necessary to exceed these gradients, utilize ridge tops where possible.
- Waterbar all skid roads and firelines during the same operating season as constructed. Use spacing for high erosion class soils (see ROD/RMP, Appendix D-Best Management Practices, Erosion Control for Timber Harvest, p.167).
- Locate skid roads to minimize disturbance to coarse woody debris. Where skid roads encounter large coarse woody debris, a section would be bucked out for equipment access. The remainder would be left in place and not disturbed.
- Rip areas identified for ripping (e.g., skid roads, landings, decommissioned roads) to a depth of 18 inches using a sub-soiler or winged-toothed ripper.
- Do not rip portions of roads within 10 feet of a stream channel.
- Rip skid trails in all tractor-yarded regeneration harvest units.
- To minimize soil disturbance, mechanized Feller-Bunchers and harvesters used off designated skid trails must have an arm capable of reaching at least 20 feet, must walk on existing or created slash when possible, and must minimize turning by avoiding return trips to the same skid trail whenever feasible.
- Mulch areas where lining logs to the roads results in extended soil surface exposure.
- To limit access to OHVs, barricade skid trails leading off system roads in all tractor units upon completion of yarding.
- In density management units, apply native seed and mulch on all landings and portions of skid trails within 100 feet above roads.

Table 2-1. Comparison of Action Alternatives

	Alternative 2	Alternative 3	Alternative 4
Forest Management			
SGFMA Regeneration	125 acres	35 acres	0 acres
NGFMA Regeneration	65 acres	0 acres	0 acres
Selection	30 acres	90 acres	25 acres
Density management	160 acres	155 acres	150 acres
Progeny test site renovation	12 acres	12 acres	12 acres
Total harvest	**392 acres**	**292 acres**	**187 acres**
Harvest systems			
Tractor	60 acres	35 acres	20 acres
Cable	180 acres	125 acres	75 acres
Helicopter	125 acres	120 acres	95 acres
Small Tractor	12 acres	12 acres	12 acres
New Temporary Road Construction	1.2 miles	1 mile	0.6 miles
Restoration			
Fuels Density Management			
Slash, handpile, and burn	580 acres	585 acres	590 acres
Slash and underburn	35 acres	35 acres	45 acres
Culvert Replacement for Fish Passage	1 culvert	1 culvert	1 culvert
Roadside Stabilization	Up to 12 miles	Up to 12 miles	Up to 12 miles
Pump Chance Renovation	3 sites	3 sites	3 sites
Roads			
Improve	6 miles	6 miles	6 miles
Full Decommission	3 miles	3 miles	3 miles
Partial Decommission	1 mile	1 mile	1 mile

NOTE: Numbers are rounded.

Table 2-2. Comparison of the Effects of the Alternatives on the Issues	
Issue 1: Fish (habitat conditions)	
Past Actions	• Reduced spawning and rearing habitat, resulting from increased stream sedimentation caused by roads, landings, and skid trails for timber harvest on both private and public lands • Increased stream temperatures as a result of timber harvest in riparian areas • Reduced LWD levels as a result of removal of conifers along streams • Timber harvest occurred along most streams on both private and public lands. Riparian areas treated the same as upland sites • Removal of most conifers along streams resulting in reduced sources for stream LWD • Timber harvest and fire exclusion has contributed to high stand densities and accumulated fuels. The potential for stand-replacement wildfires has increased.
Present Actions	• On private lands, harvesting would continue resulting in continued sedimentation of streams; less is expected than past timber harvest • More riparian conifers would be maintained during timber harvest on private lands resulting in more LWD entering streams • With more protection of riparian confers on private timber lands, shade levels would be higher than in the past, resulting in decreased stream temperatures • Less timber harvest is occurring in riparian areas on private timber lands. Riparian areas continue to develop and eventually reach mature conditions, providing more LWD sources for streams • High riparian stand densities would continue until they reach mature conditions
Current Conditions	• Pool habitat, clean gravel habitat, and LWD levels are low throughout most fish streams. Fine sediment levels are high • Stream temperatures are generally higher than natural temperatures • The culvert on BLM road #33-3-18.2 blocks cutthroat trout migration • Most Riparian Reserves are in early to mid-seral conditions, providing little LWD for streams • The potential for catastrophic wildfires to burn Riparian Reserves has increased
Future Actions	• Future timber harvest would occur within the project area and the Evans Creek Watershed on private lands • Future timber harvest would occur on public lands similar to treatments proposed under this project • Similar types of harvest treatments and harvest methods would be occur on public lands as proposed under this project • Future timber harvest would occur within the project area and the Evans Creek Watershed on private lands. Riparian areas receive greater protection then they did in the past • Future timber harvest would occur on public lands similar to treatments proposed under this project • Riparian Reserve designations are not expected to change

Table 2-2. Comparison of the Effects of the Alternatives on the Issues

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Proposed Actions	• No Action • There would be no timber harvest or road building and no change to sedimentation levels or Riparian Reserve stand conditions	• 392 acres of timber harvest • 1.2 miles of temporary road construction and 17 landings used • Log hauling and renovation on 33 miles of road • 4 miles of road decommissioning • 6 miles of road improvement • Fish culvert upgrade • 12 miles of roadside stabilization • 3 pump chances renovated • 461 acres of upland hazard fuels reduction • 154 acres of riparian hazard fuels reduction	• 292 acres of upland timber harvest • 1 mile of temporary road construction and 16 landings used • Log hauling and renovation on 33 miles of road • 4 miles of road decommissioning • 6 miles of road improvement • Fish culvert upgrade • 12 miles of roadside stabilization • 3 pump chances renovated • 466 acres of upland hazard fuels reduction • 10 acres of riparian density management treatment • 154 acres of riparian hazard fuels reduction	• 187 acres of upland timber harvest • 0.6 of a mile of temporary road construction and 13 landings used • Log hauling and renovation on 33 miles of road • 4 miles of road decommissioning • 6 miles of road improvement • Fish culvert upgrade • 12 miles of roadside stabilization • 3 pump chances renovated • 481 acres of upland hazard fuels reduction • 154 acres of riparian hazard fuels reduction
Cumulative Effects	• Continuation of current sediment levels • Aquatic habitat conditions would stay the same • Riparian stand conditions would stay the same	• Slight reduction of fine sediment levels in streams but overall aquatic habitat conditions would stay the same • Continuation of current conditions in Riparian Reserves	• Slight reduction of fine sediment levels in streams but overall aquatic habitat conditions would stay the same • Continuation of current conditions in Riparian Reserves	• Slight reduction of fine sediment levels in streams but overall aquatic habitat conditions would stay the same • Continuation of current conditions in Riparian Reserves
Issue 2: Fragile Soils				
Past Actions	• Increased erosion above background levels from timber harvest and road building • Increased compaction from road building and ground based timber harvest • Reduction in soil productivity on compacted acres			
Present Actions	• Increased erosion at slower rates due to less road building and timber harvest • Increased compaction at slower rates than in past due to reduction in road building and ground-based logging • Soil productivity lost on compacted acres			
Current Conditions	• Erosion rates above background levels with majority of erosion related to skid trails, roads, landings, and yarding corridors • Compacted acres from roads, skid trails, and landings • Soil productivity lost or reduced on compacted acres			
Future Actions	• Erosion rates would continue to be above background levels but would be at lower rates than in the past due to BMPs • Additional compaction would occur at slower rates than in the past			

Table 2-2. Comparison of the Effects of the Alternatives on the Issues

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Proposed Actions	• No Action • No management activities related to this alternative • Restoration activities that would reduce erosion would not be completed • No additional compaction from ground-based logging • Compaction would not be reduced from restoration activities • No additional loss or gain in soil productivity	• 22 acres would be tractor logged on fragile soils. Skid trails would be subject to erosion and would add to compaction in the watershed at a very small scale • Compaction would be reduced through restoration activities such as road decommissioning • Soil productivity would not be greatly affected	• 19 acres of tractor yarding would occur on fragile soils. Skid trails would be subject to erosion and would add to compaction in the watershed at a very small scale • Compaction would be reduced through restoration activities such as road decommissioning • Soil productivity would not be greatly affected	• 16 acres of tractor yarding would occur on fragile soils. Skid trails would be subject to erosion and would add to compaction in the watershed at a very small scale • Compaction would be reduced through restoration activities such as road decommissioning • Soil productivity would not be greatly affected
Cumulative Effects	• Fragile soils would continue to erode, especially on skid trails, OHV trails, roads, and landings • Roads, skid trails, and landings would remain compacted with reduced soil productivity on those acres	• Fragile soils would continue to erode, especially on skid trails, OHV trails, roads, and landings • Roads, skid trails, and landings would remain compacted with reduced soil productivity on those acres	• Fragile soils would continue to erode, especially on skid trails, OHV trails, roads, and landings • Roads, skid trails, and landings would remain compacted with reduced soil productivity on those acres	• Fragile soils would continue to erode, especially on skid trails, OHV trails, roads, and landings • Roads, skid trails, and landings would remain compacted with reduced soil productivity on those acres
Issue 3: Forest Condition				
Past Actions	• Management activities on public and private lands create a mosaic of stand ages • Fire exclusion has altered stand structure; tree density levels have increased and growth rates have declined • Older slow-growing stands replaced by fast-growing conifer plantations • Forested riparian areas treated the same as upland sites; minimal or no riparian buffers • Immediate suppression and control of all wildfires • Late, mature, and old growth stands replaced by early seral stands • Previous logging has reduced the amount of NRF owl habitat and left younger overstocked stands			
Present Actions	• Density reduction treatments increase tree vigor and growth and reduce tree susceptibility to insect and disease attack • Regeneration harvests change late-successional stands to early seral conditions • Immediate suppression and control of all wildfires • Precommercial thinning in early seral stage stands on BLM-administered land without disposal of slash			

Table 2-2. Comparison of the Effects of the Alternatives on the Issues	
Current Conditions	• Landscape dominated by younger seral stages • High stand densities and competition for site resources • High growth rate per tree in conifer plantations • Growth and yield rates have peaked in mature and modified old growth stands • Declining growth and vigor of white fir and Douglas-fir in laminated root rot pockets • Natural (historic) fire regime change from mixed severity to high severity fire regime • Increase in stem densities of suppressed conifers, fire-intolerant species, and shrub species in the understory • Low canopy base heights, dense and low continuous canopy structures, smaller trees, and high fuel loadings • Approximately 40 percent of watershed converted to early or mid-seral stage • Many overstocked stands, at risk to spread of stand-replacement wildfire
Future Actions	• Private forest lands intensively managed at short rotations of about 60 years • Silvicultural treatments applied to young, mid-, and late seral stands (1 to 80 years) to accelerate late-successional forest conditions • BLM-administered lands follow management guidelines from the PRMP/EIS; regeneration harvests in stands >100 years and density management in stands < 100 years • At the 6th field watershed scale, regeneration harvests would reduce stand structural components, lower biological diversity, and increase habitat fragmentation • Immediate suppression of all fires, human or lightening caused, would continue • Future timber harvest would occur within the Upper West Fork Evans Creek 6th field watershed on private lands • No additional fuels density management units are planned • Timber sales in adjacent subwatersheds will be sold in Fiscal Years 2006-2008

Table 2-2. Comparison of the Effects of the Alternatives on the Issues

Proposed Actions	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	• Current pattern of seral stages on BLM-administered lands remain the same • Stand densities remain high and continue to increase • Intense competition for site resources result in a decline in tree vigor and limited conifer growth potential • Growth rates in mature and modified old growth stands remain stagnant or decline with tree mortality expected to increase • Laminated root rot infected stands not treated. Mortality and wind-throw of infected trees increases • Immediate suppression of all fires, human or lightning caused, would continue	• 190 acres of regeneration harvest changes mature and modified old growth stands to early seral stands • 207 acres of density reduction treatments increase tree vigor and growth and reduce tree susceptibility to insect and disease attack • The pattern of seral stages on BLM-administered lands increases • Growth rates of planted conifers high due to low intertree competition and high crown ratios • Stands affected by laminated root rot treated to slow pathogen spread • Immediate suppression of all fires, human or lightning caused, would continue • 380 acres of timber harvest • 615 acres of fuels density management • 12 acres of progeny test site thinning • Fuels hazard treated, regeneration harvest units set back succession	• 35 acres of regeneration harvests • 257 acres of density reduction treatments increase tree vigor and growth and reduce tree susceptibility to insect and disease attack • Some change to the pattern of seral stages on BLM-administered lands • Growth rates of planted conifers high due to low intertree competition and high crown ratios • Stands affected by laminated root rot treated to slow pathogen spread • Immediate suppression of all fires, human or lightning caused, would continue • 280 acres of timber harvest • 615 acres of fuels density management • 12 acres of progeny test site thinning • Thinning improves long-term condition	• No regeneration harvest • 187 acres of density reduction treatments increase tree vigor and growth and reduce tree susceptibility to insect and disease attack • Least change to the pattern of seral stages on BLM-administered lands • Growth rates of planted conifers high due to low intertree competition and high crown ratios • Laminated root rot infected stands not treated. Mortality and wind-throw of infected trees increases • Immediate suppression of all fires, human or lightning caused, would continue • 175 acres of timber harvest • 635 acres of fuels density management • 12 acres of progeny test site thinning • Thinning improves long-term condition

Table 2-2. Comparison of the Effects of the Alternatives on the Issues

Cumulative Effects	• Checkerboard ownership pattern continues landscape fragmentation and shift to younger stands • High stand densities reduce resiliency to environmental disturbances • On BLM-administered land, no late-successional stands harvested; canopy and structure unchanged • PRMP/EIS timber management assumptions and forest condition projections are not implemented • Fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for high severity wildfire events • Increase in the amount of early and mid-seral stage stands • Increase potential for initiation and sustainability of crown fires within early and mid-seral stands • Increased number of days during fire season a wildfire could transition from a surface fire to a crown fire • Late and mature stands on private lands would continue to be converted to early seral stands • Continued risk for fire spread, thus loss of owl habitat. • Slower trajectory of younger stands to grow	• Checkerboard ownership pattern continues landscape fragmentation and shift to younger stands • 392 acres treated • Density reduction lowers stand densities and increases resiliency to environmental disturbances • Loss of late-successional habitat and increased fragmentation • PRMP/EIS timber management assumptions and forest condition projections are implemented • Fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for high severity wildfire events • Conversion from late and mature stand to early seral stands would continue on harvested private lands • Less intense fire activity in treated standswhen a fire starts within the treated area • Area above Sand Creek may be used as a defensible space during extended fire suppression efforts	• Checkerboard ownership pattern continues landscape fragmentation and shift to younger stands • 292 acres treated • Density reduction lowers stand densities and increases resiliency to environmental disturbances • Less fragmentation and higher connectivity between stands • PRMP/EIS timber management assumptions and forest condition projections not fully met • Fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for high severity wildfire events • Conversion from late and mature stand to early seral stands would continue on harvested private lands • Less intense fire activity in treated stands when a fire starts within the treated area • Area above Sand Creek may be used as a defensible space during extended fire suppression efforts	• Checkerboard ownership pattern continues landscape fragmentation and shift to younger stands • 187 acres treated • Density reduction lowers stand densities and increases resiliency to environmental disturbances • Fewest acres of late-successional acres converted to early successional stands • Less fragmentation and higher connectivity between stands • PRMP/EIS timber management assumptions and forest condition projections not fully met • Fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for high severity wildfire events • Conversion from late and mature stand to early seral stands would continue on harvested private lands • Less intense fire activity in treated stands when a fire starts within the treated area • Area above Sand Creek may be used as a defensible space during extended fire suppression efforts

Table 2-2. Comparison of the Effects of the Alternatives on the Issues

Cumulative Effects (continued)		• Increased potential for initiation and sustainability of crown fires within early and mid-seral stands would continue in untreated stands • Increased number of days during fire season a wildfire could transition from a surface fire to a crown fire would continue in untreated stands • Logging units and fuels units will treat fuels, reducing risk of fire spread	• Increased potential for initiation and sustainability of crown fires within early and mid-seral stands would continue in untreated stands • Increased number of days during fire season a wildfire could transition from a surface fire to a crown fire would continue in untreated stands • Fuels breaks hasten the trajectory of younger stands to become old growth	• Increased potential for initiation and sustainability of crown fires within early and mid-seral stands would continue in untreated stands • Increased number of days during fire season a wildfire could transition from a surface fire to a crown fire would continue in untreated stands • Fuels breaks hasten the trajectory of younger stands to become old growth
Issue 4: Hydrologic Condition (including water quality and quantity)				
Past Actions	• Increased stream sedimentation as a result of roads, landings, and skid trails for timber harvest • Increased risk of larger peak flows due to large areas of timber harvested and high road density			
Present Actions	• Sedimentation rates lower than in past from roads, landings, and skid trails but still above background levels • Increased risk of larger peak flows is less than in past due to recovery of canopy, less road building, and less harvest acres			
Current Conditions	• Sedimentation is above background levels, mainly from roads and skid trails • Peak flows may be increased from roads and past harvest			
Future Actions	• Continued current level of sedimentation and low risk of increasing peak flows			
Proposed Actions	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
	• No Action • No timber harvest or road building so no risk of sedimentation or peak flow increases • Drainage would not be improved on roads so no reduction in sedimentation or the risk of peak flow enhancement	• Road improvement and decommissioning would reduce sediment sources throughout the watershed • 190 acres of regeneration harvest would result in low risk of increasing peak flows	• Road improvement and decommissioning would reduce sediment sources throughout the watershed • 35 acres of regeneration harvest would result in low risk to increasing peak flows	• Road improvement and decommissioning would reduce sediment sources throughout the watershed • No regeneration harvest would result in low risk to increasing peak flows
Cumulative Effects	• Continued current level of sedimentation and low risk of peak flow increases	• Continued current level of sedimentation and low risk of peak flow increases	• Continued current level of sedimentation and low risk of peak flow increases	• Continued current level of sedimentation and low risk of peak flow increases

Table 2-2. Comparison of the Effects of the Alternatives on the Issues				
Issue 5: Old Growth Habitat				
Past Actions	• Have reduced the levels of intact old growth stands and replaced them with early seral stands or modified them by partial harvesting • Structural complexity and biological integrity provided by intact old growth stands reduced from historic levels • Previous logging has reduced the amount of NRF owl habitat			
Present Actions	• Regeneration harvests reduces levels of old growth (intact and modified) stands			
Current Conditions	• Growth and yield rates have peaked in intact old growth stands; tree vigor and growth rates stagnant or declining • 1,501 acres (9%) of old growth stands existing in Upper West Fork Evans Creek 6th field; 577 acres are intact old growth and 924 acres are modified old growth • Many overstocked stands at risk to spread of stand-replacement wildfire			
Future Actions	• PRMP/EIS guidelines provide for regeneration harvest on matrix lands in stands >100 years • Timber sales in adjacent subwatersheds sold in Fiscal Years 2006-2008			
Proposed Actions	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
	• No Action • Growth rates in intact old growth stands stagnant or declining; individual tree mortality expected to increase • No intact old growth stands proposed for treatment; biological integrity of these stands not affected by management actions	• Regeneration harvest proposed on 165 acres (11%) of old growth forest stands; 125 of these proposed acres are intact old growth stands • Remove 142 acres within 0.5 miles of owl sites	• Regeneration harvest proposed on 20 acres (1%) of old growth forest stands; proposed acres are all intact old growth stands • Remove 80 acres within 0.5 miles of owl sites	• No regeneration harvest proposed on old growth forest stands; no harvest proposed on intact old growth stands • Biological integrity of these stands not affected by management actions • Selection harvest proposed on 40 acres of modified old growth stands • Remove 20 acres within 0.5 miles of owl sites
Cumulative Effects	• Areas of old growth acres maintained on BLM lands • Without logging or fire, there would be a gradual increase of old growth stands as stands less than 200 years age continue to age and develop old growth characteristics	• Reduction of structural components, lower biological diversity and increased habitat fragmentation on 165 acres of old growth forest stands • Old growth characteristics would be reduced on 1% of the total acres and 11% of the old growth acres in the 6th field watershed • One owl site in critical habitat unit would be made unsuitable	• Reduction of structural components, lower biological diversity and increased habitat fragmentation on 20 acres of old growth forest stands • Old growth characteristics would be reduced less than 1% of the total acres and 1% of the old growth acres in the 6th field watershed • Some owl NRF habitat downgraded for 3-10 years	• Areas of old growth acres maintained on BLM lands • Structural and biological diversity associated with intact old growth stands maintained • Low, short-term negative impact to old growth; long-term benefit

3.0 Affected Environment

3.1 Introduction

Chapter 3 describes the current condition of the environment within the Slick Sand project area. Past activities have contributed to the conditions that currently exist in the project area and are reflected in the descriptions. The information in this chapter provides the baseline for determining the effects of the proposed alternatives. This chapter is organized by the resources most relevant to the issues identified in Chapter 1.

3.1.1 Land Use Allocations and Restrictions

The Slick Sand Project Area includes only BLM-administered lands within the Upper West Fork 6th field subwatershed. Following is a summary of pertinent management direction contained within the NWFP and the Medford District RMP as it applies to the project area.

3.1.1.1 Riparian Reserves

Riparian Reserves were designated under the NWFP and Medford District RMP as "areas along all streams, wetlands, ponds, lakes, and unstable or potentially unstable areas where the conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis" (USDA and USDI 1994, 7). Riparian Reserve widths are 160 feet on each side of non-fish-bearing streams and 320 feet on each side of fish-bearing streams. Riparian Reserves are managed to provide benefits to riparian-associated species, enhance habitat conservation for organisms dependent on the transition zone between upslope and riparian areas, improve travel and dispersal for many terrestrial animals and plants, and provide habitat connectivity within the watershed.

3.1.1.2 Deferred Watersheds

Three 7th field drainages located in the Upper West Fork Evans 6th field subwatershed were deferred from management activities in the Medford District RMP. These areas "identified as having high watershed cumulative effects" were deferred "from management activities, including timber harvest and other surface-disturbing activities for ten years, starting from January 1993. Management activities of a limited nature (e.g., riparian, fish or wildlife enhancement, salvage, etc.) could be permitted in these areas if the effects will not increase the cumulative effects." (USDI 1995, 42)

3.1.1.3 Fragile Soils

Lands dominated by granitic and schist soils are considered fragile. These lands are to be managed consistent with southern general forest management area guidelines. Surface-disturbing activities are limited on all lands dominated by fragile granitic and schist soils to "maintain site productivity, reduce soil erosion, and minimize water quality degradation" (USDI 1995, 44). Four categories of fragile soils sensitive to surface-disturbing activities are identified in Medford District's timber production capability classification: Fragile Slope Gradient, Fragile Mass Movement, Fragile Surface Erosion, and Fragile Groundwater.

3.1.1.4 Late-Successional Reserves

Late-Successional Reserves were designated in the NWFP and Medford District RMP as areas set aside "to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl" (USDA and USDI 1994, C-9). The Slick Sand project area contains one element of the Late-Successional Reserve, the known spotted owl activity centers. "One hundred acres of the best northern spotted owl habitat will be retained as close to the nest site or owl activity center as

possible for all known (as of January 1, 1994) spotted owl activity centers located on federal lands in the matrix . . . (USDA and USDI 1994, C-10). Four owl sites in the project area have designated 100-acre activity centers.

3.2 A Picture of the Watershed containing the Proposed Project

The Slick Sand project area covers 16,006 acres located in a portion of the Evans Creek 5th field watershed in Jackson County, Oregon. Proposed activities are focused within the Upper West Fork Evans Creek 6th field subwatershed. The area is located approximately 12 miles north of the town of Wimer.

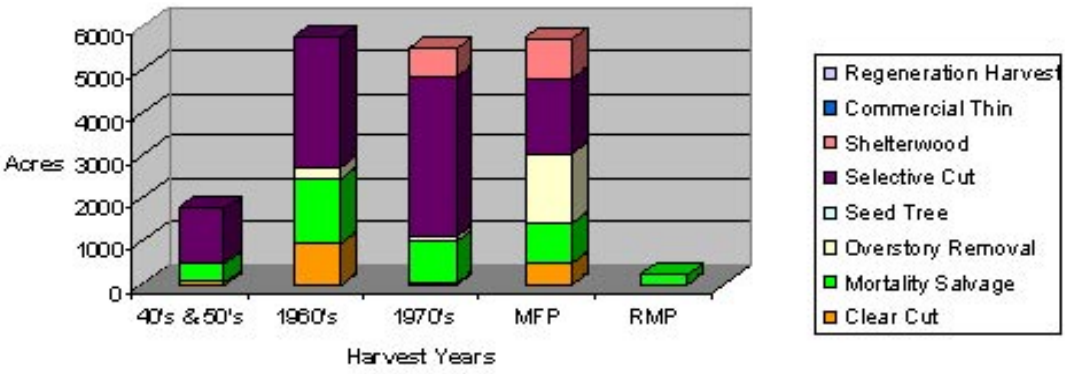
The landscape pattern in the watershed is largely determined by the checkerboard ownership (see Table 1-1). The Federal government and industrial forest landowners are the two major landowners in the watershed. On industrial timberlands, it is assumed the majority of merchantable overstory trees have been removed, leaving mostly younger Douglas-fir, with lesser amounts of ponderosa pine, incense cedar, and scattered hardwoods. “The nonfederal forests within the range of the northern spotted owl are predominantly forests that have grown back since harvest and are generally even-aged stands. They are typically managed as commercial forests…. harvest generally occurs in a stand’s fifth or sixth decade” (USDA and USDI 1994, 3&4-6). The NWFP states “these forests generally are now in early and mid-successional stages, with many at or approaching ages and sizes that will predictably result in harvest.”

Past harvesting has contributed to the existing condition in the watershed. Fire exclusion and harvest practices have contributed to the current high density and multiple layered stand conditions in many of the proposed harvest units. These past harvest methods have influenced locations and conditions of the roads within the watershed and have contributed to the affected environments described in detail later in this section.

The following is a general description of past harvest activities and trends on BLM land within the Upper West Fork Evans Creek watershed. Much of the historical information was obtained from the *Environmental History of the Evens (sp.) Creek Watershed* by Kay Atwood. For a more complete history of the Evans Creek Watershed, please refer to this document.

The activities proposed in this EA are all included in the Evans Creek Watershed. Over the past 60 years, harvest has occurred on approximately 90 percent of the BLM forested land within these watersheds. Most harvest acres have had multiple harvest entries. Harvest practices ranged from mortality salvage, or selective cutting of individual trees, to regeneration harvest including clear-cut harvest.

Figure 1. Historic Harvest on BLM-administered Lands in the Slick Sand Project Area



1800s and early 1900s

Human modification to the Evans Creek drainage began with the Native American use of fire as a tool to improve access to food supplies and to provide better protection from attacking enemies by removing cover. These human-caused low-intensity ground fires led to the extension of forest types that depended on a frequent fire regime. In the early to mid-1800s, fur trappers moved into the area and focused mainly on the beaver population. Gold mining occurred throughout the watershed in the late 1800s. Initial mining was accomplished using a pick, shovel, and pan. Eventually, hydraulic mining was introduced. Permanent agricultural settlement began in the late 1800s, primarily in the lowlands along the streams in Mid-Evans, Lower Evans, and Pleasant creeks. Settlement did not occur in the Upper West Fork Evans Creek drainage and lands within this area have been primarily owned by private timber companies or the Federal Government.

In the early 1900s, logging focused on the low lands around the settled areas. Steep, rugged terrain in the higher elevations of West Fork Evans Creek discouraged commercial timber cutting in this area. Logging was concentrated in the lower elevations, closer to settlements and transportation. In the 1920s through the 1940s, the use of more mechanized logging methods, such as the "steam donkey," high-lead logging and the crawler tractor replaced horse logging teams and provided access to these previously unentered areas. The increase in mechanized logging also brought an increase in road building in the area and, along with it, the associated impacts, such as soil erosion and siltation.

By the 1920s, fire suppression began to be emphasized. The US Forest Service constructed a guard station and fire lookout tower in the watershed. Fire suppression changed the open, lightly forested country of fire-resistant ponderosa pine and oak to an overstocked, dense forest of Douglas-fir.

World War II brought increase demand for lumber and increased logging in southern Oregon on private lands. In the years between 1950 and 1970 most of the private lands were tractor logged. Clear-cutting and shelterwood cutting were the predominant harvest treatments on private lands.

In 1937, the O&C Act provided direction for federal lands managed by the BLM in this area. The O&C Act is intended to contribute to the local economy by providing for federal timberlands to be managed for permanent timber supply, protecting watersheds, regulating stream flow, and providing recreational facilities.

1940s and 1950s

During the late 1940s and through the 1950s, approximately 1,800 acres of BLM land was harvested. The predominant harvest treatment was selection cutting, with about 1,300 acres being treated. Selection harvest typically focused on the larger, high-valued Douglas-fir and sugar and ponderosa pine trees. These harvest methods created openings in the forest stand and allowed natural regeneration to occur. Most harvesting was completed using tractor yarding and many pioneer roads were built to access these acres. To facilitate tractor harvest, roads were constructed along the streams and drainages of the watershed. Tractor yarding and road building may have occurred under all weather and soil moisture conditions and likely resulted in soil compaction across these acres. Approximately 430 acres of mortality salvage and 50 acres of clear-cutting also occurred during this time.

1960s

In the 1960s, harvesting occurred on approximately 5,800 acres in this 6th field watershed with approximately 1,500 of these acres having multiple entries. Selection cutting, mortality salvage, and clear-cutting were the primary harvest treatments with lesser amounts of overstory removal treatments. Approximately 960 acres in the watershed were clear-cut. Clear-cut areas were planted with ponderosa pine following harvest. Salvage logging occurred following the Columbus Day Storm of October 12, 1962 which brought extensive blowdown throughout the watershed.

As roads were built to access the forest, recreation use began to increase. The West Fork Evans Creek Road, the main transportation corridor in the area, was improved in 1960 and the BLM constructed Elderberry Flat Campground in 1961. Recreationists based at Elderberry Flat Campground began using skid roads and a powerline corridor as access for off-highway vehicles.

1970s

In the 1970s, selection harvest and mortality salvage again were the primary harvest treatments. Of the 5,500 acres harvested in the 1970s, 4,700 acres were either selective cut or mortality salvage treatment. The 1970s saw a decrease in clear-cutting and an increase in the 3-staged shelterwood systems with approximately 650 acres being shelterwood cut. An increase in the use of cable yarding during this time necessitated the need for new roads located out of the drainages and across the slopes and ridges.

1980s

In 1980, the BLM began implementing the Medford District Management Framework Plan (MFP). Emphasis in the MFP was to maximize timber production on high intensity management lands throughout the Medford District. Direction in the MFP was to convert existing old growth stands to rapid-growing second growth. Recommended harvest practices included clear-cut, overstory removal, 2-stage shelterwood, and single tree selection harvest. Intensive management practices to maximize growth and yield from these lands included reforestation of the harvested lands, spraying to control competing vegetation, precommercial and commercial thinning, and fertilization. The MFP implemented a 100′ no-harvest buffer on each side of Class 1 and 2 streams.

The MFP limited or modified some of the intensive management practices on the granitic soils in this drainage. This was in recognition of the higher risk of erosion and potential water quality damage from the removal of vegetation and exposure of the bare granitic soils from these treatments. Tractor harvesting was limited to slopes less than 20 percent, broadcast burning was avoided, and road construction on slopes greater than 70 percent was restricted. Logging units were designed for more sophisticated cable yarding machines which were capable of reaching farther out into units. This reduced the need to construct roads to harvest these units.

The Medford District BLM operated under the MFP from 1980 through 1993. During this time, harvesting occurred on approximately 5,700 acres with a distribution of treatments including selective cutting, overstory removal, mortality salvage, shelterwood and clear-cutting. The clear-cut and shelterwood units were planted with Douglas-fir, ponderosa pine, or both following harvest.

Approximately 1,600 acres of overstory removal was completed in these watersheds. These treatments were applied in stands where past selective or mortality salvage had created openings where natural seeding occurred and a young stand of trees became established in the understory. Overstory removal harvested the remaining larger older overstory trees leaving the understory intact and free to grow. Follow up treatments included planting in understocked openings within these units.

1990s to Present

In April 1994, the Record of Decision for the NWFP was signed. The NWFP amended the Medford District ROD/RMP, which was completed in June 1995. The NWFP and ROD/RMP set up a reserve system to protect habitat for the Northern Spotted Owl and other old growth dependent species. The reserve system included designation of Riparian Reserves, 100-acre owl cores, and Late-Successional Reserves throughout the range of the spotted owl. Forest areas outside these reserves and not set aside for other resource values were designated as matrix lands and are available for timber management.
Under the ROD/RMP and NWFP, direction for timber management includes regeneration harvest, commercial thinning, density management, and selection harvest. The ROD/RMP deferred timber harvest in three subwatersheds within the Upper West Fork Evans Creek 6th field watershed

because of high watershed cumulative effects from past harvesting. No timber harvest is proposed within these deferred watersheds under this project.

Since the ROD/RMP only salvage of scattered blowdown on 216 acres following a 1996 wind storm has occurred in the area. Other activities which have occurred on BLM lands in this area are precommercial thinning of plantations, road improvements, and decommissioning of unneeded roads.

3.3 Forest Condition

3.3.1 Methodology

The forest condition information was compiled from a variety of sources. The Medford District Proposed Resource Management Plan/Environmental Impact Statement (PRMP/EIS) provided general vegetation information and management guidance for the Medford District planning area. Research publications provided baseline information specific to forest vegetation and the impacts of managing or not managing forest stands. Geographic information system (GIS) data described the kind, amount and distribution of forest vegetation on BLM administered lands across the watersheds in which the projects are located. Aerial photos from the past forty years were used to assess changes and to determine present forest conditions (structure, canopy cover, size classes) on all land ownerships within the project area. Field visits (stand exams) provided stand specific data related to tree density, structure, composition and general stand health. Combining this information with the management objectives from the PRMP/EIS and the interdisciplinary environmental assessment team, alternatives were designed.

3.3.2 Assumptions

Timber management activities would occur on BLM-administered lands allocated to planned, sustainable harvest. The type, quantity, and impacts of timber management activities were analyzed in the Medford PRMP/EIS for both the short- (10 years) and long-term (decades). Local climate patterns of historic record and related conditions for plant growth would continue. Most private forestlands would be intensively managed with final harvest on commercial economic rotations averaging 60 years (USDI 1994, 4-5).

3.3.3 Affected Environment

3.3.3.1 Introduction

Elevation, slope, aspect, precipitation, soil type, and periodic disturbance events (fires, insects, and disease) are the primary environmental factors that determine the presence, abundance, and structural characteristics of forest plant communities. Within the project area, the plant communities have been altered by previous management activities and fire exclusion. Both activities have changed the size, diversity, and arrangement of forest vegetation and have created a mosaic of stands of varying densities and developmental stages across the landscape.

The Douglas-fir and white fir plant series are the most common forest plant classifications in the project area (USDA 1996). Ponderosa pine, sugar pine, and incense-cedar make up a small percentage of the overstory tree canopy, with Douglas-fir the dominant overstory as well as understory tree species. Madrone and black oak are the main hardwood species. Shrub species present in varying amounts are oceanspray, hazel, deerbrush ceanothus, Oregon grape, poison oak, and vine maple. Where repeated high intensity fires have occurred, knobcone pine is present, either as a scattered stand component or in small, dense, even-age stands. Where even-aged stands of knobcone pine occur, the site quality is generally poor as soils are typically shallow and infertile.

Landscape patterns (structure, amount, and spatial arrangement) of forest stands have shifted from larger contiguous stands of late-successional forests to a patchy mosaic of young and late-successional stands. Landscape patterns influence hydrology, movement and dispersal of organisms, microclimate, and the behavior of disturbances. As a general indicator of landscape structure and pattern within the project area, Table 3-1 shows the estimated amount of forest stand age classes and seral stages within the Upper West Fork Evans Creek 6th field sub watershed. The pattern of seral stages provides a basis of comparison between historic and current landscape conditions. Using the current landscape conditions, a baseline for the amount of old growth stands present in the Upper West Fork Evans Creek 6th field subwatershed can be determined.

Seral stages are a series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage. There are five stage:, early, mid-, late, mature, and old growth (PRMP/EIS, 1994).

Table 3-1. Stand Age Classes and Seral Stages in the Upper West Fork Evans Creek 6th Field Subwatershed

Stand Age Class	Seral Stage	Acres	Percent of Total
0-10	Early	966	6
11-40	Mid-	9,088	57
41-80	Late	1,751	11
81-200	Mature	2,700	17
201+	Old Growth	1,501	9

3.3.3.2 Plant Series

Plant series is a major stratification of habitat named after the dominant plant species in the final stage of ecological succession.

The Douglas-fir plant series is the most common forest plant classification in the project area (USDA 1996). Ponderosa pine, sugar pine, and incense-cedar make up a small percentage of the overstory tree canopy, with Douglas-fir the dominant overstory as well as understory tree species. Madrone and black oak are the main hardwood species. Shrub species present in varying amounts are oceanspray, hazel, deerbrush ceanothus, Oregon grape, poison oak, and vine maple. Where repeated high intensity fires have occurred, knobcone pine is present, either as a scattered stand component or in small, dense, even-age stands. Where even-aged stands of knobcone pine occur, the site quality is generally poor as soils are typically shallow and infertile.

3.3.3.3 Landscape Pattern

Landscape patterns (structure, amount, and spatial arrangement) have shifted from larger contiguous stands of late-successional forests to a patchy mosaic of young and late-successional stands. Landscape patterns influence hydrology, movement and dispersal of organisms, microclimate, and the behavior of disturbances. As a general indicator of landscape structure and pattern within the project area, Table 3-1 shows the estimated amount of forest stand age classes within the Upper West Fork Evans Creek 6th field subwatershed.

The spatial arrangement of these age classes is further controlled by the checkerboard ownership pattern. The BLM administers 59 percent (9,514 acres) of the subwatershed and private timber companies own 40 percent (6,341 acres). Private forest lands are generally dominated by stands 40 years old and less, whereas BLM-administered lands contain the entire range of age classes.

3.3.3.4 Stand Density and Tree Vigor

In the forest stands proposed for treatment, the average relative density is 97 percent. Forest stands with relative densities above 65 percent have reduced tree vigor; higher mortality of suppressed

trees; and a higher susceptibility to insects, disease, and severe fire behavior (Perry 1994; Hann and Wang 1990; Curtis 1982). These conditions reduce stand resiliency and resistance to environmental stresses.

With the loss of the natural thinning effects of wildfire, overstocked, stagnant forest stands have developed. The supply of essential site resources has decreased while the demand has increased. Overstocked stands have more trees than the site has moisture, nutrients, and growing space to sustain. Without adequate resources, tree growth and vigor declines, increasing the probability of tree mortality from insects or disease. Overstocked forest stands and increased fuel accumulations create conditions that increase the potential for stand-replacement wildfires. The existing forest canopy closure in the stands proposed for treatment is 90 to 100 percent. In the event of wildfires, forest stands with a canopy closure of 70 percent or greater have an increased fire spread rate, a higher probability of crown fires, and fires that are more difficult to control.

3.3.3.5 Conifer Growth and Yield

For most sites in southwest Oregon, 100 years (culmination of mean annual increment) is the age at which the average yearly growth in volume of a forest stand has peaked (USDI 1994). To provide a sustained harvest level and to maximize volume growth and yield, regeneration harvesting on matrix lands within the northern general forest management area is planned at 100 years (USDI 1994). Regeneration harvests would replace slow-growing trees with young, fast-growing conifers to provide the optimum rate of growth and maximize volume production.

3.3.3.6 Riparian Reserves

Stand conditions within Riparian Reserves are similar to the density levels, structure, species, and diameter classes found in the upland areas adjacent to the reserves. Moisture availability and microclimate humidity are generally higher in riparian areas immediately adjacent to the stream channel, but decrease with distance and slope away from the channel. Canopy closure within the Riparian Reserves approaches 100 percent with high levels of shade, except for an occasional small opening or recent gap created by snags or windthrown trees. The number of canopy layers is typically two or three with an upper layer of mature overstory conifers; a middle layer of hardwood or conifer species; and a lower layer of hardwoods, shrubs, and suppressed conifers. The Riparian Reserves are generally overstocked with trees greater than 8 inches in diameter or shrubs combined with trees less than 8 inches in diameter. As in the upland areas, high stand densities result in increased intertree competition for limited site resources, reduced tree vigor, and slower growth rates. The lower level vegetation in the dense stands increases fire risk by providing the ladder fuels to move the fire from the ground to the tree crowns.

3.3.3.7 Old Growth Forest Stands

The structural complexity of these forests provides a diversity of habitats for a variety of late-successional organisms and old growth dependent species. Old growth forest stands on BLM-administered lands are defined as at least 200 years old (USDI 1994). Old growth stands are further defined as intact or modified old growth stands (USDI 1994). Intact stands have not been altered by logging and are considered to have a higher level of biological integrity than old growth stands that have been modified by logging. Characteristics of intact old growth stands include, high canopy closure; a multilayered, multi-species canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground (USDI 1995). Modified old growth stands retain some but not all of the structural and functional characteristics of intact old growth forest stands. Intact old growth stands and to a lesser degree, modified old growth forests, perform important ecological functions, such as microclimate buffering during seasonal climatic extremes, food production for consumer organisms that occupy late-successional forests, carbon storage, nutrient and hydrological cycling, and sources of arthropod predators and organisms beneficial to other ecosystems or successional stages (FEMAT 1993).

Prior to fire exclusion, wildfires in old growth forests were more frequent, less intense and an important disturbance event that influenced species composition and stand densities. With fire suppression, forest stands have become overstocked with shrubs, smaller trees, and accumulated fuels. As a result, tree vigor has declined and the potential for stand-replacement wildfires has increased.

In the Upper West Fork Evans Creek 6th field subwatershed, 1,501 acres are classified as forest stands 200 years old or greater. Of that amount, 924 acres have been partially logged over the past 40 years. The remaining 577 acres have not been logged and are described as intact old growth stands.

3.3.4 Environmental Consequences

Table 3-2. Comparison of Effects on Forest Condition from All Alternatives	
Issue: Forest Condition	
Past Actions	• Management activities on public and private lands create a mosaic of stand ages • Fire exclusion has altered stand structure; tree density levels have increased and growth rates have declined • Older slow-growing stands replaced by fast-growing conifer plantations • Forested riparian areas treated the same as upland sites; minimal or no riparian buffers
Present Actions	• Density reduction treatments increase tree vigor and growth and reduce tree susceptibility to insect and disease attack • Regeneration harvests change late-successional stands to early seral conditions
Current Conditions	• Landscape dominated by younger seral stages. • High stand densities and competition for site resources • High growth rate per tree in conifer plantations • Growth and yield rates have peaked in mature and modified old growth stands • Declining growth and vigor of white fir and Douglas-fir in laminated root rot pockets
Future Actions	• Private forest lands intensively managed at short rotations of about 60 years • Silvicultural treatments applied to young, mid-, and late seral stands (1 to 80 years) to accelerate late-successional forest conditions • BLM-administered lands follow management guidelines from the PRMP/EIS; regeneration harvests in stands >100 years and density management in stands < 100 years • At the 6th field watershed scale, regeneration harvests would reduce stand structural components, lower biological diversity, and increase habitat fragmentation

Table 3-2. Comparison of Effects on Forest Condition from All Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Proposed Actions	• Current pattern of seral stages on BLM-administered lands remain the same • Stand densities remain high and continue to increase • Intense competition for site resources result in a decline in tree vigor and limited conifer growth potential • Growth rates in mature and modified old growth stands remain stagnant or decline with tree mortality expected to increase • Laminated root rot infected stands not treated. Mortality and wind-throw of infected trees increase	• 190 acres of regeneration harvest changes mature and modified old growth stands to early seral stands • 207 acres of density reduction treatments increase tree vigor and growth and reduce tree susceptibility to insect and disease attack • The pattern of seral stages on BLM-administered lands changes • Growth rates of planted conifers high due to low intertree competition and high crown ratios • Stands affected by laminated root rot treated to slow pathogen spread	• 35 acres of regeneration harvests • 257 acres of density reduction treatments increase tree vigor and growth and reduce tree susceptibility to insect and disease attack • The pattern of seral stages on BLM-administered lands changes • Growth rates of planted conifers high due to low intertree competition and high crown ratios • Stands affected by laminated root rot treated to slow pathogen spread	• No regeneration harvest • 187 acres of density reduction treatments increase tree vigor and growth and reduce tree susceptibility to insect and disease attack • The pattern of seral stages on BLM-administered lands changes • Growth rates of planted conifers high due to low intertree competition and high crown ratios • Laminated root rot infected stands not treated. Mortality and wind-throw of infected trees increases
Cumulative Effects	• Checkerboard ownership pattern continues landscape fragmentation and shift to younger stands • High stand densities reduce resiliency to environmental disturbances • On BLM-administered land, no late-successional stands harvested; canopy and structure unchanged • PRMP/EIS timber management assumptions and forest condition projections are not implemented	• Checkerboard ownership pattern continues landscape fragmentation and shift to younger stands • 392 acres treated • Density reduction treatments lower stand densities and increase stand resiliency to environmental disturbances • Loss of late-successional habitat and increased fragmentation • PRMP/EIS timber management assumptions and forest condition projections are implemented	• Checkerboard ownership pattern continues landscape fragmentation and shift to younger stands • 292 acres treated • Density reduction treatments lower stand densities and increase stand resiliency to environmental disturbances • Less fragmentation and higher connectivity between stands. • PRMP/EIS timber management assumptions and forest condition projections not fully met	• Checkerboard ownership pattern continues landscape fragmentation and shift to younger stands • 187 acres treated • Density reduction treatments lower stand densities and increase stand resiliency to environmental disturbances • Fewest acres of late-successional acres converted to early successional stands • Less fragmentation and higher connectivity between stands • PRMP/EIS timber management assumptions and forest condition projections not fully met

Table 3-2. Comparison of Effects on Forest Condition from All Alternatives				
Issue: Old Growth Habitat				
Past Actions	• Have reduced the levels of intact old growth stands and replaced them with early seral stands or modified them by partial harvesting • Structural complexity and biological integrity provided by intact old growth stands reduced from historic levels			
Present Actions	• Regeneration harvests reduces levels of old growth (intact and modified) stands			
Current Conditions	• Growth and yield rates have peaked in intact old growth stands; tree vigor and growth rates stagnant or declining • 1,501 acres (9%) of old growth stands existing in Upper West Fork Evans Creek 6th field; 577 acres are intact old growth and 924 acres are modified old growth			
Future Actions	• PRMP/EIS guidelines provide for regeneration harvest on matrix lands in stands >100 years			
Proposed Actions	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
	• No old growth stands proposed for treatment • Biological integrity of these stands not affected by management actions	• Regeneration harvest proposed on 165 acres (11%) of old growth forest stands; 125 of these proposed acres are intact old growth stands	• Regeneration harvest proposed on 20 acres (1%) of old growth forest stands; proposed acres are all intact old growth stands	• No regeneration harvest proposed on old growth forest stands; no harvest proposed on intact old growth stands • Biological integrity of these stands not affected by management actions • Selection harvest proposed on 40 acres of modified old growth stands
Cumulative Effects	• Areas of old growth acres maintained on BLM lands • Without logging or fire, there would be a gradual increase of old growth stands as stands less than 200 years age continue to age and develop old growth characteristics	• Reduction of structural components, lower biological diversity and increased habitat fragmentation on 165 acres of old growth forest stands • Old growth characteristics would be reduced on 1% of the total acres and 11% of the old growth acres in the 6th field watershed	• Reduction of structural components, lower biological diversity and increased habitat fragmentation on 20 acres of old growth forest stands • Old growth characteristics would be reduced less than 1% of the total acres and 1% of the old growth acres in the 6th field watershed	• Areas of old growth acres maintained on BLM lands • Structural and biological diversity associated with intact old growth stands maintained

3.3.4.1 Effects of Alternative 1 (No Action) on Forest Condition

Direct and Indirect Effects

In Alternative 1, stand densities would remain high and continue to increase. Intense competition for limited site resources would result in a decline in tree vigor and limited conifer growth potential. Growth rates would remain stagnant or decline with tree mortality expected to increase. Declining tree vigor and growth reduces a tree's ability to resist a variety of damaging agents (Franklin, et al. 1987). A higher risk of insects, diseases, and wildfire due to high stand densities and fuel load would be expected (ODF 1990; Powell 1999; Filip 1998). In the absence of

disturbance events, such as wildfire or density management, the number of trees per acre would remain at levels above the carrying capacity of the site (Oliver 1996). Stand canopy closure would remain at 90 to 100 percent.

Stand resiliency to disturbance events, including drought, insects, wildfire, and climate change, would remain low. Continued high stand densities, high surface and ladder fuels, and low tree vigor would tend to magnify rather than buffer the effects of disturbance events (Perry 1995). In the event of a wildfire, greater detrimental effects to soils, wildlife habitat, forest structure, and watershed processes would potentially occur, resulting in a longer restoration and landscape recovery period (Brown 2000; USDA 2000).

Mortality rates of large sugar and ponderosa pines would remain at levels higher than historic rates. Fire exclusion has reduced the extent and frequency of wildfires that naturally thinned the understory. Without density control, competition for limited site resources between dense understories and large overstory pines would increase. This competition would lead to reduced tree vigor and an increased susceptibility of large sugar and ponderosa pines to beetle infestation. Mortality of large pine species would result in the loss of a valuable genetic and structural legacy. Of particular importance are large healthy ponderosa pines tolerant of wildfire and drought (Agee 1993; Habeck 1992). Deep root systems allow these species to access soil moisture deeper in the ground (Wenger 1984; Burns and Honkala 1990). This ability to get to deeper water sources, increases drought tolerance and may also increase the probability of pine species persisting in the event of potential climate change.

Ecological processes would continue in old growth stands, though the processes would be modified by the effects caused by fire exclusion. Stand level processes include tree growth and maturation; death and decay of large trees; understory tree establishment; canopy gap closure; and low to moderate disturbances, such as fire, insects, and disease, which create canopy openings. Historically, wildfires played an important role in the development and maintenance of old growth stands. Frequent, low intensity wildfires influenced species composition, density levels, and within-stand structural diversity. In the absence of fire, fuel load, vegetative biomass, and competition for site resources has increased, resulting in lower tree vigor and decreased stand resistance to insects and disease. These physical and biological changes have affected the stability and the developmental pathway of these older stands. In the short-term, the amount of intact and modified old growth would not change from present levels. In the long-term, without logging or wildfire, a gradual increase of old growth would occur as mature stands grow older and develop old growth characteristics.

Cumulative Effects

Past Actions - Timber harvesting has altered the structure, amount, and spatial arrangement of forest vegetation from larger contiguous stands of late-successional (mature and old growth seral stages) forests to a patchy mosaic of young and late-successional stands. During the past 80 years, the amount of conifer stands 80 years old and greater has declined in the Upper West Fork Evans Creek 6th field subwatershed from 50 to 70 percent to approximately 25 percent. The impacts of these past entries include forest fragmentation, simplification of stand structure, and reduced habitat diversity. Forest ecosystems that are highly fragmented and have simplified stand structures are less resistant and resilient to environmental stresses, such as wildfire, insects, and disease.

Since the implementation of the PRMP/EIS in 1994, approximately 216 acres of BLM-administered lands have been logged within the Upper West Fork Evans Creek 6th field subwatershed. Mortality salvage occurred on all these acres.

Fire exclusion since the early 1900s has contributed to development of high stand densities. With the exclusion of fires, forest stands have become overstocked with shrubs, smaller trees, and accumulated fuels. As a result, tree vigor has declined and the potential for stand-replacement wildfires has increased.

Present Actions - There are no active timber sales on BLM-administered lands in the Upper West Fork Evans Creek 6th field subwatershed. On private industrial lands, no active logging is taking place at this time.

Future Actions - No future commercial timber sales are currently planned by the BLM in the Upper West Fork Evans Creek 6th field subwatershed in the next five years. Reevaluation of the cumulative effects from past management activities in three deferred 7th field watersheds within the Upper West Fork Evans Creek watershed may occur within the next five years. Depending on the findings of this analysis, management activities may or may not be proposed. Noncommercial treatments, such as brushing and precommercial thinning may occur. These treatments would reduce vegetative competition, increase conifer growth, and accelerate stand development toward older more complex stands. Depending on how much of the precommercial thinning slash is treated, stand susceptibility to wildfire may increase or decrease.

On private industrial forest lands, logging plans are unknown. In stands with an average diameter of 8″ DBH and greater, commercial logging is expected within the next 5 to 10 years. Silvicultural methods (clear-cutting and overstory removal) that create early seral stands would most likely be used. In stands less than 8″ DBH, little commercial logging is expected in the next 15 to 20 years. Within these stands, brush control and precommercial thinning are the two primary management activities most likely to occur, both of which would reduce stand densities and increase conifer growth. Depending on whether the precommercial thinning slash is treated, stand susceptibility to wildfire may increase or decrease. The number of acres that would be treated over the next 10 to 15 years is unknown.

Cumulative Effects - Stand densities on BLM-administered lands would continue to increase, further reducing the vigor and resiliency of forest stands to environmental disturbances. Tree growth and vigor would not be maximized as competition for limited site resources would remain high. On private lands, harvesting would continue and result in the conversion of older stands to early seral stands, with conifers planted to maximize growth and yield. Most private forestlands would be intensively managed with final harvest on commercial economic rotations averaging 60 years (PRMP, 1994). Within the planning area, the estimated condition of forest stands in relation to their range of natural variation would not change. The rate of tree mortality, stand growth and vigor, and species composition would remain outside of the range of natural conditions with the trend of forest conditions on BLM-administered lands continuing to deteriorate (USDI 1994, 3-18).

No regeneration harvests would occur. Growth rates in these stands would remain low and tree mortality due to insects, disease, or low tree vigor would be at higher than normal levels (PRMP/EIS, 1994). The amount of old growth stands on BLM-administered lands in the Upper West Fork Evans Creek 6th field subwatershed would remain the same. In the long-term, without logging or wildfire, a gradual increase of old growth stands in the watershed would occur as stands less than 200 years old continue to age and develop old growth characteristics. An increase in old growth stands would enhance the seral stage mixture toward older more structurally complex and biologically diverse stands.

This alternative (No Action) would not meet the timber management assumptions and forest condition projections provided for in the Medford District PRMP/EIS.

3.3.4.2 Effects on Forest Condition Common to All Action Alternatives

Direct and Indirect Effects

Stands identified for density management and progeny test site renovation would have smaller and less vigorous trees harvested. The development of larger diameter and taller trees would be accelerated and the characteristics of a mature stand would develop faster (Bennett and Maquire 1995; Duncan 2002; Emmingham and Elwood 2002). Maintaining larger trees with fuller crowns would provide sufficient tree canopies to reduce vegetative competition from brush and hardwoods. Stand vigor and individual tree size would be increased with density levels at full site occupancy.

In the selection harvest, density management, and progeny test site renovation stands, the number of trees per acre would be reduced toward levels the site has water and nutrients to sustain. Forest stand susceptibility to insect attack, disease infection, and fire would be expected to be reduced (Oliver, et al. 1996). Depending on tree size, approximately 50 to 200 trees per acre would remain. The healthiest large conifers and hardwoods would be maintained by reducing adjacent competing vegetation, insuring the long-term ecological benefits of large trees are present within the landscape for the foreseeable future. An increase in tree growth would occur once the root systems of the residual trees expand (approximately 5 to 10 years) and are able to utilize moisture, nutrients, and additional growing space. Tree crowns would increase in size and photosynthetic area, with stand crown closure increasing approximately 10 percent every 5 years (based on Organon growth and yield projections) until full canopy closure is reached (Hann 2003). Carbon uptake, pollen production, and the production of viable seeds would also increase as tree vigor increases (USDOE 1999; Kramer and Kozlowski 1979). Treating stands would result in vigorous, healthy stands and a landscape resilient to environmental changes.

Canopy closure in the density management and progeny test site renovation stands would be decreased from 80 to 100 percent to 40 to 60 percent. In density management stands, conifer and hardwood species diversity would be present with drought-tolerant species favored for retention. Additionally, the potential for a high intensity wildfire would be reduced as average tree size increases, total vegetative biomass decreases, and surface fuels are treated (Graham, et al. 1999; Agee 1996; Pollet and Omi 2002).

All treatments would favor large healthy sugar and ponderosa pine by reducing competing trees. This reduction in competition would result in increased tree vigor, decreased mortality, and the conservation of a unique genetic and structural stand component (Latham and Teppeiner 2002).

Approximately 450 acres of lands designated as Matrix and 130 acres of Riparian Reserves are proposed for fuels density management. Shrubs would be slashed and small trees less than 7″ DBH would be thinned. The slash created from these activities would be piled and burned. Stand canopy closure would be reduced by 10 to 20 percent. The reduction of vegetative biomass and small tree densities would increase crown base heights, reduce ladder fuels, and provide additional site resources (moisture and nutrients) for residual trees. These changes would lower fire intensity in the event of a wildfire and increase vigor of residual trees. Specific to Riparian Reserves, tree vigor and conifer growth rates would improve and accelerate the development and growth of large diameter trees that are important for shading, stream structure and channel protection.

Roads identified for full decommissioning would have the road bed tilled, mulched, and planted to reestablish conifer species. Removal of the compacted surface would increase site productivity and provide suitable growing conditions for planted conifers and the establishment of native vegetation. Canopy cover would slowly form and blend in with adjacent stands. Roads identified for partial decommissioning would not be tilled or planted. Soil compaction on those road beds would continue to limit the establishment and growth of trees, shrubs, and herbaceous vegetation.

No effects on forest conditions are expected from culvert replacement for fish passage, roadside stabilization, and pump chance renovation.

Cumulative Effects

Density reduction treatments (density management, selection harvest, fuels density management, and progeny test site renovation) would reduce competition related mortality, increase tree vigor and growth, and maintain preferred species. With these changes, the trend of forest conditions in the treated stands would improve and approach the range of natural variation associated with the plant series, leading to more complex stand structures. With an increase in tree vigor, the treated stands would be less susceptible to insects and disease. This treatment combined with past, present and future density reduction treatments in the watershed would improve stand and landscape resistance and resiliency to environmental disturbances.

On private lands, harvesting would continue and result in the conversion of older stands to early seral stands, with conifers planted to maximize growth and yield. Most private forestlands would be intensively managed with final harvest on commercial economic rotations averaging 60 years (PRMP 1994). At the watershed scale, regeneration harvests would reduce stand structural components, lower biological diversity, and increase habitat fragmentation. Forest ecosystems that are highly fragmented and have simplified stand structures are less resistant and resilient to environmental stresses, such as wildfire, insects, and disease.

3.3.4.3 Effects of Alternative 2 on Forest Condition

Table 3-3. Silviculture Treatments in Alternative 2 within Matrix and Riparian Reserves

Silvicultural Treatment	Matrix Treatment Acres	Riparian Reserves Treatment Acres
SGFMA Regeneration	125	0
NGFMA Regeneration	65	0
Selection Harvest	35	0
Density Management	160	0
Progeny Test Site Renovation	12	0
Fuels Density Management	485	130
Total treatment acres	**882**	**130**

Direct and Indirect Effects

Approximately 190 acres are proposed for regeneration harvest. These stands are above the age of culmination of mean annual increment and have passed the point of optimum wood production. To maximize the volume growth capability of the site, slow-growing trees would be harvested and young, fast-growing conifers would be established. Stands identified for regeneration harvests would retain variable levels of healthy, large green trees greater than 20″ DBH. Canopy closure would be reduced to 10 to 40 percent, depending on the level of green tree retention. SGFMA regeneration harvest would leave 16 to 25 trees per acre greater than 20″ DBH with a residual canopy closure of 25 to 40 percent. NGFMA regeneration harvest would leave 6 to 8 trees per acre greater than 20″ DBH with a residual canopy closure of 10 to 15 percent. Retained overstory trees and down logs would provide for structural and biological legacies (Franklin 1992; Hansen, et al. 1991; Hunter 1995). Herbaceous, shrub, and tree species composition would be shifted toward shade-intolerant and drought-tolerant species. Snags and coarse woody debris would remain to provide habitat for wildlife, invertebrate, microbial, and fungal species, as well as provide important ecological functions such as moisture retention, soil stabilization, and nutrient recycling (Harmon and Hua 1991; Franklin, et al. 1987). Surface fuels created during management activities would be treated to minimize wildfire risk. The species mix and density level of planted trees would trend toward the plant communities and stocking levels historically present. The impact of regeneration harvests would be the loss of large diameter trees, multiple canopy layers, and high canopy closure for a period of about 80 years. After 80 years, these late-successional characteristics would begin to redevelop.

Of the 1,500 acres of old growth stands within the project area, 11 percent (165 acres) would be converted to early seral stands through regeneration harvest. Of the 165 acres, 125 acres of regeneration harvest would occur in intact old growth. This represents 22 percent of the intact old growth stands in the Upper West Fork Evans Creek 6th field subwatershed. Fuels density management in old growth stands would reduce the amount of shrubs and small trees (7″ DBH and less) in the understory layer. Minimal structural, vegetative, or ground-disturbing impacts would occur. These old growth stands would benefit from reduced competition and more site resources available for the residual trees.

Density reduction treatments (density management, selection harvest and progeny test site thinning) would increase the vigor, growth and structural development of treated stands. Stand and landscape resistance and resiliency to environmental disturbances (drought, insects and disease) would increase. In the Upper West Fork Evans Creek 6th field subwatershed, selection harvest would occur on 35 acres, density management on 160 acres, and progeny test site thinning on 12 acres for a combined total of 207 acres, or 1 percent of the acres within the watershed. Density reduction treatments would increase the vigor, growth, and structural development in treated stands. See Section 3.3.4.2, Effects on Forest Condition Common to All Action Alternatives, Direct and Indirect Effects, for detailed descriptions of direct and indirect effects of density reduction treatments.

On 485 acres of lands designated as Matrix and 130 acres of Riparian Reserves, vegetation (ladder fuels) would be modified to reduce wildfire risk. Trees and shrubs 7″ DBH and less would be treated to reduce the risk of fires moving from the ground into the tree crowns. Reduced density levels would also benefit the development and growth of residual trees. The treatment acres represent 4 percent of the acres within the watershed.

Cumulative Effects

Regeneration harvest would add to past and present actions by further reducing the amount of forest stands 80 years and older in the watershed. At the watershed scale, regeneration harvests would reduce structural components, lower biological diversity, and increase habitat fragmentation. Forest ecosystem sustainability is dependent on maintaining components, structures, and processes that have developed and adapted over extended periods of time. In the Upper West Fork Evans Creek 6th field subwatershed, 165 acres of old growth forest stands would be converted to early seral stands. This equals 1 percent of the total acres within the watershed and 11 percent of the old growth stands within the watershed (see Section 3.3.4.2, Effects on Forest Condition Common to All Action Alternatives, Cumulative Effects, for additional information).

Stands identified for regeneration harvests (SGFMA and NGFMA) are at the biological age at which the average annual growth in volume of the stand has culminated. Following regeneration harvest, the growth and vigor of planted trees would be maximized due to low vegetative competition and high crown ratios. The species mix and density levels of planted trees would be within the range of natural conditions for the plant series.

At the larger spatial scale of the planning area (Medford District), it was projected that implementation of the PRMP/EIS would result in an increase from present levels of late-successional stands on BLM-administered lands over the next 10, 20, 30, and 100 years (USDI 1994, 4-26). Regeneration acres would be offset by in-growth of stands into the late-successional classification. In the long-term (100 years), the ratio of older forests to younger forests would increase and more closely approximate the balance of seral stages which is thought to have existed on BLM-administered lands prior to grazing, logging, and fire suppression (USDI 1994, 4-24).

Density reduction treatments, including fuels density management, would occur on 775 acres or about 4 percent of the Upper West Fork Evans Creek 6th field subwatershed. At this level of treatment, the impacts of density reduction on forest stands within the watersheds would be considered minor (see Section 3.3.4.2, Effects on Forest Condition Common to All Action Alternatives, Cumulative Effects).

3.3.4.4 Effects of Alternative 3 on Forest Condition

Table 3-4. Silviculture Treatments in Alternative 3 within Matrix and Riparian Reserves

Silvicultural Treatment	Matrix Treatment Acres	Riparian Reserves Treatment Acres
SGFMA Regeneration	35	0
NGFMA Regeneration	0	0
Selection Harvest	90	0
Density Management	155	10
Progeny Test Site Renovation	12	0
Fuels Density Management	490	130
Total treatment acres	**782**	**140**

Direct and Indirect Effects

Regeneration harvest on 35 acres of mature and old growth stands would decrease canopy closure and stand structure, and change the vegetative composition toward species found in younger, less complex stands. Individual conifer tree growth would be maximized with stand density maintained at levels the stand has resources (moisture, nutrients, and sunlight) to support. The proposed regeneration harvest acres would be less than the levels prescribed for (based upon stand age) and allowed under the NWFP and the Medford District ROD/RMP.

Density reduction treatments (selection harvest, density management, and progeny test site thinning) would increase the vigor, growth, and structural development of treated stands. Stand and landscape resistance and resiliency to environmental disturbances (drought, insects and disease) would increase. In the Upper West Fork Evans Creek 6th field subwatershed, selection harvest would occur on 90 acres, density management on 155 acres, and progeny test site thinning on 12 acres for a combined total of 257 acres, or 1 percent of the acres within the watershed. Density reduction treatments would increase the vigor, growth, and structural development in treated stands. Stand and landscape resistance and resiliency to environmental disturbances would increase (see Section 3.3.4.2, Effects on Forest Condition Common to All Action Alternatives, Direct and Indirect Effects for detailed descriptions of direct and indirect effects of density reduction treatments).

On 485 acres of lands designated as Matrix and 130 acres of Riparian Reserves, vegetation (ladder fuels) would be modified to reduce wildfire risk. Trees and shrubs 7″ DBH and less would be treated to reduce the risk of fires moving from the ground into the tree crowns. Reduced density levels would also benefit the development and growth of residual trees. The treatment acres represent about 4 percent of the acres within the watershed.

In 2 forest stands, parts of 3 Riparian Reserves (10 acres) would be thinned. No-cut buffers would be established adjacent to the stream with the remaining portion of the Riparian Reserve treated. Trees and shrubs less than 20″ DBH would be thinned to reduce densities. The slash created from these activities would be piled and burned. Residual stand canopy closure would be approximately 50 percent. The reduction of vegetative biomass and tree densities would provide additional site resources (moisture and nutrients) for residual trees. These changes would increase tree vigor and accelerate the growth and development of larger conifer trees.

Approximately 1 percent (20 acres) of the 1,500 acres of old growth stands within the Upper West Fork Evans Creek 6th field would be converted to early seral stands. These 20 acres are considered intact old growth stands, which represents 3 percent of the intact old growth stands in the 6th field.

Cumulative Effects

Regeneration harvest would add to past and present actions by further reducing the amount of forest stands 80 years and older in the watershed. At the larger spatial scale of the planning area, 35 acres of regeneration harvest would not cause a decrease in the total amount of late-successional stands on BLM-administered lands. The 35 acres of regeneration harvest would be offset by the in-growth of stands into the late-successional classification. At the watershed scale, regeneration harvests would reduce structural components, lower biological diversity and increase habitat fragmentation. Forest ecosystem sustainability is dependent on maintaining components, structures, and processes that have developed and adapted over extended periods of time.

In the Upper West Fork Evans Creek 6th field subwatershed, 20 acres of old growth forest stands would be converted to early seral stands. This equals .001 percent of the total acres within the watershed and 1 percent of the old growth stands within the watershed. The impact of this amount of regeneration harvest at the watershed scale is considered minor (see Section 3.3.4.2, Effects on Forest Condition Common to All Action Alternatives, Cumulative Effects, for additional information).

Implementation of this alternative would not meet the timber management assumptions and forest condition projections detailed in the Medford District ROD/RMP. The ROD/RMP modeled harvest levels and projected future stand ages within the planning area based on the assumption that stands within NGFMA on matrix lands 100 years or older would be programmed for a regeneration harvest. This alternative does not use stand age as the sole criteria for prescribing regeneration harvests. Stand structure (canopy closure, species diversity, and variability of tree size classes), stand density, and tree condition (crown ratio, form, and foliage color) are the principal characteristics used to assess stand health. The silvicultural systems were determined based on the condition of these attributes and combined with the recommendations from the watershed analysis. Density reduction treatments, including fuels density management would occur on 775 acres or about 5 percent of the Upper West Fork Evans Creek 6th field subwatershed. At this level, the impacts of density reduction on forest stands within the watersheds would be considered minor (see Section 3.3.4.2, Effects on Forest Condition Common to All Action Alternatives, Cumulative Effects).

3.3.4.5 Effects of Alternative 4 on Forest Condition

Table 3-5. Silviculture Treatments in Alternative 4 within Matrix and Riparian Reserves

Silvicultural Treatment	Matrix Treatment Acres	Riparian Reserves Treatment Acres
SGFMA Regeneration Harvest	0	0
NGFMA Regeneration Harvest	0	0
Selection Harvest	25	0
Density Management	150	0
Progeny Test Site Renovation	12	0
Fuels Density Management	495	130
Total treatment acres	**682**	**130**

Direct and Indirect Effects

No regeneration harvest would occur under Alternative 4. No old growth forest stands would be changed to early seral conditions on BLM-administered lands. As a result, greater stand canopy closure, forest structure, and connectivity would remain within the landscape. The regeneration harvest acres would be less than the levels prescribed for (based upon stand age) and allowed under the NWFP and the Medford District ROD/RMP.

Density reduction treatments (selection harvest, density management, and progeny test site thinning) would increase the vigor, growth and structural development of treated stands. Stand and landscape resistance and resiliency to environmental disturbances (drought, insects, and disease) would increase. In the Upper West Fork Evans Creek 6th field subwatershed, selection harvest would occur on 25 acres, density management on 150 acres, and progeny test site thinning on 12 acres for a combined total of 187 acres, or 1 percent of the acres within the watershed. Density reduction treatments would increase the vigor, growth, and structural development in treated stands. Stand and landscape resistance and resiliency to environmental disturbances would increase (see Section 3.3.4.2, Effects on Forest Condition Common to All Action Alternatives, Direct and Indirect Effects" for detailed descriptions of direct and indirect effects of density reduction treatments).

On 505 acres of lands designated as Matrix and 130 acres of Riparian Reserves, vegetation (ladder fuels) would be modified to reduce wildfire risk. Trees and shrubs 7″ DBH and less would be treated to reduce the risk of fires moving from the ground into the tree crowns. Reduced density levels would also benefit the development and growth of residual trees. The treatment acres represent 4 percent of the acres within the watershed.

Less than 3 percent (40 acres) of the old growth stands in the project area would receive silvicultural treatment. Selection harvest would reduce stand densities by removing low vigor trees across all size classes. These stands would retain many of the structural components (vigorous large trees, snags, coarse woody debris, canopy gaps, vertical structure, vegetative diversity, and a high level of canopy closure) of an old growth forest and many of the ecological processes and functions inherent to old growth forest stands would remain.

Cumulative Effects

Density reduction treatments, including fuels density management, would occur on 785 acres or about 5 percent of the Upper West Fork Evans Creek 6th field subwatershed. At this level, the impacts of density reduction on forest stands within the watersheds would be considered minor (see Section 3.3.4.2, Effects on Forest Condition Common to All Action Alternatives, Cumulative Effects).

Implementation of this alternative would not meet the timber management assumptions and forest condition projections detailed in the Medford District ROD/RMP. The ROD/RMP modeled harvest levels and projected future stand ages within the planning area based on the assumption that stands within NGFMA on matrix lands 100 years or older would be programmed for a regeneration harvest. This alternative does not use stand age as the sole criteria for prescribing regeneration harvests. Protection of areas of high biological integrity was the primary objective with no regeneration harvest of old growth forest stands proposed.

3.4 Soil

3.4.1 Methodology

The BLM West Fork Evans Creek Watershed Analysis (USDI 1994) was the primary source of information for the affected environment. GIS was also used for analyzing the existing conditions of the 6th field watershed. GIS was used to identify soils in the project area and the Soil Survey of Jackson County, Oregon (SSJC) was used to characterize soils in the project area.

The scale used in this analysis is the 6th field subwatershed level and the 7th field drainage level. The 5th field watershed is used to describe general conditions of the watershed. The temporal scale being used is both short-term (1 to 5 years) and long-term (10 to 30 years). Cumulative effects analysis would look at longer time scales when describing the events leading up to the current conditions.

3.4.2 Assumptions

Designated skid trails spaced at approximately 150′ apart result in compaction of 12 percent or less on a unit-by-unit basis.

3.4.3 Affected Environment

Key points in the project area:

- Fragile Soils
- High road and skid trail density

3.4.3.1 Soil Types

The dominant soil types found within the project area are derived from decomposed granitic and grandioritic rocks (see Map 3). These soils typically have a loose grained sandy loam or loamy sand texture. They are highly erodible and are prone to debris slides and gully erosion from water runoff, particularly when disturbed or left unvegetated. Revegetation is usually difficult due to low organic matter content, low nitrogen levels, and a low water holding capacity. Due to a lack of fine particles in the soil, erosion is common on roads without adequate surfacing.

In T32S, R4W, Section 35 and T33S, R4W, Section 1, the dominant soil types come from metamorphic rocks. These soils are not as erodible as the granitic soils, and management restrictions for granitic soils, such as allowing tractor logging on 20 percent or less slopes, do not apply.

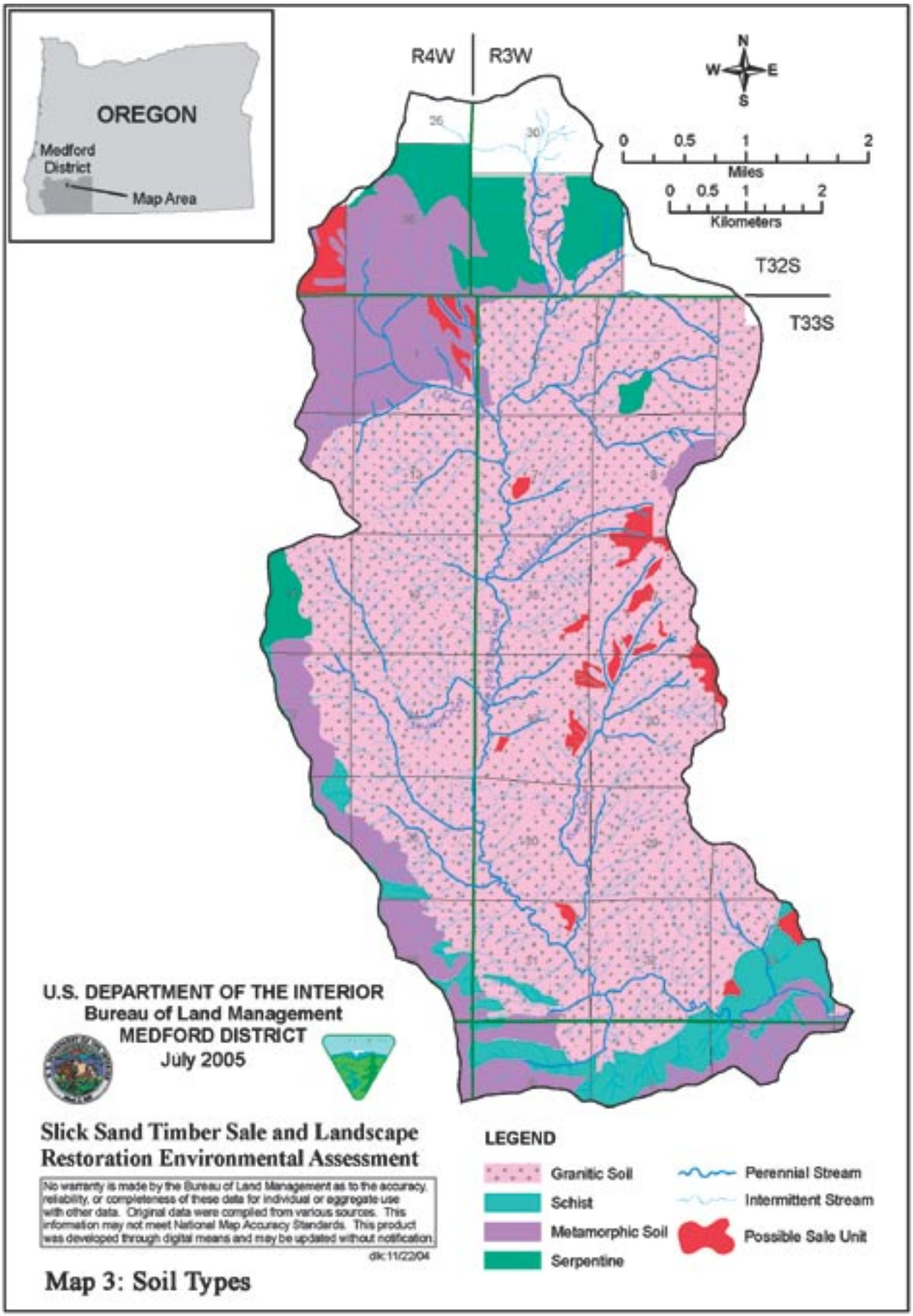
A small portion of the project area has soils derived from schist rocks which are also prone to surface erosion.

3.4.3.2 Fragile Soils

Four categories of fragile soils are identified in Medford District's timber production capability classification (TPCC). Soils derived from granite or schist bedrock with highly erodible soil surface horizons are considered fragile (USDI 1995a, 155). This subwatershed is highly dissected with steep headwalls and sideslopes. These areas have been restricted or withdrawn from management practices through the TPCC system (USDI 1995b, 3).

3.4.3.3 Soil Erosion

An expansive network of roads and skid trails exists along streams and across steep sideslopes where erosion control is most difficult. The road density is high within the Upper North Fork Evans Creek 6th field watershed at 6.2 miles per square mile. Road cut-banks in this subwatershed



Map 3: Soil Types

are subject to erosion due to the granitic soils and lack of vegetation established on the cut-banks. The total number of miles of road cut-banks prone to erosion is unknown, largely in part due to the discontinuous nature of cut-banks and the varying amount of exposed soil. Off-highway vehicle (OHV) use has created a network of trails on highly erodible soils throughout the project area, including on old skid trails, in the powerline corridor, and on road cut-banks. Trails on steep slopes without vegetation are subject to rill and gully erosion.

Erosion of forest soils is a concern because it reduces soil productivity. This reduction of productivity through soil erosion is generally due to decreasing the available soil water for forest growth and through loss of nutrients in eroded sediment (Elliot, et al. 1999).

Sandy loams derived from granitic bedrock make up the majority of soil types in the project area. In general, granitic soils are more prone to erosion than soils derived from metamorphic rock.

The following table lists the types of soils in the subwatershed that would be affected by potential projects. Table 3-4 lists the type of soil, the soil number, the slopes found within that particular soil type, and the parent material from which the soil was derived.

Table 3-4. Soil Types found in the Slick Sand Project Area

Soil Type	Number	Parent Material	Slope
Lettia Sandy Loam	104E 105E	Granitic	12-35%
Norling-Acker Complex	134F	Granitic	35-55%
Steinmetz Sandy Loam	180G 181G	Granitic	35-75%
Tethrick Sandy Loam	193G 194G	Granitic	35-75%
Wolfpeak Sandy Loam	201E	Metamorphic	12-35%
Acker-Dumont Complex	3E 4E	Metamorphic	12-35%
Acker-Norling Complex	5F	Metamorphic	35-55%
Goolaway Silt Loam	72E 72F	Metamorphic	20-35% 35-55%
Kanid-Atring Very Gravelly Loam	94G 95G	Schist	50-80%

The existing amount of soil erosion is the result of past actions that occurred in the Upper West Fork Evans Creek 6th field subwatershed. Past actions have resulted in disturbed soil conditions, such as compaction, erosion, and loss of soil productivity. The major actions in this subwatershed that have resulted in these conditions include timber harvest and road building. Other contributions include powerline construction and maintenance, OHV use, and rural settlement. The soil conditions at the Evans Creek 5th field watershed scale have resulted from these additional actions: urbanization, agriculture, livestock, water withdrawals, and mining.

3.4.3.4 Soil Compaction

Due to the high road density and the extensive network of skid and OHV trails throughout the watershed, soil compaction is a concern. Compaction can increase erosion by locally increasing the amount of runoff which results in a greater risk of erosion.

Past actions that have resulted in the current level of soil compaction in the Upper West Fork Evans Creek 6th field watershed include ground-based timber harvest, road building, landings constructed for timber harvest, powerline road construction and maintenance, and OHV use. These land uses have been shown to cause soil compaction, erosion, and a subsequent loss of soil productivity (Elliot, et al. 1999).

3.4.4 Environmental Consequences

Table 3-5. Comparison of Effects on Soil from All Alternatives				
Issue: Fragile Soils				
Past Actions	• Increased erosion above background levels from timber harvest and road building • Increased compaction from road building and ground based timber harvest • Reduction in soil productivity on compacted acres			
Present Actions	• Increased erosion at slower rates due to less road building and timber harvest • Increased compaction at slower rates than in past due to reduction in road building and ground-based logging • Soil productivity lost on compacted acres			
Current Conditions	• Erosion rates above background levels with majority of erosion related to skid trails, roads, landings, and yarding corridors • Compacted acres from roads, skid trails, and landings • Soil productivity lost or reduced on compacted acres			
Future Actions	• Erosion rates would continue to be above background levels but would be at lower rates than in the past due to BMPs • Additional compaction would occur at slower rates than in the past			
Proposed Actions	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
	• No Action • No management activities related to this alternative • Restoration activities that would reduce erosion would not be completed • No additional compaction from ground-based logging • Compaction would not be reduced from restoration activities • No additional loss or gain in soil productivity	• 22 acres would be tractor logged on fragile soils. Skid trails would be subject to erosion and would add to compaction in the watershed at a very small scale • Compaction would be reduced through restoration activities such as road decommissioning • Soil productivity would not greatly be affected	• 19 acres of tractor yarding would occur on fragile soils. Skid trails would be subject to erosion and would add to compaction in the watershed at a very small scale • Compaction would be reduced through restoration activities such as road decommissioning • Soil productivity would not greatly be affected	• 16 acres of tractor yarding would occur on fragile soils. Skid trails would be subject to erosion and would add to compaction in the watershed at a very small scale • Compaction would be reduced through restoration activities such as road decommissioning • Soil productivity would not greatly be affected
Cumulative Effects	• Fragile soils would continue to erode, especially on skid trails, OHV trails, roads, and landings • Roads, skid trails, and landings would remain compacted with reduced soil productivity on those acres	• Fragile soils would continue to erode, especially on skid trails, OHV trails, roads, and landings • Roads, skid trails, and landings would remain compacted with reduced soil productivity on those acres	• Fragile soils would continue to erode, especially on skid trails, OHV trails, roads, and landings • Roads, skid trails, and landings would remain compacted with reduced soil productivity on those acres	• Fragile soils would continue to erode, especially on skid trails, OHV trails, roads, and landings • Roads, skid trails, and landings would remain compacted with reduced soil productivity on those acres

3.4.4.1 Effects of Alternative 1 (No Action) on Soil

Direct and Indirect Effects

Under the No Action Alternative, no timber harvest, fuels treatments, roadwork, or culvert replacement would occur. Under this alternative, there would be no direct effects from ground disturbance to soils. Overstocked stands would remain in that condition, maintaining the current fire risk. Fires that occur in overstocked stands tend to have higher burn severities. High burn severities destroy the duff layer and damage soils by changing soil structure which can lead to increased levels of erosion. Roads would remain in the current condition and continue to erode. A decrease in funding has caused maintenance levels to drop and roads to become more prone to erosion. Roads that are eroding and exhibiting drainage problems would not be improved under this alternative. Roads would not be decommissioned to help reduce road-related sediment and road density. There would be no roadside stabilization project to help reduce cutbank erosion. Erosion levels would continue at the current trends.

Cumulative Effects

Roads and skid trails have the greatest impact to soils because of the long-lasting effects these disturbances have on soils. Compaction, loss of soil productivity, and erosion have resulted from roads and skid trails found in the subwatershed. Continuation of current management would maintain the current condition of roads and the current level of road-related erosion.
Since 1995, a total of 2,402 acres of timber harvest has occurred on BLM lands in the Evans Creek 5th field watershed: 148 acres using ground-based tractors, 682 acres using cable harvest methods, and 1,573 acres using helicopter. Ground-based tractor logging causes the greatest amount of ground disturbance and would have had the greatest chance of sediment reaching streams as a result.

Private lands are assumed to remain in an early to mid-seral state with the majority of harvest methods being ground-based or skyline with some areas of helicopter. Private lands may use ground-based logging on grounds steeper than 20 percent in granitic soils, resulting in greater risk of erosion. A large network of skid trails on private lands in the Evans Creek 5th field watershed is being used by OHVs.

Future BLM projects within the Evans Creek 5th field watershed could potentially occur across approximately 12,000 acres. It is likely that over half these acres would not have treatments occurring on them due to Riparian Reserves, other buffers, and stands not meeting criteria for treatment. Similar ratios of treatments and harvest methods would be expected as those being considered in this analysis.

3.4.4.2 Effects on Soil Common to All Action Alternatives

In all action alternatives, 12 acres of extremely overstocked progeny test sites would be thinned. A small tractor would be used to complete this project which would cause minor amounts of compaction and displacement. Thinning these 20+ year old stands would have a neutral effect on soils in the project area. Fuels treatments, road improvement, road decommissioning, fish culvert replacement, roadside stabilization, and pump chance renovation projects are essentially the same in all action alternatives. Fuels treatments would include slashing, handpiling, and burning small diameter brush and tree species. These treatments would be completed with hand crews so there would be no ground disturbance from heavy machinery. The piles would be small and well-dispersed throughout the units. The location and size of piles would help to minimize any potential damage to soil from burning of piles. No direct effects on soils would result from this project. Soil compaction would not occur because no heavy machinery would be used. Erosion is not expected due to the size, location, and timing of burning slash piles. The fuels treatments vary by about 20 acres (611 to 632 acres) throughout the alternatives; however, treatments are the same and the effects would be the same at a subwatershed or watershed scale.

One culvert is proposed for replacement to improve fish passage. The removal and replacement of this culvert would likely cause a small amount of sediment to be transported downstream. This would be a short-term impact (hours to days). The sediment would settle in pools and areas of

deposition until it is moved down through the stream system during fall and winter flows. Due to the very low amount of sediment transported this would not change the sediment transport regime. The amount would be minimized by using PDFs and timing the installation to low-flow periods. This project would be beneficial to water quality and the aquatic ecosystem shortly after project completion. Roadside cutbanks and selected fillslopes would be revegetated through hydromulching. This project would occur throughout the watershed on up to 12 miles of road out of a total of 155 miles of road. This would not be a continuous treatment, but a spot treatment on eroding cutbanks identified for stabilization. The establishment of vegetation would stabilize eroding cutbanks and reduce the amount of sediment in ditchlines which eventually is deposited into stream channels. This project would reduce erosion from road cutbanks.

In all action alternatives, approximately 6 miles of road out of approximately 155 miles would be improved. This equates to improving 4 percent of the roads in the subwatershed. Road improvement would include grading, rocking, improving ditchlines, adding cross-drains, and improving culverts. These actions would improve the drainage and condition of roads locally to reduce road-related erosion and subsequent stream sedimentation. Many roads not be used for the timber sale or located on private lands would not be included in this project and would continue to contribute sediment to streams.

Road decommissioning would result in three miles of full decommissioning and one mile of partial decommissioning. This action would reduce road density within the subwatershed from 6.2 miles per square mile to 6.0 miles per square mile. Fully decommissioning roads would include ripping the roadbed which would reduce compaction and increase the rate of infiltration in the road prism. Soil productivity would be improved on the ripped road surfaces. In full and partial decommissioning, cross-drain and stream-crossing culverts would be pulled and roads would be blocked. This action would be beneficial to soils because it would decrease compaction, decrease the amount of open roads and road density, remove the risk of culverts becoming plugged and causing fill slope failures, and reduce the amount of potential erosion from roads. Three pump chances would be renovated to provide better storage of water. These pump chances would be cleaned and the intakes would be improved to allow the pump chances to function properly. This project would have a neutral effect on soils. No compaction or displacement of soils would result from this project.

3.4.4.3 Effects of Alternative 2 on Soils

Direct and Indirect Effects

Under Alternative 2, 380 acres would be harvested throughout the 16,007 acre project area. This equates to 2.5 percent of the 6th field subwatershed being treated. Treatments would be spread across the landscape, minimizing the impacts in any one area. The three main types of harvest methods would be tractor, cable, and helicopter. Generally, tractor causes the most ground disturbance, followed by cable, and helicopter. On granitic soils in the watershed, tractor logging would only be allowed on slopes less than 20 percent gradient (USDI 1995b, 35). Ground disturbance from tractor yarding would be minimized by using designated and existing skid trails.Tractor yarding would occur over a total of 60 acres in this alternative. Tractor logging would occur on 36 acres of soils derived from metamorphic rock on slopes up to 35 percent and on 24 acres of soils derived from granitic rock on slopes up to 20 percent. The increased limitation of slope on granitic soils would limit the risk of erosion.By using designated and existing skid trails, the amount of compaction would be limited to 12 percent or less of each unit. This would equate to a maximum of seven acres becoming compacted in metamorphic-derived soils and a maximum of three acres becoming compacted on granitic soils. About 0.04 percent compaction would be added to current conditions in the subwatershed across both metamorphic and granitic soils. This added level of compaction would be inconsequential at the subwatershed scale.

Ripping skid trails in regeneration units would help to ameliorate compacted conditions further by increasing porosity and infiltration. Skid trails would be ripped in all 23 acres of regeneration harvest units on metamorphic soils and 22 acres of regeneration harvest units on granitic soils. The other 14 acres of skid trails on granitic soils would be in density management units. Skid trails in

density management units above roads would be mulched to minimize sediment-laden runoff from skid trails reaching ditchlines.

Tractor yarding causes soil disturbance which can increase erosion rates above natural background rates. Erosion rates from timber harvesting and road construction may increase to 0.05 to 0.25 tons per acre per year (Dissmeyer 2000, 104).

Soil compaction as a result of tractor yarding would reduce long-term soil productivity. The level of impact is dependent upon the extent and degree of compaction. These impacts are anticipated to be kept at minimal levels from the implementation of PDFs, such as the ripping of skid trails, seasonal restrictions from wet soil conditions, and utilization of well-spaced designated skid trails. The Jackson County Soil Survey identifies steep yarding paths, skid trails, and firebreaks on granitic soils as being subject to rill and gulley erosion unless they are protected by a plant cover, adequate waterbars, or both (SSJC, p 176). Cable yarding corridors are steep yarding paths that would be created on a portion of 190 acres proposed for cable yarding. These corridors would be spaced at a maximum of 150 feet apart, but would likely be closer due to harvest system restraints. Until vegetation is reestablished (1 to 3 years) in steep yarding corridors, rill and gulley erosion is possible. The likelihood of eroded sediment reaching stream channels would be very low due to Riparian Reserve buffers and the lack of a delivery mechanism between yarding corridors and stream channels.

In Alternative 2, 1.2 miles of temporary road would be constructed: 0.5 miles on metamorphic soils and 0.7 miles on granitic soils. Road construction in granitic soils requires additional PDFs (see Appendix B, Soil). This action would increase compaction and reduce soil productivity in the road prism over the short-term (1 to 5 years). These effects would be mitigated by ripping the road surface in the same year as timber harvest and quickly reestablishing vegetation. Erosion would be limited by decommissioning the roads in the same year as used for harvest during the dry season. Erosion control methods, such as seeding and mulching, would further reduce the erosion potential.

Seven helicopter landings would be built and two helicopter landings would be reconstructed. Five helicopter and three service landings currently exist. The newly constructed and reconstructed landings would be ripped to reduce compaction and reestablish vegetation to minimize erosion. The existing landings would not be ripped because they are located on private lands or in rock pits that would be used in the future. Ripping the newly constructed landings would minimize the amount of additional compaction in the Upper North Fork Evans Creek 6th field subwatershed.

Cumulative Effects

Since 1995, 2,402 acres of timber harvest has occurred on BLM lands in the Evans Creek 5th field watershed: 148 acres using ground-based tractors, 682 acres using cable harvest methods, and 1,573 acres using helicopter.

An additional 60 acres would be tractor logged under this alternative with 12 percent or less of those acres being disturbed. This would cumulatively add to the acres compacted in the watershed. Skid trails in 45 acres of regeneration harvest units would be ripped to reduce compaction and increase infiltration and soil productivity.

Private lands are assumed to be in an early to mid-seral stand condition and would continue to be managed on a short rotation using primarily ground-based and skyline methods of harvest.

3.4.4.4 Effects of Alternative 3 on Soils

Direct and Indirect Effects

A total of 280 acres, or about 2.1 percent of the subwatershed, would be harvested under Alternative 3. The types of harvest include 35 acres of SGFMA Regeneration, 90 acres of Select Cut, and 155 acres of density management. The three methods used for harvest would include 35

acres of tractor, 125 acres of cable, and 120 acres of helicopter. There are approximately 16 acres of tractor harvest on metamorphic soils and 19 acres on granitic soils. The metamorphic soils are less erodible than granitic soils and can be tractor yarded on up to 35 percent slope. Granitic soils can only be tractor logged on slopes up to 20 percent. The use of existing and designated skid trails would limit the compaction to 12 percent or less throughout the tractor units. Approximately 5 acres could be compacted using tractors for harvest which equates to 0.03 percent of the Upper West Fork Evans Creek 6th field subwatershed. This low level of compaction would be negligible at the 5th and 6th field watershed scales.

Ripping skid trails in regeneration units would help to ameliorate compacted conditions further by increasing porosity and infiltration. Skid trails would be ripped in seven acres of regeneration harvest units on metamorphic soils. No regeneration harvest units would be located on granitic soils in this alternative. The other 28 acres of tractor yarding units would be located in selection harvest and density management units which would not have skid trails ripped in order to protect the roots of the remaining live trees. Skid trails in density management units above roads would be mulched to minimize sediment-laden runoff from skid trails reaching ditchlines. Cable yarding corridors on granitic soils have the potential for rill and gulley erosion until vegetation is reestablished. If gullies form, soil productivity would be lost. Approximately 120 acres of cable yarding would occur under Alternative 3. Yarding corridors would be spaced at a maximum of 150 feet, but would likely be closer due to harvest system restraints. The potential for sediment to be transported to streams is low due to locations of units in relation to stream channels. Heavy machinery would be kept on roads and landings, therefore soil compaction would be negligible. Helicopter yarding is the harvest system that would be used on the majority of acres in this alternative. This harvest method has the least impact on soils and would not add to compaction or loss of soil productivity. Erosion would be low using this method of harvest.

Six helicopter landings would be built under this alternative and two helicopter landings would be reconstructed. The remaining five helicopter and three service landings are existing. The newly constructed and reconstructed landings would be ripped to reduce compaction and reestablish vegetation to minimize erosion. The existing landings would not be ripped because they are located on private lands or in rock pits that would be used in the future. Ripping the newly constructed landings would minimize the amount of additional compaction in the subwatershed.

Nearly 1 mile of new temporary road would be constructed under Alternative 3 with 0.26 miles on metamorphic soils and 0.7 on granitic soils. This action would increase compaction and reduce soil productivity in the road prism over the short-term (1 to 5 years). These effects would be mitigated by ripping the road surface in the same year as timber harvest and quickly reestablishing vegetation. Erosion would be limited by decommissioning the roads in the same year as harvest during the dry season. Erosion control methods, such as seeding and mulching, would further reduce the erosion potential.

Cumulative Effects

A total of 2,402 acres of timber harvest has occurred on BLM lands since 1995 in the Evans Creek 5th field watershed: 148 acres using ground-based tractors, 682 acres using cable harvest methods, and 1,573 acres using helicopter.

3.4.4.5 Effects of Alternative 4 on Soils

Direct and Indirect Effects

A total of 175 acres, or 1.3 percent of the 6th field subwatershed, would be harvested under Alternative 4. The types of harvest include 25 acres of selection harvest and 150 acres of density management. The 3 methods used for harvest would include 20 acres of tractor, 75 acres of cable, and 80 acres of helicopter. There are approximately 4 acres of tractor yarding on metamorphic soils and 16 acres on granitic soils. The metamorphic soils are less erodible than granitic soils and can be tractor yarded on up to 35 percent slope. Granitic soils can only be tractor logged on slopes up to 20 percent. The use of existing and designated skid trails would limit soil compaction to 12

percent or less throughout the tractor units. Approximately 2.4 acres, or 0.01 percent of the Upper West Fork Evans Creek 6th field subwatershed, could be compacted using tractors for harvest. This low level of compaction would be negligible at the 5th and 6th field watershed scales.

Ripping skid trails in regeneration units would help to ameliorate compacted conditions further by increasing porosity and infiltration. There would be no regeneration harvest under this alternative so there would be no skid trails ripped in either metamorphic or granitic. All tractor yarding would occur in selection harvest and density management units and skid trails would not be ripped in order to protect the roots of the remaining live trees. Skid trails in density management units above roads would be mulched to minimize sediment-laden runoff from skid trails reaching ditchlines.

Cable yarding corridors on granitic soils have potential for rill and gulley erosion until vegetation is reestablished. If gullies form, soil productivity would be lost. Approximately 125 acres of cable yarding would occur under Alternative 3. Yarding corridors would be spaced at a maximum of 150 feet, but would likely be closer due to harvest system restraints. The potential for sediment to be transported to streams is low due to the location of the units in relation to stream channels. Heavy machinery would be kept on roads and landings; therefore, soil compaction would be negligible. Helicopter yarding would be used on the majority of acres in this alternative. This harvest method has the least impact on soils and would not add to compaction or loss of soil productivity. Erosion would be extremely low using helicopter yarding.

Five helicopter landings would be built under this alternative and two helicopter landings would be reconstructed. The remaining four helicopter and two service landings currently exist. The newly constructed and reconstructed landings would be ripped to reduce compaction and reestablish vegetation to minimize erosion. The existing landings would not be ripped because they are located on private lands or in rock pits that would be used in the future. Ripping the newly constructed landings would minimize the amount of additional compaction in the subwatershed.

The 0.6 miles of new temporary road that would be constructed under Alternative 4 would all be located on granitic soils. This action would increase compaction and reduce soil productivity in the road prism over the short-term (1 to 5 years). These effects would be mitigated by ripping the road surface in the same year as timber harvest and quickly reestablishing vegetation. Erosion would be limited by decommissioning the roads in the same year as harvest during the dry season. Erosion control methods, such as seeding and mulching, would further reduce the erosion potential.

Cumulative Effects

Since 1995, 2,402 acres of timber harvest has occurred on BLM lands in the Evans Creek 5th field watershed: 148 acres using ground-based tractors, 682 acres using cable harvest methods, and 1,573 acres using helicopter. Ground-based tractor logging causes the greatest amount of ground disturbance and would have resulted in the greatest chance of sediment reaching streams.

3.5 Hydrology

3.5.1 Methodology

The West Fork Evans Creek Watershed Analysis (USDI 1995b) was the primary source of information for the affected environment. GIS was also used for analyzing the existing conditions of the 6th field watershed. BLM Riparian Reserve surveys were used to determine functioning condition of streams on BLM lands (USDI 1996). A change detection analysis was completed to assess harvest levels using satellite imagery data from the past 30 years. This change detection analysis measures acres of stand-replacing harvests or wildfires using approximately 30 years of data.

The scale used in this analysis is the 6th field subwatershed level, Upper West Fork Evans Creek, with some analysis done at the 7th field drainage level. The 5th field watershed scale, Evans Creek, is used to describe general conditions of the watershed. The temporal scale being used is both short-term (1 to 5 years) and long-term (10 to 30 years). Cumulative effects analysis would look at longer time scales when describing the events leading up to the current conditions.

A watershed is a geographic area draining to a common stream or river. Watersheds are delineated into a hierarchical drainage system to allow for better analysis. The largest unit is a 1st level hydrologic unit or region. Regions are divided into smaller 2nd level subregions, which are divided into 3rd level basins, followed by 4th level subbasins, 5th level watersheds, 6th level subwatersheds, and 7th level drainage areas.

3.5.2 Assumptions

Private timberlands would remain in an early to mid-seral condition with high densities of roads and skid trails.

3.5.3 Affected Environment

Key points in the project area:

- High road density.
- Major source of sediment is from roads, skid trails, and OHV trails.
- West Evans Creek is on the 303(d) list for elevated stream temperature.

The project area lies within the Upper West Fork Evans Creek which is a 16,006-acre 6th field subwatershed within the 143,281-acre Evans Creek 5th field watershed. Eight 7th field drainages were delineated in the subwatershed.

The West Fork Evans Creek Watershed Analysis contained three 6th field subwatersheds for analysis, including the Upper West Fork Evans Creek where the project area lies. The remaining two 6th field subwatersheds have since been combined to form the Lower West Fork Evans Creek 6th field subwatershed, which lies outside the project area.

The climate of this watershed is a Mediterranean-type with hot, dry summers and cool, wet winters. Summer high temperatures range from the 80s to the high 90s with occasional daytime temperatures reaching 100 plus degrees Fahrenheit (°F). Winter lows often drop to 10 to 20°F.

Three US Geologic Survey gaging stations historically operated in the 5th field watershed. Currently, no gaging stations are active.

The existing condition in the Upper West Fork Evans Creek 6th field subwatershed is the result of past actions such as timber harvest and road building. Past actions have resulted in elevated stream temperatures, increased fine sediment levels, and simplified stream channels. While the

main past actions that have resulted in these conditions are timber harvest and road building, other contributors include powerline construction and maintenance, OHV use, and rural settlement.

The existing Evans Creek 5th field watershed condition is the result of a combination of settlement, urbanization, agriculture, livestock, timber harvest, road building, water withdrawals, and mining. Past actions at this scale have also resulted in elevated stream temperatures, increased fine sediment levels, simplified stream channels, and elevated levels of Fecal Coliform on Evans Creek. Other contributors to the existing conditions in the Evans Creek Watershed include powerline construction and maintenance and OHV use.

3.5.3.1 Water Quality

Temperature

Elevated stream temperatures exist at both the subwatershed and watershed scale resulting in seven streams being listed on the Oregon Department of Environmental Quality (ODEQ) 303(d) list for 2002 (see Table 3-6). These streams are classified as water quality limited for summer stream temperature under the Clean Water Act.

Table 3-6. Streams in the Evans Creek 5th Field Watershed on ODEQ 303(d) List for Summer Stream Temperature

Stream	River Mile
Evans Creek	0.0 to 19.1
West Fork Evans Creek*	**0.0 to 17.1**
Battle Creek	0.0 to 3.9
Cold Creek	0.0 to 4.2
Ramsey Canyon	0.0 to 3.1
Rock Creek	0.0 to 6.5
Salt Creek	0.0 to 6.2

*Only stream located in the project area.

Evans Creek is also water quality limited for fecal coliform from river mile 0.0 to 19.1.

These elevated stream temperatures were caused by the removal of riparian vegetation that provides stream shade from logging, mining, settlement, and road building; water withdrawal during the summer low-flow period for irrigation and domestic use; removal of large wood from streams resulting in simplified channels with high width/depth ratios; removal of large wood resulting in large areas of stream scoured to bedrock; and past mining of streams channels. These human disturbances, along with natural causes such as climate and geology, have resulted in stream temperatures above the ODEQ summer standard of a maximum of 64ºF.

Some streams may naturally be above this standard and would never achieve the summer standard temperature because of natural causes. For example, Battle Creek, on the 303(d) list for summer temperature, was found to be at full potential for stream shade according to an analysis done by ODEQ. Other small streams in the watershed, such as Cold Creek, Rock Creek, and Salt Creek, are also at or near potential on BLM lands and would continue on this trend based on the implementation of Riparian Reserves required under the NWFP. On private timber lands, more reaches are not at potential for stream shade because private companies have a shorter harvest rotation and less restrictive buffers are required to protect streams under the Oregon Forest Practices Act (OFPA).

The main stems of West Fork Evans and Evans creeks are further from full potential shade for a variety of reasons. These streams need more shade because of the larger stream widths and more surface area to shade from solar radiation. Also, the main roads along these main stem creeks permanently reduce shade potential along these streams.

The majority of Evans Creek flows through nonindustrial private land where small agricultural and livestock operations and rural and urban homeowners are located. In many cases, these areas have vegetation cleared right up to the stream and a very low likelihood these areas would ever reach full stream shade potential because of these land uses. The upper portion of Evans Creek has both forest and agricultural land use with all but one of the reaches on BLM lands at full shade potential and most of the private lands at or near potential. Reaches not at potential are expected to reach full potential over the next 10 to 15 years, with one reach of less than 1 mile expected to achieve potential in approximately 35 years.

Early settlement in the Evans Creek 5th field watershed was primarily focused on the creek bottomlands, benches, and nearby foothills in the lower part of the watershed. These settlers cut timber to construct barns, cabins, houses, fences, and flumes; to use for firewood; to clear streams for mining; and to clear fields for crops (Atwood 1995, 46). Riparian vegetation was removed along mainstem streams, contributing to the elevated stream temperatures.

Water withdrawals for irrigation and domestic use during the summer low-flow period also cause elevated stream temperatures. Water withdrawals reduce the flow in the stream, resulting in a smaller volume of water that is heated faster and to higher temperatures than larger volumes of water. Water withdrawals occur along the mainstem of Evans Creek with a few on West Evans Creek. These withdrawals occur in areas of agriculture and mixed land use types where irrigation is heavily used for crops, lawns, small gardens, and other domestic uses. Past water withdrawals for mining also added to increased stream temperature.

Elevated stream temperatures are also a result of channel widening from the past actions of removing large wood from streams, removing streamside vegetation, mining, and splash damming. Hydraulic mining altered stream channels and permanently widened streambeds (Atwood 1995, 51). Channels with high width/depth ratios as a result of these past practices heat up quicker and to higher temperatures than deep, narrow channels. These wide, shallow channels also have large areas of exposed bedrock that heats up and retains heat longer than alluvial stream beds.

Natural causes of high summer stream temperatures include the hot, dry climate of southern Oregon. Summer high temperatures range from the 80s to the high 90s with occasional daytime temperatures reaching 100°F. Southern Oregon commonly has higher summertime temperatures than the rest of Oregon west of the Cascades which in turn cause higher stream temperatures. Due to this natural climate pattern, it is likely many streams in southern Oregon may never reach the ODEQ summer standard for stream temperature that is set for basins with salmonid rearing as a beneficial use.

Past and present actions have resulted in the current condition of elevated stream temperature. Future actions of the same nature as described would continue to contribute to the elevated stream temperature. Actions that have led to this current condition include the removal of riparian vegetation for a variety of reasons such as large scale mining in the late 1800s through the mid-1900s, logging, and road building. Other past and present actions include removal of large wood, stream channel simplification, and water withdrawals. Outside of human influences, natural conditions for high summer stream temperatures include climate and geology.

Channel Morphology

Stream surveys were completed in the 6th field subwatershed to determine the functioning condition and duration of streams.

Functioning condition is a measure of physical and biological parameters of a stream channel and riparian area.

These surveys found that sand is the most abundant substrate in this subwatershed. This is a result of the erodible granitic soils in the subwatershed and the high road and OHV trail densities. Stream channels are generally stable with some reaches showing signs of instability.

Functioning condition surveys found the majority of streams (66 percent) in the project area to be functioning at risk (FAR). About 30 percent of the streams were found to be in properly functioning condition (PFC) and 4 percent were listed as nonfunctional (see Figure 2).

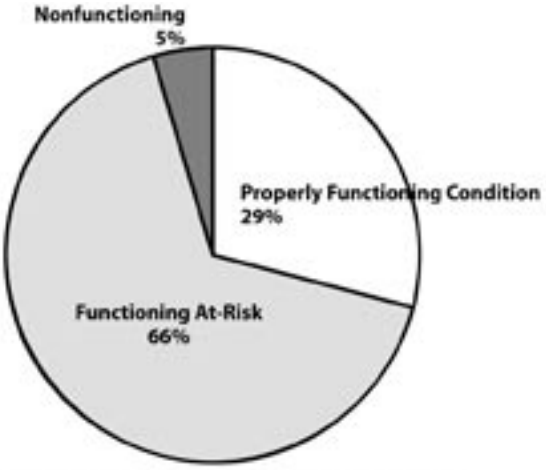


Figure 2. Stream Functioning Conditions for all Streams on BLM-administered Lands within the Upper West Fork Evans Creek Watershed

Past logging and road building decreased the amount of large wood remaining in riparian areas, increased openings along streams, decreased diversity of size classes, and increased the amount of sediment delivered to stream channels from encroaching roads and road crossings. The Riparian Reserve designation in the ROD/RMP and NWFP restricts logging and road building in riparian areas to allow for their recovery over time.

The Rosgen classification system is a widely-used method for classifying streams and rivers based on common patterns of stream morphology. Variations in stream processes are grouped into distinct stream types (see Table 3-7).

Table 3-7. Rosgen Stream Classification System

Stream Type	Stream Characteristics
A	• Steep to very steep • Well entrenched • Totally confined with low width/depth ratio • Step/pool morphology • Associated with debris flows and waterfalls
B	• Low channel sinuosity • Moderately entrenched • Characteristic ‘rapids’
C	• Relatively sinuous • Channel slope of 2% or less • Well-developed flood plain (slightly entrenched) • Riffle/pool morphology

SOURCE: Rosgen 1996, 4-4, 4-6

In general, the streams in the Upper West Fork Evans Creek 6th field subwatershed are Rosgen types “A” and “B” with some reaches of “C” stream types on lower gradients in the watershed. In general, cascade and step-pool streams, roughly equivalent to Rosgen stream types A and B, can often transport almost all of the sediment supplied to them, and are therefore less susceptible to sedimentary cumulative watershed effects (NCASI 1999, 13).

The drainage pattern of the watershed is dendritic which is characterized by the irregular branching of tributaries. The watershed is highly dissected with a high stream density of 6.4 miles per square mile.

Sediment

Road density is high in the Upper West Fork Evans Creek 6th field subwatershed at 6.2 miles per square mile. Approximately 536 miles of road are located within the Riparian Reserves in the Evans Creek 5th field watershed. A decline in road maintenance in recent years on BLM-administered roads is causing drainage problems resulting in erosion. Many miles of OHV trails

are located on the highly erodible granitic soils in the watershed. Many trails are actively eroding and subsequently depositing sediment into nearby stream channels. A powerline corridor with an access road runs through the watershed. This steep, powerline access road is used by OHVs and is eroding in many sections.

Properly functioning riparian areas store water and sediment, and help regulate stream temperatures and flows (USDI 1995b, 24). Riparian areas on BLM-administered lands in this subwatershed were impacted by past management activities, such as timber harvest and road building, before they were designated as Riparian Reserves in the NWFP. These activities, along with the checkerboard ownership in the project area, have left these areas in a mostly early to mid-seral condition, with a majority of stream reaches functioning at risk. Approximately 60 percent of the BLM stands within Riparian Reserves in this subwatershed are less than 80 years old. These young stands in Riparian Reserves do not function like mature stands. Mature stands contain multiple layers and closed canopies that provide large wood and regulate stream temperatures to the degree necessary for proper functioning stream channels.

On BLM-administered lands, fish-bearing streams receive a Riparian Reserve buffer of 320 feet on either side of the stream and 160 feet on both sides of perennial and intermittent non-fish-bearing streams.

Currently, there are no streams listed for sediment on the ODEQ 303(d) list. Several streams in the watershed are on the ODEQ integrated report as having insufficient/no data to be listed on the 303(d) list. Streams with insufficient or no data include Evans, West Evans, East Evans, Rock, Salt, Pleasant, Sykes, and May creeks.

Human causes of increased sediment above background levels in the watershed include roads, logging, mining, settlement, channel simplification, and removal of riparian vegetation. It is well documented in scientific literature that the main cause of increased sediment in a forested watershed is from roads (Dissmeyer 2000, 86).

Sedimentation is a very difficult to quantify and identify the sources of at a watershed level because of the complexity of processes that occur over time and space. A study by the National Council for Air and Stream Improvement (NCASI) determined that cumulative watershed effects are particularly difficult to predict and identify due to the individual water and sediment inputs transported to the stream at different points in time and space, and these interact with the water and sediment already in the stream (NCASI 1999, 1).

Cascade and step-pool streams, roughly equivalent to Rosgen A and B-type streams, can often transport nearly all of the sediment supplied to them, and are therefore less susceptible to sedimentary cumulative watershed effects (NCASI 1999, 13).

3.5.3.2 Water Quantity

Stream Flow

Annual precipitation ranges from 35 to 50 inches in the 6th field subwatershed. The stream flow regime is similar to the precipitation pattern; however, runoff generally lags behind precipitation by about one month.

Roads within the watersheds contribute to peak flows by effectively increasing the overall stream length through water delivery via ditches, as well as intercepting subsurface flow.

Transient Snow Zone

The Transient Snow Zone is an elevation band from 3,500 to 5,000 feet where snow accumulates and is susceptible to rain-on-snow events. Historic extreme high flows have been produced by rain-on-snow events where warm rains melted the snow pack, producing large amounts of runoff. Approximately 1,973 acres, or 12 percent of the 6th field subwatershed, are within the Transient Snow Zone.

3.5.4 Environmental Consequences

Responses of watersheds to disturbances are very complex and depend on a great deal of conditions that include, but are not limited to, the timing and intensity of storm events, basin size, slope, aspect, soils, channel stability, ground cover, and canopy cover. All of these conditions vary greatly over time and space to produce different watershed responses. The magnitude of effects from management activities depends largely on the timing and intensity of storm events during the recovery process.

Table 3-8. Comparison of Effects on Hydrology from All Alternatives

Issue: Hydrologic Condition (including water quality and quantity)				
Past Actions	• Increased stream sedimentation as a result of roads, landings, and skid trails for timber harvest • Increased risk of larger peak flows due to large areas of timber harvested and high road density			
Present Actions	• Sedimentation rates lower than in past from roads, landings, and skid trails but still above background levels • Increased risk of larger peak flows is less than in past due to recovery of canopy, less road building, and less harvest acres			
Current Conditions	• Sedimentation is above background levels mainly from roads and skid trails • Peak flows may be increased from roads and past harvest			
Future Actions	• Continued current level of sedimentation and low risk of increasing peak flows			
Proposed Actions	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
	• No Action • No timber harvest or road building so no risk of sedimentation or peak flow increases • Drainage would not be improved on roads so no reduction in sedimentation or the risk of peak flow enhancement	• Road improvement and decommissioning would reduce sediment sources throughout the watershed • 190 acres of regeneration harvest would result in low risk of increasing peak flows	• Road improvement and decommissioning would reduce sediment sources throughout the watershed • 35 acres of regeneration harvest would result in low risk to increasing peak flows	• Road improvement and decommissioning would reduce sediment sources throughout the watershed • No regeneration harvest would result in low risk to increasing peak flows
Cumulative Effects	• Continued current level of sedimentation and low risk of peak flow increases	• Continued current level of sedimentation and low risk of increasing peak flows	• Continued current level of sedimentation and low risk of peak flow increases	• Continued current level of sedimentation and low risk of peak flow increases

3.5.4.1 Effects of Alternative 1 (No Action) on Hydrology

Direct and Indirect Effects

Under the No Action Alternative, no forest management or restoration projects would occur. Under this alternative, there would be no direct effects from ground disturbance on water quality or quantity.

No timber harvest would occur and overstocked stands would remain at risk for large scale disturbances. There would be no ground disturbance under this alternative related to timber harvest.

Fuels treatments would not occur under this alternative. Current overstocked conditions would result in a high severity burn if a fire occurs in these stands. High burn severities damage soils by removing the entire duff layer and often changing the structure of the soil. This physical change can contribute to increased erosion and subsequent sedimentation of stream channels.

Road improvements or road decommissioning projects would not be completed under the No Action Alternative. Roads would remain inadequately surfaced and continue to have drainage problems. Roads determined no longer needed by an Interdisciplinary Team (IDT) would not be decommissioned. The current rate of sedimentation from erosion on roads would continue and potentially increase.

Cumulative Effects

Under the No Action Alternative, no additional cumulative effects would occur. Since 1995, a total of 2,402 acres of timber harvest has occurred on BLM lands in the Evans Creek 5th field watershed: 148 acres using ground-based tractors, 682 acres using cable harvest methods, and 1,573 acres using helicopter. Private lands are mostly in an early to mid-seral stand condition in both the uplands and along streams. There are approximately 155 miles of roads in the subwatershed for a road density of 6.2 miles per square mile.

Since 1995, 86 acres of forest was converted to early seral stand conditions through 49 acres of clear-cuts and 37 acres of regeneration harvest. Partial cut on 411 acres and density management or commercial thinning on 1,518 acres resulted in a late to mature seral stand condition. Mortality salvage, removing dead or dying trees, on 129 acres and select cut on 246 acres would not change the seral stage of these acres.

Openings within the TSZ on BLM lands would decrease as vegetation grows and the canopy closes back in over time. As openings in the TSZ became smaller, the risk of increased runoff as a result of these openings would also be reduced. Private timberlands within the TSZ would likely remain as openings in an early to mid-seral condition which would keep the risk of increased runoff at a higher level on these lands.

This alternative would maintain the current effects from previous logging and road building and would not directly add additional effects because there would be no projects implemented. However, eroding roads could become worse over time if left in the current condition.

Future BLM projects within the Evans Creek 5th field watershed could potentially occur over approximately 12,000 acres. It is likely that over half of these acres would not have treatments occurring on them due to Riparian Reserves, other buffers, and stands not meeting criteria for treatment. Similar ratios of treatments and harvest methods would be expected as those being considered in this analysis.

3.5.4.2 Effects on Hydrology Common to All Action Alternatives

Direct and Indirect Effects

No timber harvest or road building is proposed within the deferred watersheds of the Upper West Fork Evans Creek.

In all action alternatives, approximately 12 acres of progeny test sites would be thinned. A small tractor would be used to complete this project. These sites are located outside of Riparian Reserves on relatively flat ground. This project would have a neutral effect on water quality.

A small amount, 42 acres, of fuels treatments is proposed on the ridgetop of the Ash Flat deferred watershed. Approximately four acres of progeny test site thinning is proposed in the Ash Flat watershed to decrease stand density. These activities have a low impact on soils and watershed function. Within a deferred watershed, both activities would provide benefits by reducing densities of overstocked vegetation which can lead to high intensity fires.

Fuels density management, fish culvert replacement, roadway stabilization, pump chance renovation, road improvement, and road decommissioning would be essentially the same in all alternatives.

Fuels density treatments would vary by about 20 acres across Alternative 2, 3, and 4. The treatments are the same and the effects would be the same at a 5th or 6th field watershed scale. The proposal is to slash, handpile, and burn 580 to 590 acres and to slash and underburn 35 to 45 acres. Approximately 155 acres of treatments would occur within Riparian Reserves. These treatments would have no adverse effect on water quality or quantity. Due to the size and location of handpiles, as well as the remaining vegetation and duff surrounding handpiles, off-site sedimentation would not be expected. These treatments would limit the burn severity of a fire if one were to occur after the treatments were completed. Reducing the burn severity of a wildfire would be beneficial to water quality by reducing the chances of large scale erosion and subsequent sedimentation after a high severity wildfire.

One culvert is proposed for replacement for fish passage. The removal and replacement of a large culvert would likely cause a small amount of sediment to be transported downstream. This would have a short-term impact (hours to days) on water quality. The sediment would likely settle in pools and areas of deposition until it is moved down through the stream system during fall and winter flows. Due to the very low amount of sediment transported, this amount would not change the sediment transport regime. The amount would be minimized by using PDFs and timing installation during low-flow periods. This project would be beneficial to water quality and the aquatic ecosystem shortly after completion. Increasing the capacity of the culvert would reduce erosion by allowing high flows and associated debris to pass without plugging the culvert and causing a failure which would result in a high level of fine sediment entering the stream.

Vegetation would be established on roadside cutbanks and selected fill-slopes through hydromulching. This project would occur throughout the subwatershed on up to 12 miles of road out of 155 miles of roads in the subwatershed. This would not be a continuous treatment, but a spot treatment on eroding cutbanks identified for stabilization. The establishment of vegetation would stabilize eroding cutbanks and reduce the amount of sediment in ditchlines which is eventually deposited into stream channels. This project would be beneficial to water quality by reducing sediment transport from road cutbanks.

Three existing pump chances would be renovated to improve water storage. These pump chances would be cleaned and the intakes improved to allow the pump chances to function properly. This project would have a neutral effect on water quality. Water quantity would essentially remain the same, although the capacity of pump chances would be returned to the original design storage capacity.

In all action alternatives, 6 miles of road out of 155 miles of road would be improved. Many more miles of road needing improvement would not receive treatment because they would not be used in this project. This would improve the drainage and condition of roads in the subwatershed to reduce erosion and subsequent sedimentation. Improving 6 miles of road would benefit water quality locally by reducing erosion and subsequent sedimentation.

Three miles of road would be fully decommissioned and one mile of road would be partially decommissioned. Fully decommissioning roads includes ripping the roadbed which would reduce compaction and increase the rate of infiltration in the road prism. In full and partial decommissioning the cross-drain and stream-crossing culverts would be pulled and the road blocked. Pulling culverts would cause a short-term increase in sediment that would be minimized with PDFs. Decommissioning would benefit water quality by increasing infiltration, decreasing the total amount of open roads and road density, removing the risk of culverts becoming plugged and causing fill-slope failures, and reducing the amount of potential erosion from the road.

Road density would decrease in the watershed from 6.2 miles per square mile to 6.0 miles per square mile. Although this is still considered a high road density, the trend is reducing overall road miles. Reducing road density is difficult in watersheds with a checkerboard ownership pattern because of the need for private landowners to use these roads, often times resulting in leaving roads open that would reduce erosion and sediment if closed.

3.5.4.3 Effects of Alternative 2 on Hydrology

Direct and Indirect Effects

Under this alternative, a total of approximately 392 acres would be harvested. The intensity of this treatment equates to 2.5 percent of the Upper West Fork Evans Creek 6th field subwatershed and 0.3 percent of the entire Evans Creek 5th field watershed. The locations of these units are spread throughout the subwatershed and therefore the effects, such as increased erosion and runoff, would not be concentrated in one location, but spread over the landscape. Changes would be less noticeable than if the units were concentrated in one area.

Regeneration harvest would occur on a total of 190 acres under Alternative 2. Of this total, 125 acres would be SGFMA, with a remaining canopy closure of 20 to 40 percent, and 65 acres would be NGFMA, with a canopy closure of 10 to 20 percent. These treatments would increase the early seral conditions of the watershed by 1.4 percent. This is unlikely to be measurable in terms of increases in flow at the subwatershed level, but this early seral condition is considered hydrologically immature and is at a greater risk for increased runoff locally, but not at a watershed scale.

This alternative has 81 acres proposed for harvest in the TSZ where rain-on-snow (ROS) events can cause peak flow increases. At the subwatershed level, changes in peak flow due to openings in the TSZ are at a low risk because only 12 percent of the 6th field subwatershed is in the TSZ. In T32S, R4W, Section 35, there is potential for increases in localized runoff due to openings in the TSZ. Under alternative 2, 58.5 acres within the TSZ in this section are proposed to for regeneration harvest. To reduce some of the potential for increases in runoff, NGFMA units within the TSZ would have a silviculture prescription of SGFMA regeneration units that would retain more canopy.

Under Alternative 2, 160 acres of density management treatments are proposed. This would maintain a canopy closure of approximately 40 to 60 percent. This treatment would keep the stands in a late to mature seral condition which would be considered hydrologically mature. This condition is not likely to have additional increases in runoff from removing canopy and vegetation. The three main types of harvest methods that would be used in the project are tractor, cable, and helicopter. Generally, tractor causes the most ground disturbance, followed by cable, and helicopter. Ground disturbance from tractor yarding is caused by removing vegetation and duff, exposing soils to rainfall and subsequent erosion. Tractor yarding also physically displaces soils, resulting in potential erosion and subsequent off-site sedimentation. Ground disturbance from tractor yarding would be minimized by using designated and existing skid trails. Increased erosion and subsequent sedimentation is possible with ground-disturbing activities such as tractor harvest. Riparian Reserves and PDFs, such as waterbarring skid trails to divert runoff from skid trails onto the forest floor, would minimize possible sedimentation.

Under Alternative 2, 1.2 miles of temporary roads would be constructed. These roads would be located on or near ridgetops away from stream channels. These roads would not deliver sediment to stream channels because they would be located on the ridgetop and would be ripped and mulched within the same season as the roads are constructed. Runoff would not be increased due to the rehabilitation of these temporary roads. For direct and indirect effects from restoration projects, see Section 3.5.4.2, Effects on Hydrology Common to All Action Alternatives.

Cumulative Effects

The dominant cumulative effect in this watershed is the extensive deposition of sediments found throughout the stream system. Short-term impacts from tractor yarding and road renovation and decommissioning would contribute to the cumulative effect of stream sedimentation. However, the long-term benefit of road drainage and surfacing upgrading and road decommissioning would reduce potential sedimentation in the future. Since 1995, a total of 2,402 acres of timber harvest has occurred on BLM lands in the Evans Creek 5th field watershed: 148 acres using ground-based tractors, 682 acres using cable harvest methods, and 1,573 acres were using helicopter. The majority of those acres were harvested using methods with low ground disturbance and large amounts of sediment would not have left the units and reached stream channels.

Private timberlands are assumed to be at an early to mid-seral stage with high densities of roads and skid trails. Approximately 636 acres of private timberlands are within the TSZ and would remain in an early to mid-seral stage. Approximately 32 percent of the TSZ is managed at an early to mid-seral stage. The amount of early seral conditions in the TSZ would increase by 3 percent on BLM lands.

3.5.4.4 Effects of Alternative 3 on Hydrology

Direct and Indirect Effects

Under this alternative, a total of 280 acres would be harvested. The intensity of this equates to 2.1 percent of the Upper West Fork Evan 6th field subwatershed and 0.2 percent of the entire Evans Creek 5th field watershed. The locations of these units are spread throughout the subwatershed. The effects would not be concentrated in one location, but spread out over the landscape. Under Alternative 3, 35 acres of SGFMA regeneration harvest would leave a canopy cover of 20 to 40 percent and would increase the early seral condition of the watershed by 0.3 percent. This would have a low risk of increasing runoff at the subwatershed and site scale.

Harvest is proposed on 59 acres in the TSZ where ROS events can cause peak flow increases. At the subwatershed level, changes in peak flow due to openings in the TSZ are at a low risk because only 12 percent of the 6th field subwatershed is in the TSZ. In T32S, R4W, Section 35, there is potential for increases in localized runoff due to openings in the TSZ. Under alternative 3, 16.5 acres within the TSZ in this section are proposed for regeneration harvest. To reduce the potential for increases in runoff, NGFMA units within the TSZ would have a silviculture prescription of SGFMA regeneration units that would retain more canopy. Streams in this section are intermittent and non-fish-bearing.

The three main types of harvest methods that would be used in the project are tractor, cable, and helicopter. Generally, tractor causes the most ground disturbance, followed by cable, and helicopter. Ground disturbance from tractor yarding is caused by removing vegetation and duff, exposing soils to rainfall and subsequent erosion. Tractor yarding also physically displaces soils, resulting in potential erosion and subsequent off-site sedimentation. Ground disturbance from tractor yarding would be minimized by using designated and existing skid trails. Increased erosion and subsequent sedimentation is possible with ground-disturbing activities such as tractor harvest. Riparian Reserves and PDFs, such as waterbarring skid trails to divert runoff from skid trails onto the forest floor, would minimize possible sedimentation.

Under Alternative 3, 10 acres of density management would occur within Riparian Reserves. This would reduce stand densities and increase the rate of growth of trees within the reserves. Riparian Reserves and aquatic resources would benefit in the long-term at a localized scale, but young, overstocked stands would still remain in the majority of Riparian Reserves in the 6th field subwatershed. Short-term impacts would include an increased risk in sediment reaching streams from yarding corridors, but this risk would disappear as vegetation is reestablished in one to three years. Under this alternative, 1.0 mile of temporary roads would be constructed. These roads would be located on or near ridgetops away from stream channels. These roads would not deliver sediment to stream channels because they would be located on the ridgetop and would be ripped and mulched within the same season as the roads are constructed.For direct and indirect effects from restoration projects, see Section 3.5.4.2, Effects on Hydrology Common to All Action Alternatives.

Cumulative Effects

The dominant cumulative effect in this watershed is the extensive deposition of sediments found throughout the stream system. Short-term impacts from tractor yarding and road renovation and decommissioning would contribute to stream sedimentation. However, the long-term benefit of road drainage and surfacing upgrading and road decommissioning would reduce potential sedimentation in the future.Since 1995, a total of 2,402 acres of timber harvest has occurred on BLM lands in the Evans Creek 5th field watershed: 148 acres using ground-based tractors, 682 acres using cable harvest methods, and 1,573 acres using helicopter. The majority of acres on

BLM lands were harvested in this time frame using methods with low ground disturbance and large amounts of sediment would not have left the units and reached stream channels.

Private timberlands are assumed to be at an early to mid-seral stage with high densities of roads and skid trails. Approximately 636 acres of private timberlands are within the TSZ and would remain in an early to mid-seral stage. Approximately 32 percent of the TSZ is managed at an early to mid-seral stage. The amount of early seral conditions in the TSZ would increase by less than 1 percent on BLM lands and would have a low risk to changes in peak flows.

3.5.4.5 Effects of Alternative 4 on Hydrology

Direct and Indirect Effects

Under Alternative 4, a total of 175 acres would be harvested. The intensity of this equates to 1.3 percent of the Upper West Fork Evan 6th field subwatershed and 0.1 percent of the entire Evans Creek 5th field watershed. The locations of these units are spread throughout the subwatershed. The effects would not be concentrated in one location, but spread out over the landscape.
There would be no regeneration harvest under this alternative. There would be no increase in early seral vegetation in the watershed. This would have a very low risk of increasing runoff at the subwatershed and site scale due to the retention of canopy in density management and selection harvest units.

This alternative has no acres proposed for regeneration harvest in the TSZ where ROS events can cause peak flow increases. Density management is proposed on 15.6 in the TSZ of two drainages. These drainages contain small amounts of TSZ and would not be at risk to changes in peak flow as a result of openings in the TSZ. At the subwatershed level, changes in peak flow due to openings in the TSZ are at a low risk because only 12 percent of the 6th field subwatershed is in the TSZ. In T32S, R4W, Section 35, regeneration harvest would not occur and therefore there would be no potential for increases in localized runoff due to openings in the TSZ.

The three main types of harvest methods that would be used in the project are tractor, cable, and helicopter. Generally, tractor causes the most ground disturbance, followed by cable, and helicopter. Ground disturbance from tractor yarding is caused by removing vegetation and duff, exposing soils to rainfall and subsequent erosion. Tractor yarding also physically displaces soils, resulting in potential erosion and subsequent off-site sedimentation. Ground disturbance from tractor yarding would be minimized by using designated and existing skid trails. Increased erosion and subsequent sedimentation is possible with ground-disturbing activities such as tractor harvest. Riparian Reserves and PDFs, such as waterbarring skid trails to divert runoff from skid trails onto the forest floor, would minimize possible sedimentation.

Under this alternative, 0.6 miles of temporary road would be constructed. These roads would be located on or near ridgetops away from stream channels. These roads would not deliver sediment to stream channels because they would be located on the ridgetop and would be ripped and mulched within the same season as the roads are constructed. For direct and indirect effects from restoration projects, see Section 3.5.4.2, Effects on Hydrology Common to All Action Alternatives.

Cumulative Effects

The dominant cumulative effect in this watershed is the extensive deposition of sediments found throughout the stream system. Short-term impacts from tractor yarding and road renovation and decommissioning would contribute to stream sedimentation. However, the long-term benefit of road drainage and surfacing upgrading and road decommissioning would reduce potential sedimentation in the future.Since 1995, a total of 2,402 acres of timber harvest has occurred on BLM lands in the Evans Creek 5th field watershed: 148 acres using ground-based tractors, 682 acres using cable harvest methods, and 1,573 acres using helicopter. The majority of acres harvested on BLM lands in this time frame used methods with low ground disturbance. Large amounts of sediment would not have left the units and reached stream channels.

Private timberlands are assumed to be at an early to mid-seral stage with high densities of roads and skid trails. Approximately 636 acres of private timberlands are within the TSZ and would remain in an early to mid-seral stage. Approximately 32 percent of the TSZ is managed at an early to mid-seral stage. This alternative would not increase the amount of early seral conditions in the TSZ and therefore would not increase peak flows as a result of openings in the TSZ.

3.6 Riparian Reserves, Fisheries, and Aquatic Habitat

3.6.1 Methodology

Information used in this analysis includes GIS, BLM Riparian Surveys (USDI 2004), Aquatic Habitat Inventories (ODFW 1994; ODFW 1995), Aquatic Habitat Benchmarks (Moore 1997), Smolt Trap Reports (Vogt 1998, 1999, 2000, 2002, 2003, 2004), Fish Presence Surveys, and BLM field observations. The Upper West Fork Evans Watershed Analysis was used for background information. Literature related to fisheries, streams, hydrology, timber harvest, road activities, and wildfires were also used for the analysis of this project.

3.6.2 Assumptions

- Riparian Reserves are successful in protecting aquatic ecosystems during timber harvest (Hall and Lantz 1969; Newbold, et al. 1980; Murphy, et al. 1986; Meehan 1991).
- Road decommissioning creates short-term erosion and sedimentation of streams at stream crossings but, in the long-term, reduces chronic erosion and sedimentation of streams (Switalski1 et al. 2004, Madej 2001).
- Fish are dynamic, adaptive, and move throughout the stream systems (Bramblett, et al. 2002; Kahler, et al. 2001; Hilderbrand and Kershner 2000) to avoid short-term increases in sediment levels (Kahler, et al. 2001).
- Riparian Reserves can be thinned without changing stream temperatures by retaining trees that shade streams during the peak sun hours of 10:00 am to 2:00 pm (USDA and USDI 2004). Thinning young and overstocked riparian buffers can more rapidly achieve larger diameter trees (Berg and Maki 2003).

3.6.3 Affected Environment

The proposed project is located in the 16,007-acre Upper West Fork Evans Creek 6th field subwatershed and the 143,281-acre Evans Creek 5th field watershed. The climate of this area is a Mediterranean type with hot, dry summers and cool, wet winters. Summer high temperatures range from the 80s to the high 90s with occasional daytime temperatures reaching 100°F plus). Winter lows often drop to 10 to 20°F.

Some log hauling and road renovation work would occur in the Cold Creek, Rock Creek, and Upper Grave Creek 7^{h} field watersheds and are included in the analysis area. Major fish-bearing streams within the analysis area include Cedar Creek, Cold Creek, Grave Creek, Rock Creek, Sand Creek, Slick Rock Creek, and West Fork Evans Creek. Analysis within the upper Grave Creek would be limited just to impacts to the stream from log hauling. Baseline habitat information would be limited to the portion of the project area within the Upper West Fork Evans, Cold Creek, and Rock Creek watersheds.

3.6.3.1 Fish Populations

Fish species found in the Evans Creek watershed and within the project area include coho salmon (*Oncorhynchus kisutch*), steelhead trout (*O. mykiss*), and cutthroat trout (*O. clarki*). Cutthroat trout have the widest distribution, followed by steelhead and coho salmon (see Map 4).

The National Oceanographic and Atmospheric Administration (NOAA) Fisheries division listed the Southern Oregon Northern California (SONC) Coho Salmon Evolutionarily Significant Unit (ESU) as "threatened" under the Endangered Species Act (ESA) in May 1997.

An Evolutionarily Significant Unit or 'ESU' is a distinctive group of Pacific salmon, steelhead, or sea-run cutthroat trout.

As directed under ESA, NOAA Fisheries designates SONC Coho Salmon Critical Habitat (CCH) and Essential Fish Habitat (EFH), which is defined as areas within the geographical area currently or historically occupied by the species that have the physical or biological features essential to the conservation of the species and requires special management and protection. Within the project area, those areas accessible to coho salmon are designated as SONC coho salmon CCH and EFH.

Fish populations are influenced by natural and human caused disturbances. Factors such as habitat loss or degradation, commercial fishing, and variable ocean conditions are primarily responsible for the depressed status of most fish species (Nehlsen, et al. 1991). Primary issues for fish in the project area include road-related sediment and lack of large wood (ODFW 1994; ODFW 1995; USDI 1995).

3.6.3.2 Population Trends

Limited information is available on the Upper and Lower West Fork Evans Creek 6th field watersheds relating to current and historic fish populations. The only population data available for the project area is from the joint BLM and Oregon Department of Fish and Wildlife (ODFW) smolt trap program. The smolt trap project estimated steelhead population numbers between 600 and 2,000 and coho numbers increasing from 2,000 in 1998 to nearly 8,000 in 2004 (see Figure 3).

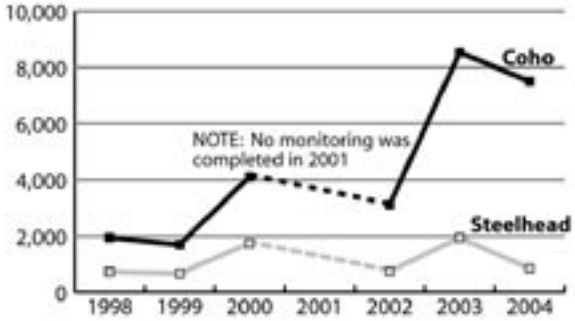
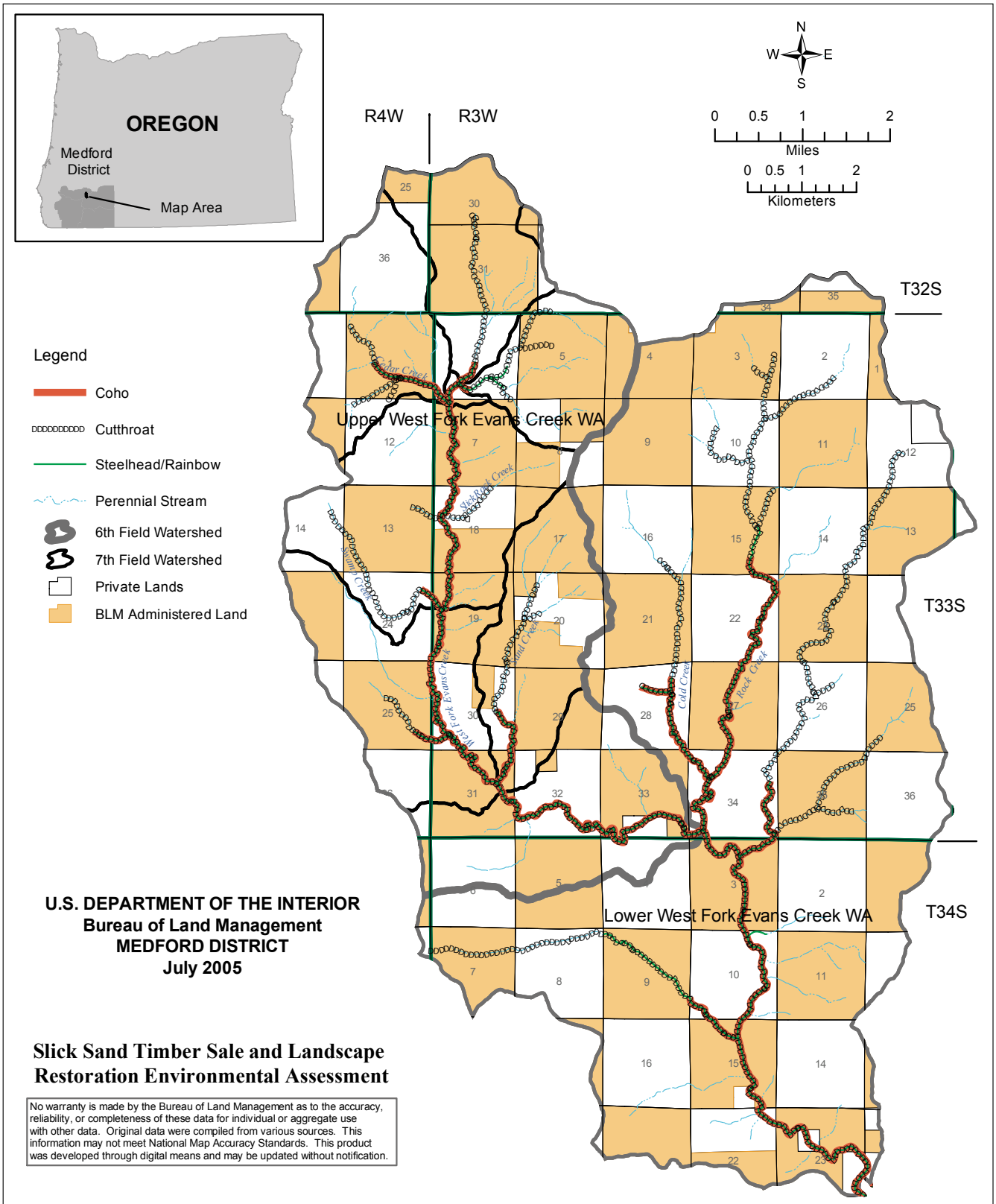


Figure 3. Coho and Steelhead Smolt Populations in the West Evans Creek Watershed

In 1999, ODFW studied the population health of steelhead within the Rogue Basin. The study found the wild steelhead populations in the Rogue Basin to be healthy and self-sustaining. Within the project area, age 0+ steelhead densities in Evans Creek, Sams Creek, and Rock Creek exceeded their juvenile density goals, indicating the local population of steelhead within the project area is healthy (Satterthwaite 2002).

Juvenile coho densities were monitored in West Fork Evans Creek from 2001 to 2003. Juvenile densities were 1.01 fish per square meter of surface area (m^2) in 2001, 1.43 fish/m^2 in 2002, and 0.55 fish/m^2 in 2003. When compared to the benchmark estimated for juvenile coho densities in Oregon coastal streams of $\geq$ 0.7 fish/m^2 (Rodgers 2000), production appears good. Coastal streams are generally accepted as being more productive than interior streams.

Historical information on local fish populations is unknown. Fish numbers were likely higher before timber harvest occurred and roads were constructed in the area. The historic distribution of fish was likely not much different than current distributions because most fish populations end where gradients get steep or at natural waterfalls.



Map 4: Fish Distribution in West Fork Evans Creek

Although coho are on a recent upward trend, their numbers remain low throughout their range in the Rogue River and Klamath Basins.

3.6.3.3 Fish Passage

Connectivity is important for fish production and restoring fish passage is an effective way to increase the availability of habitat (Roni, et al. 2002). It is common for fish to move within streams and between stream systems throughout the year (Kahler, et al. 2001). Within the Upper West Fork Evans Creek 6th field and Rock Creek 7th field watersheds, there are several roads crossing streams. Most road crossings provide for fish passage. Three culverts in the project area are known to block fish passage: two on public land and one on private land.

A culvert on BLM road # 33-3-18.2 is blocking cutthroat trout on a tributary stream flowing into West Fork Evans Creek. The road crosses the stream about 100 feet upstream from the confluence with West Fork Evans Creek. The stream is not used by coho or steelhead because of a 15-foot waterfall at the mouth of the stream. The existing culvert is under-sized, as evidenced by the scour hole at the outlet, and has a 3-foot drop. The Medford District ROD/RMP directs the BLM to remove fish barriers to allow unobstructed fish passage (USDI 1995a).

3.6.3.4 Habitat

Salmon and trout species need cool water temperatures, hiding cover, clean spawning gravels, rearing pools, and an adequate food supply for good fish production. Fish production is largely determined by habitat quantity and quality (Meehan 1991). Aquatic habitat complexity (amount of wood, pools, fine sediment levels, and gravels quantities) in the project area is generally low and undesirable for optimal fish production (Meehan 1991).

Aquatic Habitat

The ODFW conducted fish habitat surveys on Cedar Creek, Cold Creek, Rock Creek, Sand Creek, Slick Rock Creek, and West Fork Evans Creek in 1994. ODFW habitat data indicates most of these streams have few pools, low levels of large woody debris (LWD), high width/depth ratios (wide/shallow channels), low quantities of gravel, and high fine sediment levels. The fish habitat surveys indicate these streams are in poor condition. More recent data on habitat quality is unavailable, but conditions are believed to be much the same.

Pools provide important rearing habitat for juvenile salmon and trout (Nickelson, et al. 1992; Rosenfeld, et al. 2000) and winter holding habitat for adult fish (Cunjak 1996). Streams with high levels of fine sediments tend to have shallow pools because sediment deposits fill in these areas (Meehan 1991). Field observations have noted several pools throughout West Fork Evans Creek, Sand Creek, and other smaller tributary streams are filled with sand. Optimal pool habitat for these streams is greater than 35 percent of the total area; less than 10 percent is considered poor (Moore 1997).West Fork Evans Creek has the most pool habitat with 50 percent of the total surveyed stream covered by pools. All other streams have between 15 and 25 percent pool habitat, which are considered moderate levels.

LWD is important for providing cover for fish, forming pools, stabilizing channels, and trapping and sorting fine sediment (Meehan 1991). LWD also provides channel roughness to dissipate stream energy which causes bank erosion and increases channel widths (Montgomery and Buffington 1997). Reductions in LWD, through past wood removal and riparian timber harvest, have led to channel simplification and reduced cover for fish. This has resulted in declining fish production throughout the Pacific Northwest (Meehan 1991). Desired LWD levels in the project area are 50+ pieces per mile; less than 17 pieces per mile is considered low (Moore 1997). All streams in the project area are lacking LWD. West Fork Evans Creek, with the highest levels at 9.5 pieces per mile, is well below desired levels. All other streams are below 1 piece per mile. The deficiency of LWD has resulted in few pools existing in most streams and excessive amounts of sand distributed throughout most streams.

Width/depth ratio is the ratio of a channel's width to its depth. Streams with high width/depth ratios are characterized as having wide and shallow channels. LWD and deep-rooted bank vegetation are important features that influence channel widths, especially in streams with noncohesive alluvial deposits, like sand and other fine soils (Montgomery and Buffington 1997). According to Moore (1997), width/depth ratios greater than 30 are high and less than 15 are low. Channels with high width/depth ratios create poor habitat for fish because they usually have higher water temperatures, less hiding cover, and higher bank erosion rates (Poole and Berman 2001; Sullivan, et al. 1987). Width/depth ratios for all streams surveyed, except Slick Rock Creek, were higher than 30. Slick Rock Creek has a width/depth ratio of 20, which is considered fair for this area.

Clean gravel is important for spawning fish. Spawning gravel for salmon and trout ranges in size from 0.5 to 4 inches (Meehan 1991). When high, fine sediment levels occur in spawning gravels, less spawning occurs, eggs tend to be suffocated, and emerging fry become trapped, resulting in reduced production (Philips, et al. 1975; Tappel and Bjornn 1983; Chapman 1988; Meehan 1991). Hausle and Coble (1976) reviewed studies on coho and steelhead fry emergence in gravels with concentrations of sand exceeding 20 percent. When concentrations of sand were greater than 20 percent in spawning beds, emergence success declined.

The majority of the geology in the project area consists of decomposed granite. These types of soils are highly erodible and prone to erosion (USDI 1995b). When roads are constructed in decomposed granite, erosion rates tend to be high, often resulting in sedimentation of nearby streams (Megahan, et al. 2001). Sand Creek had the highest percentages of fine sediment, with 83 percent of the stream dominated by sand and silt. In the other streams, sand and silt were the dominate substrate on between 37 to 47 percent of the streams. With the existing levels of sand, it is expected that incubation and emergence success in most streams is low.

The BLM conducted riparian surveys on 54 miles of streams within the Upper West Fork Evans Creek and Rock Creek watersheds, completing 20 miles in 1995 and 34 miles in 2002. These surveys were conducted on smaller streams, most of which are not fish-bearing. Results of the surveys indicate that 19 miles are properly functioning, 35 miles are functioning-at-risk (FAR), and 0.7 miles are nonfunctioning (NF). High sediment was the main factor in the FAR and NF ratings relating to streams. Sand and silt are the dominant substrates in 44 miles of streams.

Road densities within the Upper West Fork Evans Creek 6th field watershed are 6.2 miles per square mile, one of the highest densities within the Butte Falls Resource Area. About 41 miles of roads are located within Riparian Reserves. The riparian surveys indicated that 32 miles of streams (about 60 percent) with elevated fine sediment levels are associated with roads (USDI 2004c). Approximately five miles of road on BLM-administered lands and an unknown amount on private lands have erosion problems. The high sediment levels observed in the riparian surveys are consistent with the ODFW habitat survey observations (ODFW 1994; ODFW 1995) completed on Cedar Creek, Cold Creek, Rock Creek, Sand Creek, Slick Rock Creek, and West Fork Evans Creek.

Past timber harvest, tractor logging, and road development is primarily responsible for the high fine sediment levels in most streams today. A sediment study done in a granitic watershed in northern California showed that 76 percent of the sediment in streams came from human-caused impacts, such as roads and timber harvest (Sommarstrom and Kellog 1990). Harvest methods examined in this study were tractor and cable yarder and harvest types were clear-cut, selective cut, selection, shelterwood, and seed tree methods. A certain amount of sand and silt in streams in watersheds composed of decomposed granite is natural as indicated by Sommarstrom and Kellog (1990). In this study, they found 24 percent of the sediment in streams resulted from natural processes like stream bank and hill-slope erosion.

Water temperature is one of the most important variables controlling habitat suitability for salmonids. Optimum temperatures for coho, steelhead, and cutthroat trout are 55 to 60°F and temperatures over 84°F are considered lethal (Meehan 1991). The absorption of solar radiation is the largest cause of increasing stream temperatures. Timber harvest in riparian areas that removed shade trees has been shown to increase stream temperatures (Beschta, et al. 1987). Other factors, such as climate, stream size, elevation, and groundwater flows, also influence stream temperatures. The BLM has monitored stream temperature at the confluence of West Fork Evans Creek and

Rock Creek since 2000, on Sand Creek during the 2000 season, and on Swamp Creek in 2000 and 2001. Stream temperatures in West Fork Evans Creek exceed the ODEQ water quality standard of 64.4° F for fish-bearing streams on most days from late June to late August. Sand Creek's 7-day average maximum exceeded the standard on one occasion during the summer 2000. Swamp Creek's stream temperature was monitored in 2000 and 2001 and did not exceed 64.4° F.

Riparian Habitat

Riparian areas are important for fish and the aquatic ecosystem. Riparian vegetation provides LWD for streams and cover for fish. Streamside vegetation provides bank stability, maintains undercut banks, and provides habitat for insects, an important food source for fish. Riparian trees provide a protective canopy layer that helps maintain cool water temperatures (Meehan 1991). When riparian vegetation is removed, stream temperatures often increase (Johnson and Jones 2000), LWD levels decline (Hartman, et al. 1987), and fish production can decline (Hartman, et al. 1987).

Riparian Reserves within the Evans Creek watershed are primarily associated with streams and springs. Douglas-fir, alder, bigleaf maple, Oregon ash, and Pacific yew are the dominant overstory species along most stream reaches. Vine maple, ninebark, red-osier dogwood, willow, and hazel are the most common understory species. Within the analysis area, 32.3 miles of perennial streams and 69.7 miles of intermittent streams are located on BLM-administered lands. The total area of Riparian Reserves on BLM-administered lands, within the analysis area, is 4,074 acres.

Current Riparian Reserves on BLM-administered lands, vary in age from young stands (<10 years) to old growth; the majority are less than 80 years old (see Table 3-9). Younger second-growth conifer stands tend to be overstocked and do not provide a good source of LWD for streams (Murphy and Koski 1989). The lack of mature conifers to provide a long-term source of LWD for both streams and the floodplain was the primary reason for the FAR and NF ratings regarding vegetation.

Table 3-9. Stand Age Classes and Seral Stages in Riparian Areas on Upper West Fork Evans Creek

Stand Age Class	Seral Stage	Acres	Percent of Total
0-10	Early	155	4
11-40	Mid-	1,853	45
41-80	Late	394	10
81-200	Mature	951	23
201+ (managed)	Old Growth	721	18

Due to higher humidity, fire frequencies in riparian areas associated with perennial streams are lower than in adjacent uplands. Fire return frequencies along intermittent streams are often the same as upland forest frequencies due to dry conditions during summer months (Skinner 1997). If climate conditions are extremely dry, Riparian Reserves associated with perennial streams will burn (Gresswell 1999).

Aquatic and Riparian Habitat Trends

Aquatic habitat is improving in the project area because road decommissioning and improvements have reduced the amount of chronic erosion. Culverts have been upgraded to handle 100-year flood events, resulting in less risk of major washouts. LWD restoration projects have increased the number and depth of pools, stabilized channels, and provided cover for fish. As a result, sand levels are likely less and LWD levels are higher than observed in 1994; however, the upward trend is believed to remain on a slow rate of recovery.

Riparian areas are improving throughout the project area because they are no longer managed for timber production. As a result, the younger stands are recovering and eventually would provide a good supply of LWD and increase shade levels. Full recovery of Riparian Reserves would likely take 100 to 150 years.

3.6.4 Environmental Consequences

Table 3-10. Comparison of Effects on Fish, Aquatic Habitat, and Riparian Reserves from All Alternatives	
Issue: Fish (habitat conditions)	
Past Actions	• Reduced spawning and rearing habitat, resulting from increased stream sedimentation caused by roads, landings, and skid trails for timber harvest on both private and public lands • Increased stream temperatures as a result of timber harvest in riparian areas • Reduced LWD levels as a result of removal of conifers along streams • Timber harvest occurred along most streams on both private and public lands. Riparian areas treated the same as upland sites • Removal of most conifers along streams resulting in reduced sources for stream LWD • Timber harvest and fire exclusion has contributed to high stand densities and accumulated fuels. The potential for stand-replacement wildfires has increased.
Present Actions	• On private lands, harvesting would continue resulting in continued sedimentation of streams; less is expected than past timber harvest • More riparian conifers would be maintained during timber harvest on private lands resulting in more LWD entering streams • With more protection of riparian confers on private timber lands, shade levels would be higher than in the past, resulting in decreased stream temperatures • Less timber harvest is occurring in riparian areas on private timber lands. Riparian areas continue to develop and eventually reach mature conditions, providing more LWD sources for streams • High riparian stand densities would continue until they reach mature conditions
Current Conditions	• Pool habitat, clean gravel habitat, and LWD levels are low throughout most fish streams. Fine sediment levels are high • Stream temperatures are generally higher than natural temperatures • The culvert on BLM road #33-3-18.2 blocks cutthroat trout migration • Most Riparian Reserves are in early to mid-seral conditions, providing little LWD for streams • The potential for catastrophic wildfires to burn Riparian Reserves has increased
Future Actions	• Future timber harvest would occur within the project area and the Evans Creek Watershed on private lands • Future timber harvest would occur on public lands similar to treatments proposed under this project • Similar types of harvest treatments and harvest methods would be occur on public lands as proposed under this project • Future timber harvest would occur within the project area and the Evans Creek Watershed on private lands. Riparian areas receive greater protection then they did in the past. • Future timber harvest would occur on public lands similar to treatments proposed under this project. • Riparian Reserve designations are not expected to change.

Table 3-10. Comparison of Effects on Fish, Aquatic Habitat, and Riparian Reserves from All Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Proposed Actions	• No Action • There would be no timber harvest or road building and no change to sedimentation levels or Riparian Reserve stand conditions	• 392 acres of timber harvest • 1.2 miles of temporary road construction and 17 landings used • Log hauling and renovation on 33 miles of road • 4 miles of road decommissioning • 6 miles of road improvement • Fish culvert upgrade • 12 miles of roadside stabilization • 3 pump chances renovated • 461 acres of upland hazard fuels reduction • 154 acres of riparian hazard fuels reduction	• 292 acres of upland timber harvest • 1 mile of temporary road construction and 16 landings used • Log hauling and renovation on 33 miles of road • 4 miles of road decommissioning • 6 miles of road improvement • Fish culvert upgrade • 12 miles of roadside stabilization • 3 pump chances renovated • 466 acres of upland hazard fuels reduction • 10 acres of riparian density management treatment • 154 acres of riparian hazard fuels reduction	• 187 acres of upland timber harvest • 0.6 of a mile of temporary road construction and 13 landings used • Log hauling and renovation on 33 miles of road • 4 miles of road decommissioning • 6 miles of road improvement • Fish culvert upgrade • 12 miles of roadside stabilization • 3 pump chances renovated • 481 acres of upland hazard fuels reduction • 154 acres of riparian hazard fuels reduction
Cumulative Effects	• Continuation of current level of sedimentation • Aquatic habitat conditions would stay the same • Riparian stand conditions would stay the same	• Slight reduction of fine sediment levels in streams but overall aquatic habitat conditions would stay the same • Continuation of current conditions in Riparian Reserves	• Slight reduction of fine sediment levels in streams but overall aquatic habitat conditions would stay the same • Continuation of current conditions in Riparian Reserves	• Slight reduction of fine sediment levels in streams but overall aquatic habitat conditions would stay the same • Continuation of current conditions in Riparian Reserves

3.6.4.1 Effects of Alternative 1 (No Action) on Fish, Aquatic Habitat, and Riparian Reserves

Direct and Indirect Effects

The No Action alternative would have no direct effect on fish populations, aquatic habitat, or riparian habitat. However, existing poor conditions in both aquatic and riparian habitats would continue.

Roads in decomposed granitic soils have been shown to cause stream sedimentation (Sommarstrom and Kellog 1990). By forgoing the roadside stabilization, road improvement, and road decommissioning, the existing road problems in the project area would continue to be chronic sources of sedimentation to nearby streams. Sedimentation largely contributes to the low pool area and high quantity of sand in spawning gravels. This alternative would be expected to adversely affect aquatic habitat in both the short-term (1-5 years) and long-term (5+ years). Local fish populations would be adversely affected from the continuation of elevated sand levels because sand limits spawning rates and reduces egg and early fry survival (Waters 1995; Meehan 1991; Everest, et al. 1987; Meyer, et al. 2005).

Channel widths likely would narrow over time as more LWD is accumulated in streams naturally and as more deep-rooted bank vegetation is established (Montgomery and Buffington 1997). More LWD would be added to streams and natural recruitment will occur, causing channels to narrow. However, channel widths likely would not narrow until riparian areas reach a mature seral condition and supply enough LWD to modify channel widths.

Approximately 60 percent of Riparian Reserves are young and overly dense. If left untreated, these areas would eventually recover and provide a source of LWD for streams. However, Riparian Reserves in these conditions tend to provide little LWD recruitment to streams (Murphy and Koski 1989) and it would likely take 100 to150 years before a good supply of LWD is available. Under this alternative, streams lacking LWD would have to wait several years before wood is accumulated. This would maintain low habitat complexity in most streams. Low habitat complexity has shown to decrease winter survival for fish due to lack of protection from high flows (Solazzi, et al. 2000; Pearsons, et al. 1992). It is expected LWD would remain deficient and local fish population winter survival would be adversely affected.

Several Riparian Reserves would remain at a high risk of catastrophic fires without reduction of existing hazardous fuel conditions. If a catastrophic fire were to burn riparian areas, it would destroy the existing Riparian Reserves and increase the amount of early seral conditions. Since most riparian areas are already in early to mid-seral conditions, this would be an adverse effect because streams already lack enough LWD and stream temperatures are high. A fire would further delay recovery and subsequently prolong the existing low level of LWD and low shade levels.

Stream temperatures would decrease as Riparian Reserves develop. However, this would take an estimated 100 to 150 years until most streams have mature conifers along their banks to provide good canopy layers and protection from solar radiation.

Cumulative Impacts

Ongoing BLM projects in the project area include a fish habitat restoration project and culvert projects. The fish habitat restoration project will involve placing 12 rootwads and about 16 logs in West Fork Evans Creek to improve fish habitat. The culvert work entails upgrading 12 undersized or old stream culverts with larger ones that will pass 100-year flows. One draw pipe will be removed and eight cross-drain culverts will be replaced with armored waterdips.

The fish restoration project can be expected to temporarily disturb fish in the immediate area and cause short-term (1 year) localized increases in sediment. While the logs and rootwads are being placed, fish in the immediate area would likely move out into an adjacent pool or riffle. Kahler, et al. (2001) observed fish to naturally move between adjacent habitat units. Based on this, it would be reasonable to assume that if fish are displaced a short distance (≈50 feet) when the wood is placed in the stream, their displacement would be similar to natural localized movements and would not be physically harmful. The short-term increase in suspended sediment likely would not harm fish either. Conversely, this project would benefit fish by increasing the amount of cover and pool habitat formed by the wood, resulting in a net beneficial cumulative effect.

The culvert work can be expected to cause short-term (1-2 year) localized increases in sediment, but not to the extent of harming fish. In the long-term (>3 years), there would be a reduced risk of a major washout occurring that could generate large amounts of fine sediment that would enter streams. This would be a net beneficial cumulative affect for fish and aquatic habitat.

Most of the private timber land was harvested by tractor logging. Tractor logging is known to cause the most ground disturbance of all harvest methods. Cumulatively, the extensive harvest on intermingled private timber land and the widespread use of tractors has largely contributed to the existing high sediment levels in streams and the lack of large wood. It is expected more harvest will occur in private industrial timber land in the foreseeable future. This would be likely to cause more erosion and subsequent sedimentation to local streams, which would have a negative cumulative affect to fish and aquatic habitat.

Future BLM timber sale projects in Evans Creek 5th field watershed potentially could occur on approximately 12,000 acres. Likely over half of these acres would not be treated due to Riparian Reserves, other buffers, and stands not meeting criteria for treatment. Reevaluation of the cumulative effects from past management activities in three deferred 7th field watersheds within the Upper West Fork Evans Creek 6th field watershed may occur within the next five years. Depending on the findings of this analysis, management activities may or may not be proposed. Similar types of harvest treatments and harvest methods would be expected to occur in these future projects as those being proposed under this project. Additionally, fuels treatments would occur in the very northern part of Upper West Fork Evans Creek 6th field watershed. It is expected there would be short-term (1-2 year) localized increases in sediment entering local streams. However, with Riparian Reserve buffers and other PDFs defined above, there would either be neutral cumulative or net beneficial cumulative affects to fish, aquatic habitat, and riparian habitat.

It is expected a certain number of roads on private (unkown) and BLM-administered lands (not all problem roads are identified) would continue to erode, causing sedimentation of adjacent streams in the foreseeable future. Foregoing road decommissioning, road maintenance, or road renovation opportunities would maintain this condition on BLM lands. This would be expected to have an adverse cumulative effect on fisheries and aquatic resources through potential cumulative increases in stream sediment levels. This is also dependent on private activities and their use and maintenance of the transportation system in the watershed. The adverse effects from the continued sedimentation of streams would continue to negatively affect spawning rates, egg and early fry survival, and rearing and feeding behaviors of fish in these streams (Meehan 1991; Waters 1995; Everest, et al. 1987; Meyer, et al. 2005).

The reason early and mid-seral riparian vegetation conditions are dominant throughout most Riparian Reserves is from past forest fires and past timber harvest in riparian areas. These occurrences removed much of the trees in most riparian areas. Nearly all the riparian areas on private timber lands were harvested during the last 30 to 40 years. On BLM-administered land, an estimated 3,653 acres of harvest occurred in riparian areas, which is about 90 percent of the total area of Riparian Reserves in the Upper West Fork Evans Creek 6th field watershed. Second-growth stands have been shown to not contribute adequate supplies of LWD to streams (Murphy and Koski 1989). This is the primary reason most streams are lacking LWD.

By not completing the hazardous fuels reductions in Riparian Reserves, several areas would remain at a high risk of catastrophic fires. Alternative 1 would maintain the current high risk of catastrophic fires which likely would burn riparian areas if a large fire occurred adjacent to them, further delaying late-successional riparian stand characteristics. Since most Riparian Reserves are already young and overstocked, a catastrophic fire in Riparian Reserves would further delay the time it would take for these areas to reach mature conditions. This would be a net detriment to fish, aquatic habitat, and Riparian Reserves.

3.6.4.2 Effects of Alternative 2 on Fish, Aquatic Habitat, and Riparian Reserves

Direct and Indirect Effect

Under this alternative, 392 acres of timber harvest is proposed: 160 acres of density management, 125 acres of SGFMA regeneration harvest, 65 acres of NGFMA regeneration harvest, 30 acres of selection harvest, and 12 acres of progeny test site harvest. Logging systems for these acres include 60 acres of tractor yarding, 190 acres of cable yarding, 130 helicopter acres, and 12 acres of small tractor yarding (in progeny test sites). Most timber harvest acres would have the resulting slash piled by hand or with excavator and burned. No harvesting, yarding, or post-harvest slash treatment would occur in Riparian Reserves and no avenues exist for sediment to enter streams.

Riparian buffers have shown to protect aquatic ecosystems during timber harvest activities because they maintain shade levels, provide LWD recruitment, and protect aquatic habitat (Hall and Lantz 1969; Newbold, et al. 1980; Murphy, et al. 1986; Meehan 1991). Because of these factors, no direct or indirect effects to fish or aquatic habitat are expected from the felling or

yarding of trees or post-harvest slash treatment. There is a potential for soil to move into the outer edges of Riparian Reserves when skid trails occur adjacent to them. However, it is expected to be minimal because of the PDFs for both tractor and cable yarding. A small amount of soil movement into the outer edge of Riparian Reserve would not adversely affect riparian conditions because it would quickly become vegetated and would not affect tree growth.

There would be 1.2 miles of new temporary road constructed on ridge tops and 17 landings would be used for helicopter and service landing operations. Two old landings would be redeveloped and 7 new landings constructed. The other eight landings are existing and would not be ripped after use. Temporary spur roads and newly constructed and redeveloped helicopter landings would be decommissioned, seeded, and mulched the same season. No direct or indirect affects to fish, aquatic habitat, or Riparian Reserves are expected from the temporary spur road or landing construction and subsequent decommissioning. All temporary spur roads and landings would be located outside of Riparian Reserves and no avenues exist for sediment to reach streams from these activities.

Log hauling would occur on approximately 33 miles of gravel and natural-surface roads. Sediment may enter streams when log trucks cross streams. The amount of sediment generated likely would be inconsequential. Most roads would be rocked prior to hauling and all hauling on natural-surface roads would only occur during the dry season. This would reduce the risk of sediment entering nearby streams. If a small amount of sediment were to enter streams containing fish, it may temporarily disrupt feeding or displace fish upstream or downstream. Fish naturally move around in streams (Kahler, et al. 2001), so it is unlikely this would cause any physiological hardship to a fish or local population trends. Fish habitat would have a temporary, inconsequential increase in sediment that would be washed away during the first high flows.

Four miles of road decommissioning is proposed. Sediment likely would enter streams where roads cross streams, increasing sediment levels. This would be a short-term (1-2 years) negative effect to fish and aquatic habitat. The effect to fish (steelhead and cutthroat trout) would be temporary disruption of feeding or displacement upstream or downstream. If feeding were temporarily interrupted, it is unlikely this would cause injury. Fish have evolved in environments characterized by large seasonal fluctuations in food availability and they are capable of surviving long periods without food (Simpkins, et al. 2003). Fish naturally move around in streams (Kahler, et al. 2001), so it is unlikely this would cause any physiological hardship to a fish or local fish population trends. The PDFs requiring all road decommissioning during the dry season, slopes to be pulled back to natural gradients on streams, and these roads to be waterbarred would help reduce the amount of temporary localized sediment, reducing the amount of sediment entering streams.

As the decommissioned roads become revegetated, there would be less erosion than occurred before decommissioning, resulting in an indirect benefit to fish and aquatic habitat by reducing the net input of sediment to streams. Riparian Reserves would benefit in the long-term (10+ years) because the functioning riparian areas would increase as trees grow on the decommissioned road bed. This would also benefit fish and aquatic habitat because the sources for LWD would increase where roads are within 100 feet of streams. Most in-stream LWD comes from within 100 feet of streams (Meleason, et al. 2003).

The proposed 33 miles of road renovation and 6 miles of road improvement would be expected to have indirect, negative effects to fish and aquatic habitat from localized increases to baseline stream turbidity and sediment levels in the short-term (<1 year). The PDF for completing all renovation and improvements during the dry season would minimize the amount of sediment entering streams. The amount of sediment entering streams would not extirpate fish in affected streams, but may temporarily displace fish until sediment levels return to baseline levels (<1 year). Conversely, the proposed road renovation and improvement actions would indirectly benefit fish and aquatic habitat within the watershed by reducing the amount of erosion and subsequent stream sedimentation in the long-term (>5 years).

Under Alternative 2, 12 miles of roadside stabilization would occur. Hydromulch would be sprayed on unvegetated cutbanks along roads that currently are eroding and delivering sediment to streams. The hydromulch would contain a mixture of native seed, fertilizer, mulch, limestone, tackifier, gypsum plaster, and water. The application is very accurate and it adheres to cutbanks immediately after spraying. The hydromulch would be applied during the dry season. Because of these factors, no negative affects to fish or aquatic habitat are anticipated. Long-term, stream sedimentation from eroding cutbanks would be reduced as these areas revegetate and soil is stabilized. Fish and aquatic habitat would benefit from the reduced sediment loads entering streams.

The reduction of sediment entering streams from the proposed road decommissioning, roadside stabilization, and road renovation however, would not measurably reduce the overall high fine sediment levels throughout the project area. Rather, there would be small localized reductions in fine sediment levels. The small scale of areas improved and treated versus the high densities of roads on both private and public lands contributing sediment to streams would not offset the large-scale road problems in the project area. The overall high sediment levels would persist and the benefits to fish and aquatic habitat would be minor.

The culvert on BLM road #33-3-18.2 would be replaced with a larger culvert capable of passing fish and 100-year flood events. The streambed and banks would be disturbed in the immediate area during the excavation. Up to 50 cubic yards of sediment may enter the stream during excavation and culvert installation, and may travel downstream to West Fork Evans Creek. The work would be completed during the summer low-flow period and exposed soil would be seeded and mulched, which would reduce the potential for sediment to enter the stream. Short-term (1 to 2 years) local fish would be displaced as a result of the increased suspended sediment load both in the tributary stream and West Fork Evans Creek. Cutthroat in the tributary stream may be displaced and move over the 15-foot waterfall, in which case they would be unable to return. This would reduce the number of fish in the stream; therefore reducing production. However, the remaining fish would have access to at least 0.5 miles of additional habitat, which would increase production, off-setting the loss of a few fish over the waterfall. The cutthroat trout population within the whole Evans Creek 5th field watershed is in good condition and if a few fish were pushed out of the tributary stream, they would survive in West Fork Evans Creek and it would not affect overall production. It is unlikely temporary displacement of fish would cause any physiological hardship for these species. Kahler, et al. (2001) observed the movement of fish between stream reaches and between different streams to avoid natural disturbances or to seek better feeding areas, as a common and natural occurrence. Alternatively, replacing the culvert would allow unobstructed fish passage for cutthroat trout, resulting in a beneficial effect on fish production (Roni, et al. 2002).

Three pump chances would be renovated. Short-term (<1 year) localized sediment would be generated and transported down stream. Two are located within 300 feet of cutthroat streams, West Fork Evans Creek and an unnamed tributary to West Fork Evans Creek. One is located on BLM road #32-3-31 and the other on BLM road #33-4-25.1. The third pump chance is more than 1.0 mile away from fish, which is a sufficient distance for sediment to settle out before reaching fish streams. Sediment likely would enter West Fork Evans Creek and the tributary stream from the pump chance renovation resulting in a short-term (<1 year) negative affect to cutthroat trout behavior and their habitat. The amount of sediment entering these streams is expected to be less than a cubic yard of soil and it likely would only displace fish downstream or upstream for a up to a few days. It is unlikely temporary displacement of fish would cause any physiological hardship for these species.

Hazard fuels reduction would occur on 615 acres, with 154 acres within Riparian Reserves. Riparian fuels treatments would include thinning understory conifers, hardwoods, and shrubs less than 7″ DBH; hand piling; pile burning; and 67 acres of underburning. Handlines would be constructed in Riparian Reserves and 1 or 2 may cross streams in the 67 acres of underburning. Most handlines would be located on natural topography breaks, away from streams. All handlines constructed in Riparian Reserves would be built the same season as burn operations and rehabilitated immediately following the burn, before the rainy season. No vegetation would be cut within 50 feet of any fish-bearing or non-fish-bearing perennial streams or within 25 feet of

non-fish-bearing, intermittent streams. No fuels treatments would occur in Riparian Reserves with slopes 35 percent or greater. No direct ignition would occur within the no-treatment zones (25 and 50 foot buffers defined above) during underburn operations but would be allowed to burn into the no-treatment buffer, as long as the burn is low intensity and mid- and upper level canopies are not at risk. By following these PDFs, shade levels would be maintained and no sediment is expected to enter streams.

In the long-term (>5 years), the risk of a fire destroying Riparian Reserves would be reduced. Since most Riparian Reserves are already in mid-seral conditions, reducing the risk of a fire converting riparian areas to early seral conditions would be beneficial to fish, aquatic habitat, and Riparian Reserves. Furthermore, thinning competing conifers would rapidly produce mature seral tree sizes (Berg and Maki 2003). This would improve shade levels and improve recruitment of LWD for adjacent streams. Site-specific improvements, such as decreased temperatures on perennial streams and increased LWD in streams, would result in beneficial effects on fish, aquatic habitat, and Riparian Reserves.

Cumulative Effects

See Section 3.6.4.1, Effects of Alternative 1 (No Action) on Fish, Aquatic Habitat and Riparian Reserves, Cumulative Effects for ongoing and future BLM projects in the area.

All timber harvest, post-harvest slash treatment, yarding, temporary spur road construction and decommissioning, and landing development would occur outside Riparian Reserves. No avenues exist for sediment to reach streams from these activities; therefore, they would have no cumulative effect to fish, aquatic habitat, or Riparian Reserves.

Sediment generated from the proposed road maintenance, road decommissioning, and culvert removal/replacement (including the fish culvert) would cause short-term (1 to 2 years), localized increases in stream sediment levels. By following the PDFs, the amount of sediment entering streams would be minimized. After roads are renovated and improved, vegetation reestablishes on decommissioned roads, and culvert sites stabilize, there would be less sediment entering streams and less risk of mass failures. There would be a short-term (1 to 2 years) negative cumulative impact to fish and aquatic habitat, but overall, the cumulative affect would be a net benefit because there would be less sediment entering streams than before treatment.

Log hauling would occur on maintained roads and primarily during the dry season. Due to these and other factors, stream sediment generated from log hauling is expected to be an inconsequential amount. An inconsequential increase in fine sediment would have no cumulative affects to fish or aquatic habitat.

Roadside stabilization would have a net beneficial cumulative effect to fish and aquatic habitat because 12 miles of road cutbanks would be stabilized and erosion rates reduced. This would reduce the amount of eroding surfaces, resulting in less sediment (sand and silt) entering streams. Any reduction is sediment entering streams would improve spawning and rearing habitat for fish.

The net cumulative benefit of reduced sedimentation of streams from the proposed road decommissioning, roadside stabilization, and road renovation would be inconsequential in reducing the overall elevated sediment levels throughout the project area. The overall high sediment levels would persist and the benefits to fish and aquatic habitat would be minor.

Two culvert fish barriers were upgraded in the last five years and now nearly all streams are accessible to fish. Three culverts in the project area are known block fish passage. By replacing the proposed culvert, cutthroat trout production in that stream would improve, increasing habitat connectivity for the area. This would be a beneficial cumulative affect to cutthroat trout and aquatic habitat.

Pump chance renovation likely would cause short-term increases in sediment immediately downstream where cutthroat trout occur. The impacts would be short-term (<1 year) and would be inconsequential to cutthroat population within the area. No cumulative affect from the pump chance renovation is expected.

The riparian fuels treatments would reduce the risk of a fire destroying these Riparian Reserves. Thinning out the competing conifers would also allow younger stands to more rapidly reach mature seral sizes (Berg and Maki 2003). This would improve shade levels and recruitment of LWD for adjacent streams and would provide a net beneficial cumulative affect to fish, aquatic habitat, and Riparian Reserves.

3.6.4.3 Effects of Alternative 3 on Fish, Aquatic Habitat, and Riparian Reserves

Direct and Indirect Effects

Under Alternative 3, 292 acres of timber harvest is proposed: 155 acres of density management harvest, 35 acres of SGFMA regeneration harvest, 90 acres of selection harvest, and 12 acres of progeny test site harvest. Logging systems for these acres include 35 acres of tractor yarding, 125 acres of cable yarding, 120 acres of helicopter yarding, and 12 acres of small tractor yarding (in progeny test sites). Most timber harvest acres would have the resulting slash piled by hand or with excavator and burned. None of these activities occur in Riparian Reserves and no avenues exist for sediment to enter streams.

Riparian buffers have been shown to protect aquatic ecosystems during timber harvest activities because they maintain shade levels, provide LWD recruitment, and protect aquatic habitat (Hall and Lantz 1969, Newbold et al. 1980, Murphy et al. 1986, Meehan 1991). Because of these factors, no direct or indirect effects to fish or aquatic habitat are expected from the felling or yarding of trees or post-harvest slash treatment on these acres. There is a potential for soil to move into the outer edges of Riparian Reserves when skid trails occur adjacent to them. However, it is expected to be minimal because of the PDFs for both tractor and cable yarding. A small amount of soil movement into the outer edge of the Riparian Reserve would not adversely affect riparian conditions because it would quickly revegetate and would not affect tree growth.

Ten acres of modified density management would be completed in Riparian Reserves along the headwaters of Sams Creek (T33S, R3W, Section 8), along a small tributary of Sand Creek (T33S, R3W, Section 31), and along Sand Creek above BLM road #33-3-31.2. This modified treatment would reduce the riparian canopy to 50 percent through conifer thinning, mostly Douglas-fir species less than 20″ DBH, and thinning from below to within 50 feet of Sams Creek, 95 feet of Sand Creek, and 15 feet of the tributary to Sand Creek. The objective is to release nutrients and water in areas where tree density and competition for resources is high. Minor species, such as Pacific yew, black oak, and big leaf maple, all snags, and all other riparian species would be retained, regardless of diameter. Stocking would be reduced to a relative density of approximately 40 percent with an average residual basal area of 140-160 square feet per acre.

All of the Section 8 riparian unit and most of the Section 31 riparian unit would be yarded with helicopter. A 75-foot wide section above BLM road #33-3-31.2 would be bull-lined down to the road or taken with self-loader. In the bull-lining portion, the slopes are less than 20 percent and most are between 1 and 10 percent. No avenues exist for sediment to enter Sand Creek. All soil disturbances would be seeded and mulched right after harvest.

No ground disturbance would occur within the ‘no-treatment’ buffers during the riparian treatments. There are no draws or cross-drain culverts between the treatments and adjacent streams. Any soil exposed during treatment would be seeded and mulched in the same season. The only way sediment could move to a stream would be via overland flows; however, overland flow is rare throughout the Pacific Northwest due to low precipitation intensities and high infiltration rates (Salo and Cundy 1987). No sediment is expected to reach streams resulting from the riparian thinning. Shade levels would be maintained; therefore, stream temperature would not change.

These young stands are overstocked and do not provide a good source of LWD for streams (Murphy and Koski 1989). By thinning, competition for resources would be reduced and mature seral conditions would more rapidly be achieved (Berg and Maki 2003). There are no anticipated short-term (1 to 2 years) negative impacts from thinning in Riparian Reserves to fish or aquatic resources. In the long-term (≈50+ years), more LWD recruitment is expected in the adjacent streams, which would benefit fish and aquatic habitat.

There would be 1.0 mile of new temporary road constructed on ridge tops and 16 landings would be used for helicopter and service landing operations. Two old landings would be redeveloped and 6 new landings constructed. The other eight landings are existing and would not be ripped after use. All temporary spur roads and newly constructed and redeveloped helicopter landings would be decommissioned, seeded, and mulched the same season. No direct or indirect affects to fish, aquatic habitat, or Riparian Reserves are expected because all spur roads and landings would be located outside Riparian Reserves with no avenues for sediment to reach streams from these activities.

The same miles of log hauling and road renovation would occur under this alternative as under Alternative 2. The effects would be the same.

Road decommissioning, road improvement, fish culvert replacement, roadside stabilization, and pump chance renovation projects are the same as proposed under Alternative 2. The impacts would be the same for these projects as discussed under Alternative 2.

The overall reduction of fine sediment levels in streams from the proposed road decommissioning, roadside stabilization, and road renovation would be the same as discussed under Alternative 2.

Hazard fuels reduction would occur on 620 acres, with 154 acres within Riparian Reserves. Riparian fuels treatments would include thinning understory conifers, hardwoods, and shrubs less than 7″ DBH; hand piling; pile burning; and 38 acres of underburning. The impacts would be the same as discussed under Alternative 2.

Cumulative Effects

See Section 3.6.4.1, Effects of Alternative 1 (No Action) on Fish, Aquatic Habitat and Riparian Reserves, Cumulative Effects for ongoing and future BLM projects in the area.

No sediment is expected to reach streams as a result of the timber felling, yarding, post-harvest slash treatment, temporary spur road construction and decommissioning, and landing development. This includes the thinning in the Riparian Reserves. No avenues for sediment to reach streams exist from these activities; therefore, they would have no cumulative effect to fish, aquatic habitat, or Riparian Reserves.

The cumulative effects regarding road decommissioning, road improvement, log hauling, fish culvert replacement, roadside stabilization, pump chance renovation, and riparian hazard fuel reduction would be the same as discussed in Alternative 2. See Section 3.6.4.2, Effects of Alternative 2 on Fish, Aquatic Habitat, and Riparian Reserves, Cumulative Effects.

3.6.4.4 Effects of Alternative 4 on Fish, Aquatic Habitat, and Riparian Reserves

Direct and Indirect Effects

Under Alternative 4, 187 acres of timber harvest is proposed: 150 acres of density management harvest, 25 acres of selection harvest, and 12 acres of progeny test site harvest. Logging systems for these acres include 20 acres of tractor yarding, 75 acres of cable yarding, 80 acres of helicopter yarding, and 12 acres of small tractor yarding (in progeny test sites). Most timber harvest acres would have the resulting slash piled by hand or with excavator and burned.

No harvesting, yarding, or post-harvest slash treatment would occur in Riparian Reserves and no avenues would exist for sediment to sediment to enter streams. Riparian buffers have been shown to protect aquatic ecosystems during timber harvest activities because they maintain shade levels, provide LWD recruitment, and protect aquatic habitat (Hall and Lantz 1969; Newbold, et al. 1980; Murphy, et al. 1986; Meehan 1991). Because of these factors, no direct or indirect effects to fish or aquatic habitat are expected from the felling or yarding of trees or post-harvest slash treatment. There is a potential for soil erosion to occur adjacent to Riparian Reserves, potentially causing sediment to move into adjacent Riparian Reserves. However, it is expected to be minimal because of the PDFs for tractor and cable yarding. A small amount of soil movement into the Riparian Reserve would not adversely affect riparian conditions.

There would be 0.6 miles of new temporary road constructed on ridge tops and 13 landings would be used for helicopter and service landing operations. Two old landings would be redeveloped and 5 new landings constructed. The other seven landings are existing landings and would not be ripped after use. All temporary spur roads and newly constructed and redeveloped helicopter landings would be decommissioned, seeded, and mulched the same season. No direct or indirect affects to fish, aquatic habitat, or Riparian Reserves are expected from the temporary spur road or landing construction and subsequent decommissioning because all temporary spur roads and landings would be located outside Riparian Reserves and no avenues exist for sediment to reach streams from these activities.

The miles of log hauling and road renovation would be the same in Alternative 4 as under Alternative 2. The effects would be the same.

Road decommissioning, road improvement, fish culvert replacement, roadside stabilization, and pump chances renovation proposed in Alternative 4 are the same as proposed under Alternative 2. The impacts would be the same for these projects as discussed under Alternative 2.

The overall reductions of fine sediment levels in streams from the proposed road decommissioning, roadside stabilization, and road renovation would be the same as discussed under Alternative 2.

Hazard fuels reduction would occur on 635 acres, with 154 acres within Riparian Reserves. Riparian fuels treatments would include thinning understory conifers, hardwoods, and shrubs less than 7″ DBH; hand piling; pile burning; and 25 acres of underburning. The impacts would be the same as discussed under Alternative 2.

Cumulative Effects

See Section 3.6.4.1, Effects of Alternative 1 (No Action) on Fish, Aquatic Habitat and Riparian Reserves, Cumulative Effects for ongoing and future BLM projects in the area.

No sediment is expected to reach streams as a result of the timber felling, yarding, post-harvest slash treatment, temporary spur road construction and decommissioning, or landing development. None of these activities would occur in Riparian Reserves. There are no avenues for sediment to reach streams from these activities; therefore, they would have no cumulative effect to fish, aquatic habitat, or Riparian Reserves.

The cumulative effects regarding road work, log hauling, fish culvert replacement, roadside stabilization, pump chance renovation, and riparian hazard fuel reduction would be the same as under Alternative 2. See Section 3.6.4.2, Effects of Alternative 2 on Fish, Aquatic Habitat, and Riparian Reserves, Cumulative Effects.

3.7 Fuels

3.7.1 Methodology

The evaluation and analysis of pre- and post-treatments, and fuels density and forest management treatments was completed using Fire Effects Monitoring and Inventory Protocol database FIREMON [online at http://fire.org/firemon], and Fuels Management Analysis Plus (FMA) [online at http://www.fireps.com] CrownMass program. In addition, a 12-year analysis of weather patterns during the fire season months of June 1 to September 30 (a 122-day period) was completed using the Evans Remote Automated Weather Station data. The weather analysis was completed using FireFamily Plus software and was based on the 90th percentile weather (high to extreme conditions). This information was analyzed to determine the number of fire days specific fire activity is likely to occur based on forest and fuels conditions. Information used in this analysis includes FIREMON plot data, field visits (stand exams), Photo Series for Quantify Forest Residues, and National fire Danger Rating System (NFDRS) Fire Behavior Fuel Models.

Fire history and fire risk analyses were completed using GIS-generated spatial analysis based on information provided by Oregon Department of Forestry (ODF) wildfire database. In addition, GIS data described the kind, amount, and distribution of forest vegetation on BLM-administered lands across the watersheds. This information was used with aerial photos and 1916 Revestment Surveys to determine historic and current fire regimes. The West Fork of Evans Creek Watershed Analysis was used for background information. Literature related to fisheries, streams, hydrology, timber harvest, road activities, and wildfires were also used in the analysis of this project.

3.7.2 Assumptions

Hourly wind events were not analyzed. Hourly winds, especially in the afternoon, would likely be greater than the daily averages. The resultant fire intensities would likely be greater during the late afternoon hours than predicted in this analysis. In addition, fuel moisture, temperature, and relative humidity were held constant throughout the 122-day period. The figures used were based on the 90th percentile weather for the entire 122-day period. Actual fuel moistures and relative humidity may be higher, and temperatures lower for the hotter summer months of July and August than the values used in the analysis. As a result, the predicted fire activity for those months may be lower than the actual fire activity that may occur during this time frame.

3.7.3 Affected Environment

3.7.3.1 Introduction

Fires are a normal occurrence and have played a key role as a natural disturbance process throughout southwestern Oregon (Atzet and Wheeler 1982). Fires can occur as low intensity underburns, partial stand-replacement, or catastrophic stand-replacement events. Fuel, topography, and weather are fundamental factors influencing wildfire intensity (the rate at which it consume fuel) and severity (the effect fire has on vegetation, soils, buildings, watersheds, and so forth), shaping stand structure and function of forest across the landscape (Graham, et al. 2004). Fuels can be managed to reduce fire intensities, however, decisions about fuels management treatments must also consider topography and weather.

Fire plays an important role in influencing successional processes and shaping the landscape. Throughout the 6th field watershed of Upper West Fork Evans Creek, fire scars, which are evidence of past fires, indicate fires of vary degrees likely burned throughout the watershed. Low to moderate intensity fires helped to maintain lower fuel loadings and more open understories. Areas that did not experience fire activity for longer periods of time developed stands of higher densities and fuel loadings. These areas, especially on southern aspects and during extreme weather conditions and drought, likely burned with greater intensities.

Wildland fires within the Slick Sand project area were first recorded in the 1916 Revestment Surveys. Notes from these surveys indicate large expanses of burned areas with varying degrees of severity within the Upper West Fork Evans Creek 6th field watershed. These fires burned in a mosaic pattern from surface fires to passive fires to crowning fires, resulting in little to no damage in the overstory, to leaving less than 10 percent of the canopy intact.

---

*A **surface fire** burns on the surface of the ground in needles, leaves, grasses, forbs, dead and down branches and boles, stumps, shrubs and short trees (Scott and Reinhardt 2000). A **passive fire**, also called torching, is one in which individual or small groups of trees torch out, but solid flame is not consistently maintained in the canopy. **Passive crowning** encompasses a wide range of fire behavior, from individual tree torching to nearly active crown fire (Scott and Reinhardt 2000). An **active crown** fire burns in the canopy fuels in which the entire fuel complex becomes involved (Scott and Reinhardt 2000).*

The presence of knobcone pine (*Pinus attenuata*), which is dependent on stand-replacing crown fires for reproduction, indicates the occurrence of moderate to high severity fires in the project area. Knobcone pine typically occurs on upper ridgelines and south-facing aspects indicating higher intensity fire disturbances occurred in these areas. Fire scars on large conifers species are present on northern aspects, riparian areas, areas with higher fuel moistures, and area protected from afternoon winds, indicating low to moderate intensity surface fires burned through the understory. Such fires influenced stand structure and species composition by burning or killing a disproportionate percentage of smaller trees and thin-barked or otherwise fire-sensitive species (Weatherspoon 1996).

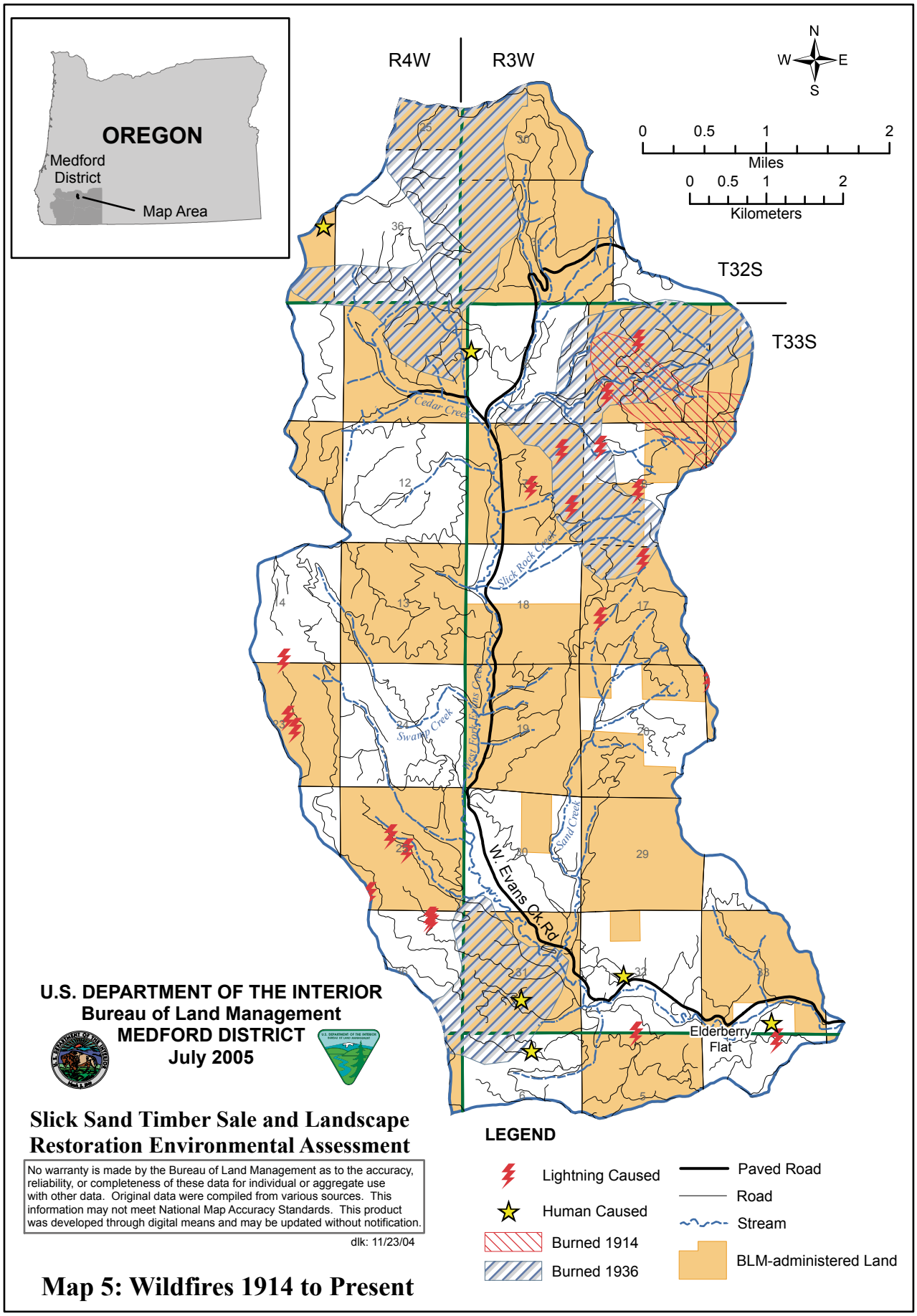
Based on current stand exam data on BLM-administered lands and visual examinations, it is estimated that knobcone pine stands cover less than 20 percent of the watershed area. This could indicate, at some point in time, the watershed may have experienced moderate to high severity fires burning in less than 20 percent of the area, starting the successional processes over.

Fire suppression efforts began in the early 1900s but effective suppression in the area did not occur until after World War II. Historically, fires were a common occurrence, burning with varying severities and scales in the project area prior to 1940. With the increase in forest management, new road construction, and the combination of adequate personnel and equipment, fire suppression became more effective. Since 1940, 17 fires, all less than 2 acres in size, have occurred in the Slick Sand project area (see Map 5). Fire suppression has reduced the number of acres burned within the watershed. Immediate suppression action and containment of all wildfires became the policy and goal of all land management agencies and continues to remain in effect today.

With the advent of fire suppression, there has been a departure from the historical fire patterns and successional development throughout the project area. Low intensity fires controlled regeneration of fire-intolerant species (plants unable to physiologically withstand heat produced by fires), promoted fire-tolerant species (such as ponderosa pine and Douglas-fir), maintained an open forest structure, and reduced surface fuel loadings (Graham, et al. 2004). The exclusion of fire has altered the Douglas-fir series, found throughout the project area, from the natural level of vegetation maintained by fire to overstocked stands with an increase in the number of suppressed trees and shrub species, and an increase in surface fuel loadings.

Fuel loading is the weight of fuels in a given area, usually expressed in tons per acre, pounds per acre, or kilograms per square meter (Fire Effects Guide 2004).

In addition to fire suppression, past forest management practices have shifted the variable heterogeneous stands of late-successional forest to a patchy mosaic of young (early to mid-seral stage) stands. This has increased the susceptibility of the project area to the effects of fire. The increased susceptibility of young stands is due to homogeneous canopies, continuous horizontal and vertical stand structures, increased surface fuel loadings, and high stocking levels. These structure changes have contributed to the shift from low intensity surface fires to severe stand-replacing fires (Kauffman 2004). A surface fire can quickly become a high intensity fire which



Map 5: Wildfires 1914 to Present

may lead to increased fire intensity in neighboring unmanaged forest. Historically, this watershed may have had as little as 20 percent of the area in early seral stand condition. Mapping of known past actions indicate that the watershed now has as much as 45 to 65 percent in early seral stage.

3.7.3.2 Fire Regimes

Fire regime is a generalized description of fire's role within an ecosystem and is characterized by fire frequency, severity, seasonality, duration, and extent of fire occurring in an area (Agee 1993).

Fire Regime 3 best represents the natural (historic) fire regime of the Douglas-fir series which is found throughout the project area. Historically, fires in the Douglas-fir series varied from light surface fires to partial stand-replacement fires to heavily damaged overstory and, in some instances, patches of stand-replacement.

Historical conditions or processes are most often characterized in terms of fire regimes. Five natural (historic) fire regime groups were developed based on the average number of years between fires (fire frequency) combined with the severity of the fire on the dominant overstory vegetation (Hardy, et al. 1999; Schmidt, et al. 2002). Fire severity is the degree in which vegetation and site conditions have been altered by fire. Table 3-11 summarizes the five natural (historic) fire regime groups. These fire regimes represent historic fire regimes prior to the era of fire exclusion.

Table 3-11. Fire Regime Groups

Fire Regime Group	Fire Frequency	Fire Severity
I	0-35 years	• Low to mixed severity • Surface fires • <75% dominant overstory vegetation replaced
II	0-35 years	• High severity • Stand-replacement fires • >75% dominant overstory vegetation replaced
III	35-100+ years	• Mixed severity • Surface to stand-replacement fires • <75% dominant overstory vegetation replaced
IV	35-100+ years	• High severity • Stand-replacement fires • >75% dominant overstory vegetation replaced
V	200+ years	• High severity • Stand-replacement fires • >75% dominant overstory vegetation replaced

The combination of fire suppression and past forest management practices has altered the historical fire regime throughout the project area. This alteration has changed the natural level of vegetation, creating overstocked homogenous stands with higher tree densities in the understory and increased surface fuel loadings. A departure form the historical fire regime has occurred throughout the watershed. The overall effect has shifted the low severity and low to moderate severity fire regimes to moderate to high severity regime (Agee 1993).

Fuel loading is the weight of fuels in a given area, usually expressed in tons per acre, pounds per acre, or kilograms per square meter (Fire Effects Guide 2004).

Departure from the historic fire regime in the Upper West Fork Evans Creek 6th field watershed has increased the number of days during the fire season (fire days) a low intensity surface fire

could transition into a higher intensity crown fire activity. Crown fire begins with torching, or movement of fire into the crown, followed by active crown-fire spread in which fire moves from tree crown to tree crown through the canopy (Peterson, et al. 2005).

A 12-year analysis of weather patterns during the fire season months of June 1 to September 30 (a 122-day period) was completed using the Evans Remote Automated Weather Station data. The analysis was based on the 90th percentile weather (high to extreme conditions). From this analysis, the number of days in which the wind blew at a certain speed was determined. This information was analyzed to determine the number of fire days specific fire activity is likely to occur based on current forest and fuels conditions (see Table 3-12).

Table 3-12. Fire Days in Upper West Fork Evans Creek 6th Field Watershed

Current Forest Conditions				Fire Activity								
				Surface Fire			Passive Crown Fire			Active Crown Fire		
Seral Stage	Total Acres	Total BLM Acres	Canopy Base Height (feet)	Wind Speed (mph)	Flame Length (feet)	Fire Days	Wind Speed (mph)	Flame Length (feet)	Fire Days	Wind Speed (mph)	Flame Length (feet)	Fire Days
Early	966	332	4	n/a	n/a	n/a	0-4	4-5	78	>5	6	44
Mid-	9,088	4,012	1	n/a	n/a	n/a	0-11	3-5	118	>11	6	4
Late	1,751	1,117	8	0-4	4	78	5-27	5-11	43	>27	12	1
Mature > 80 years	4,201	3,919	13	0-15	6	120	16-18	7	1	>19	8	1

The data collected and analyzed from the project area provided evidence that early to mid-seral stage stands are more susceptible to intense fire behavior conditions (see Appendix E, Fuels). Lower canopy base heights (cbh), dense and low continuous canopy structures, smaller trees, and high fuel loadings from previous forest management activities have created conditions conducive to the initiation and sustainability of crown fire activity. Regeneration areas (plantations) are likely to burn more intensely and uniformly throughout the unit if no site preparation treatment occurred prior to planting, or if several precommercial thinnings have occurred without treatment of the slash, than units where sequential fuels treatments have occurred (Weatherspoon and Skinner 1995).

Canopy base height (cbh) is the lowest height above the ground at which there is sufficient understory canopy fuel to propagate fire vertically through the canopy (Scott and Reinhardt 2001).

Surface fire activity for early and mid-seral stands is very limited and very dependent on environmental conditions such as fuel moisture, weather, and physical setting. Early seral stands can have initiation of passive crown fires for 78 days of the 122-day fire season with winds less than 5 miles per hour. Active crown fire activity can be initiated and likely sustained for 44 days of the 122-day period in early seral stands with winds speeds over 5 miles per hour. Initiation of crown fire activity, resulting in high mortality of all vegetation, is more likely to occur when surface fuels are not treated following sequential fuels treatments or are located on a southern aspect. A surface fire would likely become a passive fire almost immediately following ignition in mid-seral stage stands with winds less than 11 miles per hour. The higher intensity passive crown fires are very likely to occur throughout the fire season with the initiation of active crown fire when winds start to reach 11 miles per hour (see Table 3-12).

Fire suppression resources are more readily able to contain a surface fire due to lower intensities (flame lengths) and slower rates of spread. Once flame lengths reach four feet in length or the fire starts to flare up into the canopy, direct attack by fire suppression resources, especially by engine and hand crews, becomes increasingly difficult. Once a fire becomes an active crown fire, fire resources are unable to fight the fire directly. At this point, fires have the ability to rapidly grow and become large before containment is possible. Embers lofted during passive and active crowning can start new fires downwind, making containment even more difficult and increasing the overall rate of fire growth (Scott and Reinhardt 2000).

A fire initiated within a late seral stage stand remains a surface fire until wind speeds increase to five miles per hour. Once the wind increases to speeds greater than five miles per hour, passive crown fire activity is likely to occur on 43 fire days (see Table 3-12). Flame lengths and intensities vary greatly throughout the stand and are dependent on slope, aspect, fuel moisture, and surface fuel loadings.

Greater mortality to intermediate and codominant species occurs in areas where the understory vegetation or suppressed trees are dense enough to spread the surface fire into the canopy of the overstory trees. Higher wind speeds would likely affect fire spread and intensities less in late seral stage stands than in mid- and early seral stands due to larger trees acting as natural wind blocks and reducing wind within a stand. However, once the fire becomes an active crown fire, the higher canopy bulk densities found in late seral stage stands are more conducive to sustained runs of active crown fire, increasing the damage to and mortality of the dominant overstory trees.

Surface fire activity is likely to occur most of the fire season in mature stands when a fire is initiated within the stand. Due to the structural complexity of these stands, fire behavior would vary throughout the stand. However, the abundance and distribution of down dead woody material, large amounts of organic soil material, and a deep layer of continuous ground fuels often found in forest that have not experience fire for several decades can sustain low intensity burning for weeks to months, with potential flaming combustion under dry, windy, conditions (Graham, et al. 2004). Combustion of woody fuel can contribute significantly to smoke production and soil impacts (Graham, et al. 2004). Initiation of crown fire is reduced due to the higher canopy base heights, however, the increased intensities and sustained heat created could increase the damage and, in some cases, the mortality of the overstory trees, even after the flaming front has passed.

The current canopy densities of mature and late seral stage stands within the watershed, are very capable of sustaining crown fire activity. Depending on environmental conditions, or during drought years, a fire originating outside these stands which becomes an active crown fire can continue to burn through these older stands with very high intensities. Active crown fires increase radiation, spread rates, and spotting distances leading to even greater rates of fire growth than would occur if the fire remained on the surface (Scott and Reinhardt 2000).

3.7.3.3 Fire Risk

Fire risk is the probability of an ignition, whether the source is human or lightning, within a given area. Historically, lightning played a much larger role in the project area as an ignition source than humans. Fire risk from human causes, within the Upper West Fork Evans Creek 6th field watershed has increased, and is likely to continue to increase due to expanded OHV use, increased recreational use, camping in Elderberry Flat Recreation Area, and dispersed camping within the area.

Information from the ODF wildfire database shows a total of 17 fires occurred from 1967 to 2003 within the project area. Lightning accounted for 70 percent of the total fires and 30 percent were human-caused. Of the human-caused fires, 80 percent started along roads or OHV trails near the Elderberry Flat Recreation Area.

3.7.4 Environmental Consequences

Forest management and fuels density management activities promote healthy forest conditions and characteristics, and modify the vertical stand structure to decrease the probability of the initiation of crown fire activity, and establish a defensible area for use during extended fire suppression activities.

The shift from natural (historical) fire regime to more of a moderate to high severity fire regime has resulted in more days during the fire season in which the initiation and spread of crown fire activity is more likely. Weather conditions, topography, and fuels characteristics are key elements which affect the intensity and severity of a wildfire. However, fuels characteristics can be modified, affecting fire behavior and reducing the number of days a treated stand would initiate

Table 3-13. Comparison of Effects on Fuels from All Alternatives				
Issue: Forest Condition				
Past Actions	• Immediate suppression and control of all wildfires • Forest management activities; such as timber logging, precommercial thinning, on BLM-administered land • Timber harvest activities on private lands • Late, mature, and old growth stands replaced by early seral stands			
Present Actions	• Immediate suppression and control of all wildfires • Precommercial thinning in early seral stage stands on BLM-administered land without disposal of slash • Timber harvest activities on private lands would continue			
Current Conditions	• Natural (historic) fire regime change from mixed severity to high severity fire regime • Increase in stem densities of suppressed conifers, fire-intolerant species, and shrub species in the understory • Low canopy base heights, dense and low continuous canopy structures, smaller trees, and high fuel loadings • Approximately 40 percent of watershed converted to early or mid-seral stage			
Future Actions	• Immediate suppression of all fires, human or lightening caused, would continue • Future timber harvest would occur within the Upper West Fork Evans Creek 6th field watershed on private lands • Silvicultural treatments applied to young and mid-seral stands • BLM-administered lands follow management guidelines from the ROD/RMP • No additional fuels density management units are planned			
Proposed Actions	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
	• No actions proposed on BLM-administered lands • Immediate suppression of all fires, human or lightning caused, would continue	• Immediate suppression of all fires, human or lightning caused, would continue • 380 acres of timber harvest • 615 acres of fuels density management • 12 acres of progeny test site thinning	• Immediate suppression of all fires, human or lightning caused, would continue • 280 acres of timber harvest • 615 acres of fuels density management • 12 acres of progeny test site thiningn	• Immediate suppression of all fires, human or lightning caused, would continue • 175 acres of timber harvest • 635 acres of fuels density management • 12 acres of progeny test site thinning

Table 3-13. Comparison of Effects on Fuels from All Alternatives

Cumulative Effects	• Fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for high severity wildfire events • Increase in the amount of early and mid-seral stage stands • Increase potential for initiation and sustainability of crown fires within early and mid-seral stands • Increased number of days during fire season a wildfire could transition from a surface fire to a crown fire • Late and mature stands on private lands would continue to be converted to early seral stands	• Fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for high severity wildfire events • Conversion from late and mature stand to early seral stands would continue on harvested private lands • Treated stands would experience less intensity fire activity when a fire starts within the treated area • Area above Sand Creek may be used as a defensible space during extended fire suppression efforts • Increased potential for initiation and sustainability of crown fires within early and mid-seral stands would continue in untreated stands • Increased number of days during fire season a wildfire could transition from a surface fire to a crown fire would continue in untreated stands	• Fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for high severity wildfire events • Conversion from late and mature stand to early seral stands would continue on harvested private lands • Treated stands would experience less intensity fire activity when a fire starts within the treated area • Area above Sand Creek may be used as a defensible space during extended fire suppression efforts • Increased potential for initiation and sustainability of crown fires within early and mid-seral stands would continue in untreated stands • Increased number of days during fire season a wildfire could transition from a surface fire to a crown fire would continue in untreated stands	• Fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for high severity wildfire events • Conversion from late and mature stand to early seral stands would continue on harvested private lands • Treated stands would experience less intensity fire activity when a fire starts within the treated area • Area above Sand Creek maybe used as a defensible space during extended fire suppression efforts • Increased potential for initiation and sustainability of crown fires within early and mid-seral stands would continue in untreated stands • Increased number of days during fire season a wildfire could transition from a surface fire to a crown fire would continue in untreated stands

and sustain crown fire activity. Forest treatments that target canopy base height and canopy bulk density can be implemented to reduce the probability of crown fire (Graham, et al. 2004). The number of days during the fire season when conditions allow a surface fire to transition into crown fire activity should decline following forest treatments. Therefore, the number of fire days when fire activity can be reduced is a relevant measurement of the impact on fire behavior within each treated stand.

3.7.4.1 Effects of Alternative 1 (No Action) on Fuels

Direct and Indirect Effects

No new management is proposed under Alternative 1; the effects described would reflect current conditions and trends shaped by events unrelated to forest management and possible natural disturbance events. The No Action Alternative would continue the current trend of departure from mixed severity fires to more intense, stand-replacing, high severity fires throughout the project area. Immediate suppression and control of all wildfires, human or lightning caused, would continue.

Fire suppression efforts have reduced the periodic natural thinning processes and reduction of surface fuels which maintained a healthy heterogeneous forest structure. The natural (historic) fire regime would continue to depart from a mixed severity regime to a moderate to high severity regime as stand densities continue to increase. Exclusion of fire would promote the influx of more shade-tolerant, fire-intolerant species; this could lead to a loss of healthy fire-tolerant species and an increase of unhealthy, suppressed trees. In addition, without fire or forest management, shrub species, surface fuel loadings, and the regeneration of conifers and hardwoods would continue to increase. As a result, lowering canopy base heights and increased canopy densities would increase the potential for the initiation and sustainability of crown fire activity.

The number of days during the summer fire season which crown fire activity could be initiated and sustained would increase. This would be especially true for early, mid-, and late seral stage stands. These conditions over time would increase the potential for large stand-replacement fire within the watershed. Larger numbers of acres would burn, increasing the impacts and damage to mature stands, Riparian Reserves, soils, wildlife habitat, and air and water quality within the watershed. Larger fires could place firefighters and the public at greater risk and would increase suppression and rehabilitation costs.

The ecological processes which shift successional development of stands into mature and old growth stands would continue without the natural influences of wildfire. However, without fire or forest management to maintain an open forest structure, these stands could development more dense, homogenous canopy cover that would continue to be susceptible to the initiation and sustainability of active crown fire activity. This would be especially true during extended periods of dry or drought conditions and during high to extreme weather conditions.

Mature and old growth stands that have experience past fire events and currently have a more open stand structure, would likely continue to have surface fire activity when the fire is initiated within the stand. However, extreme weather conditions could contribute to the initiation of crown fire activity in these stands based on the diverse multi-level, multi-layer canopies which contribute to the ladder fuel component and the heavy surface loading due to the amount of down dead woody material commonly found in mature and old growth stands. Mature and old growth stands may also be more susceptible to active crown fires due to the dense canopy cover, especially if the crown fire is initiated outside of the stand.

Cumulative Effects

Stands in the early to mid-seral stages would continue to experience higher intensity fires, throughout the majority of the fire season. The early to mid-seral stage stands account for more than 65 percent of all lands within the Upper West Fork Evans Creek 6th field watershed. Past forest management practices on private and BLM-administered lands have shifted the mostly continuous late-successional forest to a patchy mosaic of young stands. Private lands in the project area are dominated by early to mid-seral stands less than 40 years old. The BLM-administered lands exhibit a range of seral age classes; however, slightly more than 40 percent are in the early to mid-seral stages. In the No Action Alternative, these untreated young stands would continue to burn with increased fire intensities and severities and potentially increase fire intensities in neighboring managed and unmanaged stands. This trend would continue until they develop the characteristics of healthy mature and old growth stands.

3.7.4.2 Effects of Alternative 2 on Fuels

Direct and Indirect Effects

Immediate suppression and control of all wildfires would continue. Stands not identified for treatment would continue to be shaped by natural events unrelated to any proposed action, and as described in the No Action Alternative. The following discussion reflects the direct and indirect impacts of the proposed actions in the identified treatment areas for Alternative 2. Effects discussion also includes cumulative impacts for those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

Under Alternative 2, approximately 190 acres of regeneration harvest, and 160 acres of density management would occur on Matrix lands throughout the project area. Slash disposal treatment recommendations have been made for each unit proposed for harvest. See Appendix E, Fuels and Air Quality, Table E-1, for recommended slash disposal treatments identified for each unit proposed. Overstory canopies would be reduced as indicated in Chapter 2, Section 2.2.1, Forest Management.

A fuels assessment would be conducted within each unit following harvest activity. This assessment would determine the fuels hazard and fire risk based on aspect, slope, surface fuels loadings, access, and location of each unit. Post-harvest slash disposal treatments originally identified are based on the proposed harvest method and the estimated fuel loadings expected. Modification or additional treatment recommendations would be based on the fuels assessment and the amount of slash created during harvest activities. Those units, which rate as a high risk, would receive priority for slash disposal treatment. Post-harvest slash treatments would consist of underburning; lop and scatter; or excavator piling, hand piling, and burning of the piles created (see Appendix A, Silviculture Prescriptions, Table A-11, for treatments proposed for each unit). Additional thinning of the understory may be needed, based on the fuels assessment, to further reduce the fuels hazard within the identified harvest units. The specification would be the same as the proposed fuels density management treatments based on the seral stage of the stand.

Reducing canopy cover to less than 40 percent in regeneration harvest units would decrease canopy bulk densities in the upper canopy but would increase surface fuel loading. This would reduce the potential to sustain crown fire activity; however, before the residual slash is treated, the increase in surface fuel loadings in combination with the remaining understory vegetation would increase surface fire intensities. In addition, regeneration units would likely see no change or a slight decrease in canopy base height. Torching or passive crown fire activity would likely occur, incurring damage or mortality to the remaining trees. Open canopies would also contribute to increased forward fire spread during higher wind events due to increased sun and wind exposure. A study conducted following wildfires on the Hayfork Ranger District of the Shasta-Trinity National Forest (Weatherspoon and Skinner 1995) indicated that plantations receiving no treatment burned uniformly and severely, while units receiving treatment, especially those that were broadcast burned prior to being planted, showed less damage overall. However, Weatherspoon and Skinner determined that all plantations received some degree of damage, with greater fire damage to areas smaller than 10 acres in size. Higher intensity fire activity in adjacent stands generally led to greater damage in the plantation. Post-harvest treatment of the initial slash residue is critical prior to planting. Additional precommercial thinning and removal of slash as the stand matures would be needed to help maintain fire resiliency. All regeneration harvest units have been identified to receive post-harvest slash disposal treatment. A risk assessment has been completed to determine if additional treatment, such as underburning, is needed.

Treatments designed to reduce canopy fuels through density management and selection harvest increase and decrease fire activity simultaneously. Slash generated from the thinning of timber stands, before slash disposal treatment, would create surface fuel loadings greater than current levels. This increase in surface fuels would increase fire behavior intensities, with higher flame lengths and greater rates of spread in the event of a wildfire. Despite the temporary increase in ground fuels, recent research indicates a reduction in crown fuels outweighs any increase in surface fire hazard (Omi and Martinson 2002). Reducing the canopy by 40 to 60 percent would decrease the canopy bulk density in density management and selection harvest units. This decrease in the canopies would reduce the possibility the overstory canopy would be able to sustain crown fire activity. All density management and selection harvest units have been identified to receive post-harvest slash disposal treatment. The treatment of the slash and additional thinning of brush and conifers less than 7″ DBH would raise the canopy base height so transition from a surface fire to a crown fire would only occur in very extreme conditions (see Appendix E, Fuels and Air Quality). Understory thinning in combination with a reduction to 40 to 60 percent canopies in late seral stands would provide the greatest benefit to reduced crown fire activity.

Under Alternative 2, 615 acres of fuels density management and 12 acres of progeny site thinning would occur in a variety of stand ages, including 30 acres in old growth stands and 155 acres in Riparian Reserves.

Fuels density management focuses on thinning understory vegetation (conifers, hardwood, and shrub species) less than 7″ DBH. Fuels density management would modify the vertical stand structure (ladder fuels) which contributes to the transition of a surface fire to crown fire activity, decreasing the probability of the initiation of crown fire within the treated area. Treating continuous blocks along the ridgelines above Sand Creek drainage would provide larger areas which would have lower fire crown activity thereby providing a defensible space which could be used during extended fire suppression activities. In addition, initial ignition of a wildfire within this larger area would allow fire suppression resources a greater opportunity to attack the fire directly and to quickly contain the fire at a smaller size. Treatments vary slightly depending on the age of the stand and existing canopy cover (see Appendix E, Fuels Density Treatment Table). The slash created from these activities would be hand-piled and burned. In Section 19, underburning would occur on approximately 35 acres (see Appendix E, Map 7) after the initial thinning, hand piling, and hand-pile burning is completed.

Table 3-14 shows the estimated number of fire days each fire activity (surface, passive and active crown fire) would likely occur, depending on fuels and weather conditions. Analysis of the fuels density management treatments indicates a reduction in the number of days during the fire season when weather conditions (wind speeds) are conducive to transitioning surface fires into an active crown fire activities following treatment. Potential for crown fire would increase under drier conditions; in areas with steep, southern exposed slopes; and in forest stands with no canopy cover to reduce the wind speeds. Understory thinning in all seral stages would reduce the potential initiation of active crown fire activity within treated areas when a fire starts within or immediately adjacent to the treated stand.

Table 3-14. Current and Post Treatment Condition of Fuels Density Management Areas

Forest Fuels Condition		Fire Activity								
		Surface Fire			Passive Crown Fire			Active Crown Fire		
Seral Stage	**Crown Base Height (cbh)**	**Wind Speed (mph)**	**Flame Length (feet)**	**Fire Days**	**Wind Speed (mph)**	**Flame Length (feet)**	**Fire Days**	**Wind Speed (mph)**	**Flame Length (feet)**	**Fire Days**
Current Conditions										
Early	4	n/a	n/a	**n/a**	0-4	4-5	**78**	>5	6	**44**
Mid-	1	n/a	n/a	**n/a**	0-11	3-5	**118**	>11	6	**4**
Late	8	0-4	4	**78**	5-27	5-11	**43**	>27	12	**1**
Mature	13	0-15	6	**120**	16-18	7	**1**	>19	8	**<1**
Post Fuels Density Management Conditions										
Early	4	n/a	n/a	**n/a**	0-17	4	**121**	>18	11	**1**
Mid-	6	2	3	**31**	3-15	4	**90**	>16	8	**1**
Late	9	0-5	5	**114**	6-26	5	**7**	27	12	**<1**
Mature	9	0-15	6	**120**	16-18	7	**1**	>19	8	**<1**

Early seral stage stands, including the progeny test site, would continue to have higher fire activity than the mid- to mature seral stands. This is due to density of the vegetation, lower canopy heights, and even-aged, uniform structure of the early seral stage canopies. However, the spacing would be sufficient to reduce the fire activity to torching of single or small clumps of trees, with short periods of active crown fire activity as wind speeds increase to 18 miles per hour. The number of days during the fire season these stands would exhibit active crown fire activity would decrease. The severity which fires would burn would be reduced, minimizing the damage to the areas treated as well as the potential impacts to surrounding stands.

Treatment of mid-seral stage stands would raise the canopy base height, create small openings and, in some cases, reduce the canopy cover up to 20 percent. This would increase the number of fire days when a fire initiated within the stands would burn at lower intensities and remain a surface fire. Transition to an active crown fire would occur only at very high wind speeds. As

winds increase, the fire activity would increase, with occasional torching of overstory trees, but would drop back to the surface at the openings created. Mortality of the understory trees less than 8″ DBH would remain high because the surface fuel loadings have not been reduced; however, mortality rates of the overstory would be reduced.
Following treatment, a fire initiated within a late to mature seral stand would likely remain a surface fire within the treated area for the majority of the fire season. Extreme weather conditions and winds could transition the passive fire activity into active fire activity within these stands.

Mortality rates would remain the same for the smaller suppressed trees and would decrease for the intermediate to codominant trees within these stands. The larger dominant trees would experience some scorching of the boles but the canopies would remain intact with very low mortality of these trees. Old growth stands would exhibit similar fire behavior to that of a mature stand. However, the abundance and distribution of down dead woody material, large amounts of organic soil material, and deep layer of continuous ground fuels often found in forests that have not experienced fire for several decades can sustain low intensity burning for weeks to months, with potential flaming combustion under dry, windy, conditions (Graham, et al. 2004). Combustion of woody fuel can contribute significantly to smoke production and soil impacts (Graham, et al. 2004). Initiation of crown fire within the treated area is reduced, due to the higher canopy base heights; however, the increased intensities and sustained heat created could increase the damage and, in some cases, the mortality of the overstory trees, even after the flaming front has passed.

Cumulative Effects

A wildfire occurrence would result in less severe effects due to the reduction in fuel amounts. The removal of ladder fuels reduces the amount of vertical continuity and lowers the propagation and spread of crown fire activity. Wildfire would burn with less intensity, duration, and severity. Crown fire propagation is dependent on the abundance and horizontal continuity of canopy fuels (Omi and Martinson 2002). Small changes in the fire environment can transition a surface fire to active crown fire abruptly with no period of passive crowning to act as a warning. Location of extreme fire effects within the watershed would be a function of the presence of steep slopes, hot aspects, amount of fuel present, fuel continuity, presence of ladder fuels, and weather conditions at the time of fire occurrence. However, once a crown fire is initiated it maybe possible for crown fire to spread through adjacent stands that have been treated and could not initiate crown fire on their own (Scott and Reinhardt 2001).

The majority of private forest lands within the project area and throughout the Upper West Fork Evans Creek 6th field watershed are characterized as early to mid-seral stage stands due to heavy forest management activities. Future harvest activities on these lands are unknown, although future action would likely occur in the remaining late seral stage stands. Past harvest activities on private lands indicate that the late seral stage stands after harvesting would exhibit characteristics of early to mid-seral stage stands. The proposed fuels treatments and forest management activities would have little to no impacts on the potential fire activity within the private forest lands.

Reduction in fire intensities would be localized within or immediately adjacent to the treated areas. Fire suppression initial attack efforts would be most effective if a fire started within the proposed treatment areas. The forest management units incorporated with the fuels density management areas would establish a defensible area for use during extended fire suppression activities possibly reducing the overall size of a wildfire. This defensible space would be most effective when a fire starts within the Sand Creek drainage or along the Elderberry Flat Recreation Area and moves up to the treated stands. Fires which start outside of these areas would still exhibit the ability to transition into a crown fire. This would be especially true in stands that have had previous forest management activities throughout the watershed, and are now in early to mid-seral stage condition. Additional forest management activities and fuels density reduction activities which occur within the Upper West Fork Evans Creek 6th field watershed would produce localized benefits within those treated areas and would not affect the proposed Slick Sand treatment areas.

3.7.4.3 Effects of Alternative 3 on Fuels

Direct and Indirect Effects

Immediate suppression and control of all wildfires would continue. Stands not identified for treatment would continue to be shaped by natural events unrelated to any proposed action and as described in the No Action Alternative. The following discussion reflects the direct and indirect impacts of the proposed actions in the identified treatment areas for Alternative 3.

Under Alternative 3, 35 acres of regeneration harvest, 155 acres of density management, 90 acres of selection harvest, and 12 acres of progeny site thinning would occur on Matrix lands throughout the project area. Slash disposal treatment recommendations have been made for each unit proposed for harvest (see Appendix A, Silviculture Prescriptions, Table A-11, for recommended slash disposal treatments identified for each proposed unit). Overstory canopies would be reduced as indicated in Chapter 2, Section 2.2.1, Forest Management.

A fuels assessment would be conducted within each unit following harvest activity as explained in Alternative 2.

The effects of the forest management activities in Alternative 3 would differ slightly from the effects of Alternative 2 with the change from regeneration harvest to density management and selection harvest (see Appendix E, Map 8, for unit locations). Increasing the number of acres treated by selection harvesting would contribute to reducing the number of fire days when a surface fire can transition into a crown fire within that treated stand. As explained in Alternative 2, regeneration harvest methods can produce greater surface fuel loads, increase exposure to wind increasing potential wildfire spread rates, and convert the stand to an early seral stand. Selection harvest and density management treatment area would have reduced canopy density, lower canopy base height, and decreased number of fire days in which these stands would transition into crown fire.

Under Alternative 3, approximately 620 acres of fuels density management would occur in a variety of stand ages, including 20 acres in old growth stands and 150 acres in Riparian Reserves.

The effects on fuels in this alternative would remain the same as in Alternative 2 for each of the seral stages. The change in acres represents a harvest unit that would no longer be logged but would now receive fuels density management treatment.

Cumulative Effects

The cumulative effects of Alternative 3 would be the same as those listed in Section 3.7.4.2, Effects of Alternative 2 on Fuels, Cumulative Effects.

3.7.4.4 Effects of Alternative 4 on Fuels

Direct and Indirect Effects

Immediate suppression and control of all wildfires would continue. Stands not identified for treatment would continue to be shaped by natural events unrelated to any proposed action, and as described in the No Action Alternative. The following discussion reflects the direct and indirect impacts of the proposed actions in the identified treatment areas for Alternative 4.

Under Alternative 4, 150 acres of density management, 25 acres of selection harvest, and 12 acres of progeny site thinning would occur on Matrix lands throughout the project area. No regeneration harvest is proposed. Slash disposal treatment recommendations have been made for each unit proposed for harvest. See Appendix A, Silviculture Prescriptions, Table A-11, for the recommended slash disposal treatments identified for each proposed unit. Overstory canopies would be reduced as indicated in Chapter 2, Section 2.2.1, Forest Management.

A fuels assessment would be conducted within each unit following harvest activity, as explained in Section 3.7.4.2, Effects of Alternative 2 on Fuels.

Selection harvest and fuels density management activities would occur in the units identified (see Appendix E, Map 9, for unit location). The effects would be the same as described in Alternate 2 for these treatment activities in late-seral stage stands.

Under Alternative 4, approximately 635 acres of fuels density management would occur in a variety of stand ages, including 20 acres in old growth stands and 150 acres in Riparian Reserves.

The effects on fuels in this alternative would remain the same as in Alternative 2 for each of the seral stages. The change in acres represents a harvest unit that would no longer be logged but would now receive fuels density management treatment.

Cumulative Effects

The cumulative effects of Alternative 4 would be the same as those listed in Section 3.7.4.2, Effects of Alternative 2 on Fuels, Cumulative Effects.

3.8 Wildlife

3.8.1 Methodology

The entire project area was surveyed for spotted owl presence annually from 1990 through 1996 as part of an Oregon State Cooperative Wildlife Research Unit demographic density study area (Forsman 1983). Known sites have since been monitored annually by BLM, OSU, or Boise biologists. If a known site is unoccupied in a given year, the survey area is widened in case the center of activity shifted. All adult owls detected in the area in 2004 or 2005 were color-banded to enable the identification of individuals in future years without the need for retrapping (Forsman, et al. 1996).

Forest Operations Inventory units within the 6th field subwatershed were visited in 2004 to update classification of stands for spotted owl habitat capability. Each Operations Inventory polygon was given a rating. If several habitat types occurred within the stand, the rating was based on the majority of the stand. The original ratings were completed in 1992 using aerial photos for the NWFP. The rating system was the same in both 1992 and 2004, incorporating the field experience of the biologist to determine stand character habitats spotted owls are most likely to use (see Table 3-15).

Table 3-15. Northern Spotted Owl Habitat Types	
Habitat Type	**Description**
Type 1: Nesting	Nesting habitat meets all spotted owl life requirements. These forests have a high canopy closure (greater than 60 percent), a multi-layered structure, and large overstory trees. Deformed, diseased, and broken-top trees, as well as large snags and down logs, are also present.
Type 2: Roosting/Foraging	This habitat is not suitable for nesting, but provides spotted owls with roosting, foraging, and dispersal habitat. Canopy closure is usually greater than 60 percent but with a more uniform structure and moderately-sized overstory trees. Deformed trees, snags, and down wood are less prevalent than in Habitat Type 1.
Type 3: Potential Habitat	Does not presently meet spotted owl needs but has the potential to grow into Habitat Types 1 and 2.
Type 4: No Potential	Does not have the potential of developing into late-successional forest or supporting old growth dependent species.
Type 5: Dispersal with Potential	Not suitable for spotted owl nesting, but may be important for travel between old growth stands. It has the potential to grow into Habitat Types 1 or 2.
Type 6: Dispersal with No Potential	Provides structure thought to be important for spotted owl dispersal but is not likely to provide the late-successional conditions required for spotted owl reproduction.

There is a subjective element to the rating system, with many forest stands on the edge of being or not being considered as owl habitat. Habitat acreage figures on a subwatershed scale are accurate to within about 10 percent.

To quantify habitat change, several radii may be used. The provincial home range radius for the Klamath Province is 1.3 miles. Since many owl sites are closer together and have overlapping home ranges, a radius of 0.5 miles is also used for analysis. The 0.5 mile radius reflects the area most used by a resident owl pair. A 0.25 mile radius reflects the owl's center of activity.

3.8.2 Assumptions

Under the NWFP, large LSRs will be maintained across the landscape. For spotted owl sites known as of January 1994, 100-acre cores will be maintained. A connectivity network of riparian management zones will be maintained. If a new owl site is discovered after completion of this EA, timber sale contract stipulation E-4 will permit a halt to operations until mitigating measures can be explored.

Additional suitable and dispersal habitat is located on intermingled private lands. It is not known whether that habitat will be maintained or when private lands may be harvested. It is likely that little or no older forest habitat would be available on nonfederal lands in the short- or long-term (FEIS, RMP, 4-53).

3.8.3 Affected Environment

The wildlife analysis will focus on the Upper West Fork Evans Creek 6th field subwatershed containing the Slick Sand project area. The BLM manages 60 percent of the 16,006 acre subwatershed. This 6th field subwatershed is one of seven that comprise the 59,300 acre Evans Creek 5th field watershed. The area is located in the Klamath Mountains physiographic province.

Medford BLM was included in a programmatic Biological Assessment and Biological Opinion (BA/BO) with US Fish and Wildlife Service (USFWS), dated 20 October 2003, to cover proposed actions for years 2004 through 2008.

Several classifications of special status species are found in the project area:

- Federally Listed
- Bureau Sensitive
- Bureau Assessment
- Bureau Tracking

A summary of the status of various special status species that could occur on the Medford district is shown in Appendix F, Wildlife.

The main issues addressed by this EA that affect terrestrial wildlife are Old Growth lands and Forest Condition. The only special status species known or suspected to be present that are concerned with these two issues are the Northern Spotted Owl and the Red Tree Vole. Other special status species, such as goshawk and fisher, are not limited to old growth habitat and will be discussed in Appendix F, Wildlife.

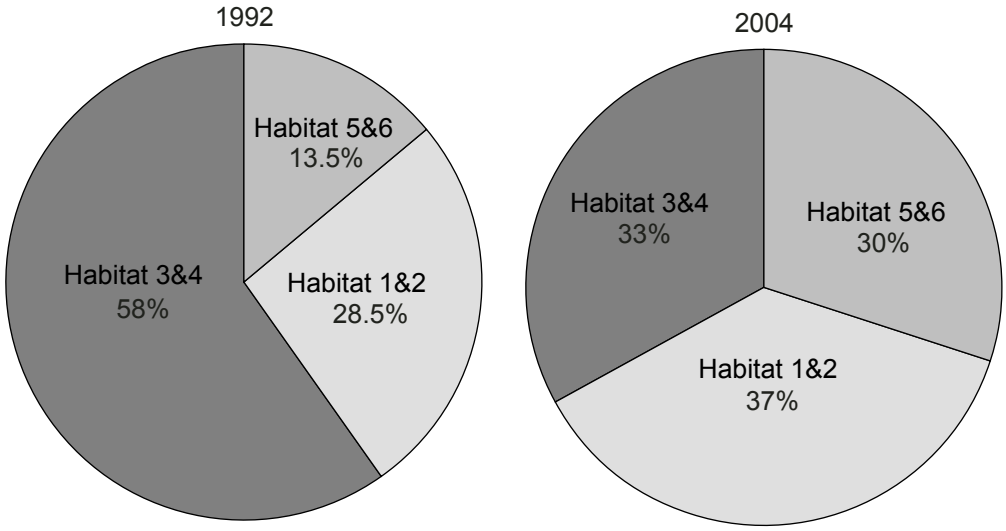
3.8.3.1 Northern Spotted Owl (Federally Threatened)

Based on studies of owl habitat preferences, including habitat structure and use and prey preference throughout the range of the owl, spotted owl habitat consists of four components: nesting, roosting, foraging, and dispersal. Suitable habitat includes areas with the vegetative structure and composition necessary to provide successful nesting, roosting, and foraging (NRF).

In 1992, habitat within the project area (6th field watershed) was classified as follows (see Figure 4):

- **Habitat Type 1 - 1,056 acres**
- **Habitat Type 2 - 1,631acres**
- **Total Suitable (NRF) Owl Habitat - 2,687 acres, or 28 percent of BLM-administered lands**

Figure 4. Change in Spotted Owl Habitat between 1992 and 2004 in Upper West Fork Evans Creek 6th Field Watershed



In 2004, the habitat rating was reevaluated. No timber sales or major wildfires had occurred on the federal lands in the subwatershed during the previous decade. The canopies of former partial cut stands have grown more closed to become suitable habitat. With “in-growth”, intermediate size trees have grown to make formerly partial cut stands more multi-storied, which are more likely to be used by spotted owls and their prey.

In 2004, habitat within the project area was classified as follows (see Figure 4):

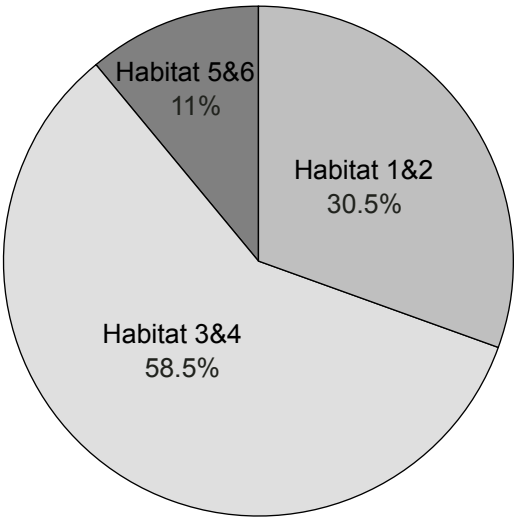
- **Habitat Type 1 - 1,498 acres**
- **Habitat Type 2 - 1,983 acres**
- **Total Suitable Owl Habitat - 3,481 acres, or 37 percent of BLM-administered lands**

Currently, 30 percent of the federally managed lands in the subwatershed are in habitat 5 or 6, which provide dispersal habitat for owls moving across the landscape. This is in addition to the suitable habitat type 1 and 2, which also provide dispersal habitat.

Six historic spotted owl sites are located within the Upper West Fork Evans Creek 6th field subwatershed. Recent monitoring history, current status, and amount of nearby suitable habitat is shown in Appendix F, Wildlife, Table F-1. Four of the six sites have a designated LSR 100-acre activity center. One of those four (Sand Creek) is believed to be an alternate for another site (White Rock). Two sites (Section One Pit, Last Go Round) were found after the January 1994 cutoff for establishing Late-Successional Reserves in the Northwest Forest Plan, and consequently do not have a protected 100-acre core.

Another 30 historic owl activity centers are located within the Evans Creek 5th field watershed; 18 of those sites were determined to be active in either 2004 or 2005. All 30 of those sites have a designated LSR 100-acre owl activity center that is intended in the NWFP to provide an older seral habitat stepping stone for connectivity across the province. At the Evans Creek 5th field watershed scale, 41.5 percent of federal lands provided dispersal habitat in 1992 (see Figure 5)

Figure 5. Spotted Owl Habitat in 1992 in Evans Creek 5th Field Watershed



As of June 25, 2005, surveys have detected a male at the Slick Rock Creek site, a pair at Section One Pit, and a pair at White Rock. None of these sites are nesting in 2005. No birds have been detected at Sand Creek, Last Go Round, or Skeleton Mountain. The vacant sites will continue to be surveyed in July and August 2005 to determine occupancy and productivity. All six will be resurveyed in 2006.

Sections 36 and 31 at the north end of the Upper West Fork Evans 6th field subwatershed are within designated spotted owl Critical Habitat Unit (CHU) OR-32 (*Federal Register*, 50 CFR Part 17, Vol. 57 No. 10, Wed. Jan. 15 1992, pages 1796-1838). That CHU encompasses 34,753 acres of federal lands (USDI 2003, Biological Opinion, 80).

Section 5 in the northwest end of the subwatershed is a designated Connectivity/Diversity Block in the NWFP.

A Connectivity/Diversity Block is a 640-acre section managed on a 150-year harvest rotation where 25 to 30 percent of the block is to be maintained in late-successional forest at any point in time (USDA and USDI 1994, C-42).

In the 2004 habitat rating, 67 percent of the federal land in the subwatershed is dispersal habitat, with over half of that providing NRF habitat (see Figure 4). Between the array of 100-acre owl cores, and the amount of dispersal habitat, there is ample connectivity across the subwatershed and watershed, and between the large LSRs to provide for genetic interchange and dispersing spotted owls.

Interagency Effectiveness Monitoring studies (Lint, et al. 1999) has been ongoing in 13 study areas across the range of the spotted owl. Two study areas are located in southwest Oregon: the Klamath study area (3 miles northwest of the project area) and the Southern Oregon Cascades study area (25 miles east of the project area). The latest meta-analysis status report indicates the owl populations in these two study areas appear to be within a statistical range of being stationary when averaged over the 1985 to 2003 span of the study (Anthony, et al. 2004, 59). The average over the 13 study areas showed a 3.7 percent decline per year in adult owl survival across the range of the species (Anthony, et al. 2004, 59).

The USFWS recently completed a Status Review for the species, concluding that listing as Threatened was still warranted (USDI 2004, 72). This is the most current information regarding the status of the northern spotted owl and threats to its survival. This finding was based on the following four reports: *Scientific Evaluation of the Status of the Northern Spotted Owl* (Sustainable Ecosystems Institute, Courtney et al. 2004); *Status and Trends in Demography of Northern Spotted Owls, 1985-2003* (Anthony, et al. 2004); *U.S. Fish & Wildlife Service 5-Year Status Review* (USFWS 2004); and *Northwest Forest Plan – The First Ten Years (1994-2003): Status and trend of northern spotted owl populations and habitat, PNW Station Edit Draft* (Lint, Technical Coordinator, 2005). In southern Oregon and northern California, northern spotted owl populations were more stationary than in Washington (Anthony, et al. 2004). The fact that northern spotted owl populations in some portions of the range were stationary was not expected within the first 10 years, given the general prediction of continued declines in the population over the first several decades of NWFP implementation (Lint 2005). The cause of the better demographic performance on the southern Oregon and northern California study areas, and the cause of greater than expected declines on the Washington study areas are both unknown (Anthony, et al. 2004). Courtney, et al. (2004) noted that a rangewide population decline was not unexpected during the first decade, nor was it a reason to doubt the effectiveness of the core NWFP conservation strategy.

Due to past timber harvest history, the Upper West Fork Evans Creek 6th field subwatershed is somewhat unusual when compared to other areas in the Butte Falls Resource Area. Due to widespread past partial harvest, stands on BLM-administered land in the Slick Sand vicinity were too open to be considered typical suitable owl habitat during the habitat inventory of 1992. In the past decade, these stands have grown taller, canopies have closed in, intermediate size trees have filled in, and the stands have returned to suitable habitat status. What makes this area unusual is the larger proportion of acreage in these younger, marginally suitable stands across the subwatershed. The trajectory of many of these stands to become better quality owl habitat would be hastened if the crowded stems and canopies were thinned. Spotted owls would currently have difficulty flying through the dense, second-growth stands (under the overstory) that have returned to marginally suitable habitat status in the last decade.

Anthony, et al. (2004) indicated there is some evidence that Barred Owls may have had a negative effect on NSO survival in the northern portion of the spotted owl range. They found little evidence for such effects in Oregon or California. The threat from Barred Owl competition has not yet been studied to determine whether it is a cause or a symptom of northern spotted owl population declines, and the reports indicate a need to examine threats from Barred Owl competition. No barred owls have been detected in the Upper West Fork Evans 6th field subwatershed. At two spotted owl sites in the Evans Creek 5th field watershed, barred owls have been detected. One site has been intermittently occupied by barred owls, but in 2005 the site was reoccupied by spotted

owls. The second barred owl site was new in 2005, and the spotted owls have not been detected.

According to Courtney, et al. (2004), there exists a potential for habitat loss due to Sudden Oak Death in the southern portion of the range, however the threat is of uncertain proportions. In addition, Courtney, et al. (2004) indicated there is no way to predict the impact of West Nile Virus, which is also identified as a potential threat.

3.8.3.2 Red Tree Vole

Red tree voles live in Douglas-fir, spruce, and hemlock forests. Their food consists entirely of the needles of the tree in which they are living. No formal surveys have been performed in the area, but they are known to occur in the northern (higher elevation) end of the subwatershed. They could potentially occur in all the proposed sale units.

With the implementation of the new Survey and Manage Record of Decision (USDA and USDI 2004), the red tree vole is no longer on the Medford District Sensitive Species list. It moved from Survey and Manage status to Bureau Tracking, where surveys are not required. There is no requirement to protect known sites. The red tree vole is a prey item of the spotted owl.

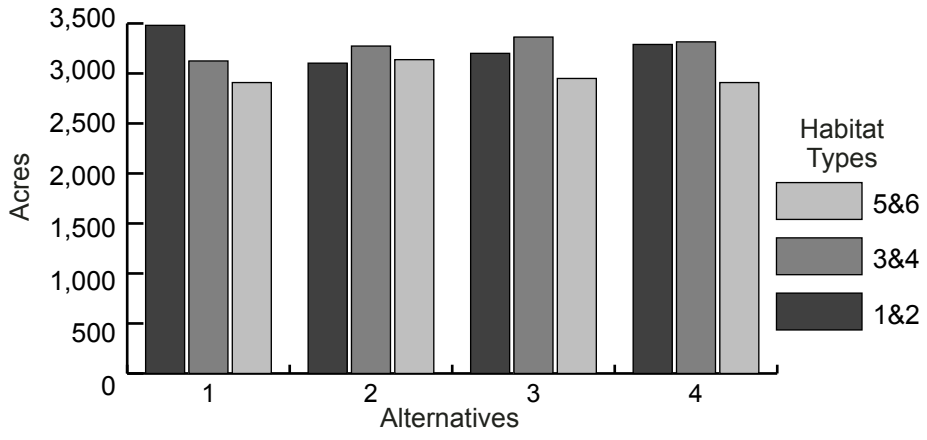
3.8.4 Environmental Consequences

Table 3-16. Comparison of Effects on Wildlife from All Alternatives

Issue: Forest Condition				
Past Actions	Previous logging has reduced the amount of NRF owl habitat, and left younger overstocked stands			
Present Actions	None ongoing in the 6th field subwatershed			
Current Conditions	Many overstocked stands, at risk to spread of stand-replacement wildfire			
Future Actions	Will be timber sales in adjacent subwatersheds sold in fiscal years 2006-2008			
Proposed Actions	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
	No fuels reduction, no timber harvest	Fuels hazard treated, regeneration units set back succession.	Fuels same as alt 2, thinning improves long-term condition	Fuels same as alt 2, thinning improves long-term condition
Cumulative Effects	Continued risk for fire spread, thus loss of owl habitat. Slower trajectory of younger stands to grow	Logging units and fuels units will treat fuels, reducing risk of fire spread	Creates fuels breaks, hastens trajectory of younger stands to become old-growth	Creates fuels breaks, hastens trajectory of younger stands to become old-growth.
Issue: Old Growth				
Past Actions	Previous logging has reduced the amount of NRF owl habitat			
Present Actions	None ongoing in the 6th field subwatershed			
Current Conditions	Ample stands over 80 yrs age, but few stands over 150 years age			
Future Actions	Will be timber sales in adjacent subwatersheds sold in fiscal years 2006-2008			
Proposed Actions	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
	No logging	Remove 142 ac within 0.5 miles of owl sites	Remove 80 ac within 0.5 miles of owl sites	Remove 20 ac within 0.5 miles of owl sites
Cumulative Effects	Current amount of OG maintained.	One owl site in CHU will be made unsuitable	Some owl NRF habitat downgraded for 3-10 years	Low short-term impact to old growth, long-term benefit

Figure 7 shows a comparison of the amount of spotted owl habitat within the Upper West Fork Evans Creek 6th field subwatershed expected for each alternative. The changes in habitat and the effects of those changes are discussed under each alternative. Habitat 1 & 2 is NRF suitable. Habitat 5 & 6 is dispersal only. Habitat 3 & 4 is not currently owl habitat.

Figure 7. Changes in Spotted Owl Habitat by Alternative



3.8.4.1 Effects of Alternative 1 (No Action) on Wildlife

Direct and Indirect Effects

Under Alternative 1, no harvest would occur. Stands that have grown into suitable northern spotted owl habitat in the past decade would be maintained as owl habitat. With no thinning (selection harvest or density management), the trajectory of some stands to grow into better suitable habitat would continue at a slower rate than if the stands were thinned. Spotted owl suitable habitat in the CHU would be maintained.

Stands would remain overstocked and at high risk of stand-replacement fire. Such a fire would reduce the amount of suitable owl habitat, depending on the extent of the fire.

Existing older seral habitat for red tree voles would be maintained

Cumulative Impacts

Suitable owl habitat removed in the last decade by BLM timber sales in the Evans Creek 5th field watershed (Home Run, Salty Bones, Cleveland Railroad, Anti Sypher, and Salt Air) was included in the analysis for the programmatic BA/BO with USFWS. Suitable owl habitat was removed on 57 acres of regeneration harvest. Suitable habitat was degraded to dispersal habitat on 1,510 acres of commercial thinning. This change in habitat was included in the basin-wide update of the baseline situation. As thinned canopies continue to grow, some of these stands will return to being suitable NRF habitat in the next decade.

No commercial timber sales have occurred on BLM-administered land within the Upper West Fork Evans Creek 6th field subwatershed in the past 15 years. Removal of special forest products, such as firewood, boughs, and roadside hazard trees, has occurred. BLM will be considering additional timber sales in other subwatersheds of the Evans Creek 5th field watershed in fiscal years 2006 (Pleasant Creek and Evans Sardine), 2007 (Slick Battle), and 2008 (Lower East Evans, Fielder) that will have the potential to remove or degrade additional suitable owl habitat.

Timber harvest on intermingled private lands is expected to continue. The private lands are not currently considered suitable owl habitat due to previous clear-cutting or thinning, but they do provide some dispersal habitat.

3.8.4.2 Effects Common to All Action Alternatives

Direct and Indirect Effects

Due to proposed removal of suitable owl habitat adjacent to known territories (within the provincial home range radius of 1.3 miles), each of the three action alternatives would be a "May Affect-Likely to Adversely Affect" in terms of consultation under the ESA. However, each segment of the proposed action is within the incidental take provision of the BA/BO (USDI, 2003), as long as seasonal restrictions are implemented. There would be no harvest within designated 100-acre cores or large LSRs.

Ample connectivity would be maintained within riparian management corridors and within dispersal habitat spread across the subwatershed. Over 50 percent of the federally administered lands would provide spotted owl dispersal habitat.

Effects of the fuels hazard reduction treatments would be nearly the same across the three action alternatives. Habitat for spotted owl prey species, such as woodrats, may be altered for up to two years through treatment of ground and shrub layers, but prey populations are expected to recover rapidly (within one to three years). Only material less than 7″ DBH would be cut and burned on up to 635 acres (6 percent of the Upper West Fork Evans Creek 6th field subwatershed).

To enable comparison between alternatives, the number of acres proposed for treatment within ¼-mile and ½-mile radii (areas of highest use) of historic owl sites are displayed in Appendix F, Wildlife, Table F-1. The effect on spotted owls from fuels treatments would be minimal.
In the proposed fuels treatments, only the understory would be treated, so impacts to sensitive species would be minimal. Disruption of ground-level habitat from the cutting, piling, and burning would be of short duration (one to three years). The potential short-term negative impact would be more than offset by the "insurance value" gained from the reduction in the likelihood of a stand-replacement fire event. That is, older seral habitat for sensitive species is more likely to persist for the next few decades if the fuels treatment areas enable containment of wildfires before they spread. A wildfire would be more likely to be a low-intensity underburn that would retain the larger older trees. Controlled burns in the fuel hazard reduction projects would mimic historic natural low-intensity fire events. Up to 590 acres within the subwatershed are proposed for fuels treatment, about 6 percent of the forested federal land in the 6th field subwatershed.

Effects from progeny test site renovation, culvert replacement, pump chance renovation, and road projects would be minimal to owls and to terrestrial wildlife in general. No owl suitable habitat would be degraded. Seasonal restrictions would be imposed near active owl sites to mitigate noise disturbance. In the two progeny test site renovation locations, both areas are currently even-aged plantations 20-30 feet tall. They are not suitable habitat for older seral species. Thinning would hasten the growth on those 12 acres into larger trees.

At the Evans Creek 5th field watershed level, the effect of the proposed action on spotted owls would be low. Another 17 recently active (2003, 2004, or 2005) owl pair locations would not be within 1.3 miles of a project unit. Ample dispersal habitat would remain well distributed. The northernmost sections (3, 4, 5, 31) would not be treated. They currently provide stepping stones of suitable habitat on an east-west axis to link large LSRs, OR-0223 (Cow Creek-Galesville) and OR-0224 (Elk Creek). The connectivity block (Section 5) would not be entered in any of the alternatives.

There is a high probability red tree vole would occur in some of the proposed units, especially those in the moister north half of the sale area. Some nesting trees would be lost. Thinned stands would become too open for continued red tree vole occupancy until the canopy closed back in (in 10 years). Red tree voles are spotted owl prey, although woodrats are the major owl prey in southwest Oregon. With the removal of red tree vole from the Survey and Manage category (USDA and USDI 2004), the species is expected to persist across the watershed within riparian corridors, 100-acre owl activity centers, and connectivity blocks, thus preventing the need to list the species.

Cumulative Effects

USFWS Biological Opinion (USDI 2003, 81) concludes that given the juxtaposition of the landscape, the current condition of the CHUs and anticipated NRF loss within the CHUs, the USFWS does not anticipate the connectivity or nesting-roosting-foraging goals of the southwest Oregon administrative units' critical habitat network will be precluded by the proposed action. The USFWS bases this conclusion on the amount of spotted owl habitat impacts, the remaining habitat in those impacted CHUs, and the remaining NRF habitat throughout the CHU network within the action area.

In summary, the following reports; *Scientific Evaluation of the Status of the Northern Spotted Owl* (Sustainable Ecosystems Institute, Courtney, et al. 2004); *Status and Trends in Demography of Northern Spotted Owls, 1985-2003* (Anthony, et al. 2004); *U.S. Fish & Wildlife Service 5-Year Status Review* (USFWS 2004); and *Northwest Forest Plan – The First Ten Years (1994-2003): Status and trend of northern spotted owl populations and habitat, PNW Station Edit Draft* (Lint, Technical Coordinator, 2005) identified greater than expected northern spotted owl population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. The reports did not find a direct correlation between habitat conditions and changes in spotted owl populations, and they were inconclusive as to the cause of the declines. Lag effects from prior harvest of suitable habitat, competition with barred owls, and habitat loss due to wildfire were identified as current threats; West Nile Virus and Sudden Oak Death were identified as potential new threats. Complex interactions are likely among the various factors. The status of the northern spotted owl population and increased risk to spotted owl populations due to uncertainties surrounding barred owls and other factors, were reported as not sufficient to reclassify the species as endangered at this time.

3.8.4.3 Effects of Alternative 2 on Wildlife

Direct and Indirect Effects

Effects on owl habitat at the stand level vary depending on the proposed treatment. Regeneration harvest would remove 190 acres of suitable spotted owl habitat. NGFMA regeneration harvest (maintaining 6 to 8 trees per acre) and SGFMA regeneration harvest (maintaining 16 to 25 trees per acre) would remove spotted owl suitable habitat (habitat types 1 and 2: nesting-roosting-foraging) to become nonsuitable (habitat type 3). In 20 to 40 years, new trees would fill in between the reserve trees, and habitat would return to suitable condition.

An additional 175 acres of selection harvest and density management would downgrade suitable habitat (NRF) to become dispersal habitat. In units proposed for selection harvest or density management, 40 to 50 percent canopy cover is maintained. Suitable habitat is temporarily downgraded to dispersal (habitat type 5), but will recover to suitable status in 10 to 20 years. Acres to be treated represent 11 percent of the currently suitable habitat in the project area.

Logging activity disrupts ground level habitat for prey species, but the shrub layer fills back in within two to five years, so impacted prey species rebound. The habitat degradation for prey species is of relatively short duration. Selection harvest, with increased spacing of stems and more open canopy, combined with fuels treatments, would make the stand less prone to spread of a stand-replacement fire and more likely to return to a late seral condition.

Suitable owl habitat within the Upper West Fork Evans Creek 6th field subwatershed would decrease from 3,481 acres (36 percent) to 3,107 acres (32 percent) (see Figure 7). The NWFP requirement to maintain at least 15 percent of each watershed in older stand characteristics (80 plus years) would still be met.

Four of the six historic owl activity centers have proposed harvest units within a ½-mile radius of the site. Suitable habitat closer to an owl activity center is more important for foraging than areas out to the fringe of the provincial home range (Klamath Province) radius of 1.3 miles. For comparison of scale between alternatives, total acres of timber harvest units within a ¼-mile (activity center) and ½-mile (main home range) radius of the owl sites are displayed in Appendix F, Wildlife, Table F-1.

In Alternative 2, the heaviest impact would be to the Section One Pit site in Section 35, which nested and produced one young in 2004. The same adult female, paired with a new male, was present in 2005 but not nesting. There are currently 77 acres of suitable habitat on BLM-administered lands within a ¼-mile radius of this site. Regeneration harvest would remove 56 of the 77 acres of unmanaged old growth at this owl center. The remaining 21 acres are in Riparian Reserves and would not be entered.

NGFMA regeneration harvest proposed in this alternative would remove most of the nesting habitat in the owl activity center, and would make this owl site unsuitable for at least 40 years. The Section One Pit site, located on Matrix land, was identified after January 1994, so a 100-acre, no-cut activity center LSR was not designated. The only protection for the owl site mandated by NWFP is a seasonal restriction during the nesting season. The proposed action is within the guidelines of the BA/BO, the NWFP, and the Medford District ROD/RMP.

At the Slick Rock Creek owl site, there are 9 acres of logging proposed within ¼ mile, and another 13 acres within 0.5 miles. As long as seasonal restrictions were employed, impact to this owl site would be low. The site would remain viable. Impacts to the other historic sites are minimal, due to the few proposed treatment acres within a half mile radius (see Appendix F, Wildlife, Table F-1).

Harvest units proposed within Section 35 are located in designated spotted owl Critical Habitat (CHU 0-32) (details of the Critical Habitat designation are listed in the Appendix F, Wildlife). The designation of Critical Habitat predated the NWFP and no special management was listed for Critical Habitat in the NWFP. Alternative 2 would be “May Affect, Likely to Adversely Affect” in terms of Critical Habitat due to removal of suitable habitat within an active owl activity center. General effects are the same as listed in Section 3.8.4.2, Effects Common to All Action Alternatives. Any current red tree vole nesting in harvest units (190 acres regeneration and 190 acres selection harvest and density management), which cover 9 percent of the stands over 80 years old in the 6th field subwatershed, would not persist.

Cumulative Effects

Impacts of timber sales in the past decade and proposed for the next three years in the Evans Creek 5th field watershed are discussed in Section 3.8.4.1, Effects of Alternative 1(No Action) on Wildlife, Cumulative Effects. Past logging has reduced the amount of older seral forest in the subwatershed. BLM sales completed in the last 12 years in the Evans Creek 5th field watershed changed 505 acres of owl suitable habitat to unsuitable, and downgraded 1,893 acres to dispersal. While 30 percent of the forested acres remain in 80 year and older stands, little acreage remains in an old growth character of over 150 years age.

This alternative would remove sufficient spotted owl NRF habitat within an active center of activity (Section One Pit) to make the site no longer suitable, which would not benefit the recovery of the federally listed species.

While the proposed action would heavily affect one owl site and minimally affect three others, it is unlikely the actions proposed in Alternative 2 would appreciably reduce or diminish the survival or recovery of the spotted owl, both at the provincial and the range-wide level. The final rule for the designation of critical habitat (USDI 1992) stated that adverse modification analysis should be based on impacts to CHUs at the provincial level. The provincial critical habitat network would continue to function as intended.

Ongoing actions on intermingled nonfederal lands continue to maintain that portion of the landscape in an earlier seral condition, not suitable as spotted owl habitat.

No other sales are planned in this subwatershed in the next few years. Proposed fuels projects would benefit the older seral stands by reducing the likelihood of spread of stand-replacement wildfire.

3.8.4.4 Effects of Alternative 3 on Wildlife

Direct and Indirect Effects

Of 292 acres proposed for harvest, 35 would be regeneration harvest and 245 acres would be density management or selection harvest, for a total of 3 percent of the BLM-administered forested land in the subwatershed. Acres to be treated represent 8 percent of the 3,481 acres of available suitable owl habitat identified in the 2004 habitat mapping update.

Impacts of the commercial thinning on the Slick Rock and White Rock spotted owl sites would be minimal, with no units within 0.25 miles of either activity center. Fuels treatments are proposed within the ¼-mile center of activity radius, but foraging habitat would only be slightly disrupted for one to three years. Harvest acreage within the ¼-mile and ½-mile radii from each owl site is shown in Appendix F, Wildlife, Table F-1.

At the Section 1 Pit owl site, 10 acres of SGFMA regeneration harvest (16-25 trees per acre to remain) is proposed just outside the ¼-mile radius. About 10 acres of selection harvest is proposed within the ¼-mile radius. Since this owl site was designated after 1994, a 100-acre no-cut activity center was not required under the NWFP. The viability of this owl site and the likelihood of successful nesting would be reduced in the short-term (5 to 10 years). In 2004, the owls nested in a grove of unentered old growth. Thinning of such a stand (maintaining 50 to 60 percent canopy cover) would not improve it as owl habitat, since the stand is already in an ideal condition for owls. The proposed action is within the guidelines of the BA/BO, the NWFP, and the Medford District ROD/RMP.

In Alternative 3, selection harvest and density management harvest units are proposed within Section 35, which is designated spotted owl Critical Habitat (CHU 0-32) (details of the Critical Habitat designation are listed in the Appendix F, Wildlife). The designation of Critical Habitat predated the NWFP, and no special management was listed for Critical Habitat. Alternative 3 would be “May Affect, Likely to Adversely Affect” in terms of Critical Habitat due to degradation of suitable habitat in Section 35. Selection harvest or Density management units would change from NRF suitable habitat to dispersal habitat.

Fuels treatments would occur within 0.25 miles of the Slick Rock owl site. Since suitable habitat would not be degraded and seasonal restrictions on chainsaw activity would be imposed, fuels treatments would have no effect on the owls. The fuels projects would benefit continued spotted owl productivity by reducing the likelihood of the spread of a stand-replacement fire that would remove owl suitable habitat.

Selection harvest and density management on 245 acres would open canopies sufficiently that red tree vole nesting would be unlikely. After about 10 years, the canopies would begin to close and red tree vole nesting could resume as red tree voles recolonize from adjacent untreated units. It is not known if red tree voles are present in any of the proposed units.

Cumulative Effects

Impacts of timber sales in the past decade and proposed for the next three years in the Evans Creek 5th field watershed are discussed in Section 3.8.4.1, Effects of Alternative 1(No Action) on Wildlife, Cumulative Effects. Past logging has reduced the amount of older seral forest in the subwatershed. BLM sales completed in the last 12 years in the Evans Creek 5th field watershed changed 505 acres of owl suitable habitat to unsuitable and downgraded 1,893 acres to dispersal. While 30 percent of the forested acres remain in 80 year and older stands, little acreage remains in an old growth character of over 150 years age.

This alternative would remove sufficient spotted owl NRF habitat within an active center of activity (Section One Pit) to make the site no longer suitable, which would not benefit the recovery of the federally listed species.

While the proposed action would heavily affect one owl site and minimally affect three others, it is unlikely the actions proposed in Alternative 3 would appreciably reduce or diminish the survival or recovery of the spotted owl, both at the provincial and the range-wide level. The final rule for the designation of critical habitat (USDI 1992) stated that adverse modification analysis should be based on impacts to CHUs at the provincial level. The provincial critical habitat network would continue to function as intended.

Ongoing actions on intermingled nonfederal lands continue to maintain that portion of the landscape in an earlier seral condition, not suitable as spotted owl habitat.

Proposed fuels projects would benefit the older seral stands by reducing the likelihood of spread of stand-replacement wildfire.

The number of federal or private acres that would be impacted by timber harvest in the Evans Creek 5th field watershed in the next five years cannot be predicted. No additional federal sales are planned in this subwatershed, but planning for BLM sales in adjacent subwatersheds will begin this year.

3.8.4.5 Effects of Alternative 4 on Wildlife

Direct and Indirect Effects

No regeneration harvest is proposed in Alternative 4. The 175 acres of density management and selection harvest represents 0.2 percent of the BLM-administered forested lands in the subwatershed.

A maximum of 8 acres are proposed within 0.5 miles of any active owl sites (see Appendix F, Wildlife, Table F-1). Within a ½-mile radius of four known spotted owl sites, a total of 21 acres of suitable habitat would be downgraded to dispersal, but a relatively large amount of adjacent suitable habitat would remain. The three active owl sites that have produced young in recent years are predicted to remain productive.

The fuels projects would have no negative impacts for wildlife, but would provide a benefit for the next decade as they reduce the probability of a stand-replacement wildfire in the central portion of the Upper West Fork Evans Creek 5th field subwatershed.

Cumulative Effects

Because no BLM timber harvest has occurred in the subwatershed in the past 15 years, the impact of this alternative on terrestrial wildlife would be minimal. Impacts of private sales along with past and foreseeable federal actions are the same as outlined in Section 3.8.4.1, Effects of Alternative 1 (No Action) on Wildlife, Cumulative Effects. Due to past harvest actions, the amount of old growth and, thus, the capacity to support more spotted owl breeding pairs has been reduced.

3.9 Summary of Effects on Other Resources

3.9.1 Introduction

The following resources did not pertain to the issues identified and analyzed in this EA. Possible effectws from each alternative were analyzed and the analyses are included in the Appendices. A summary of the effects is included below. See the Appendices for the complete discussions.

3.9.2 Effects of Alternatives on Air Quality

Smoke from prescribed fire has the potential to affect the air quality within the Slick Sand project area as well as the immediate surrounding areas. The project area is not located near any communities that would be affected by smoke from prescribed fire.

In the process of treating natural and activity-related fuels, the generation of particulate pollutants can temporarily impact air quality. Current air quality and visibility conditions are not monitored within the project area. Because no permanent sources of particulate matter production exist in the project area, the air quality and visibility throughout the area is thought to be good.

The Medford District BLM is required to be in full compliance with the Oregon Smoke Management Plan. Prior to conducting prescribed burning activities, registration of prescribed burn locations is required. The specific location, size of the burn, fuel loadings, ignition source, time, and duration of ignition are reported prior to ignition. Advisories or restrictions are generated on a daily basis by the State Meteorologist. This information is used to determine the appropriate time to conduct the planned prescribed burn.

See Appendix C, Fuels and Air Quality, for a full discussion of the effects of the alternatives.

3.9.3 Effects of Alternatives on Botany

The Slick Sand project area is outside the ranges and does not contain suitable habitat for *Fritillaria gentneri*, *Limnanthes floccosa* ssp *grandiflora,* or *Lomatium cookii*. The proposed activities would result in **"no effect"** to these three Endangered plants.

Surveys for Special Status vascular and nonvascular plants have been completed in all proposed treatment units. The proposed activities would not trend toward listing Special Status vascular or nonvascular plants because sites would be protected from direct and indirect effects. Predisturbance surveys for Special Status fungi are not practical (USDA and USDI 2004a, 122) because the fungi produce ephemeral sporocarps (fruiting bodies) on an irregular basis. Because of their rarity across the NWFP area, it is unlikely Sensitive fungi are present in the Camp Cur timber harvest units and the risk is low they would be impacted. The assumption is made that protecting known sites (current and future found) for these Sensitive fungi species, in addition to conducting large-scale fungi inventories throughout the Pacific Northwest, will be adequate in ensuring this project and future projects would not contribute to the need to list them (USDI 2004, 5-2).

See Appendix E, Botany, for a full discussion of the effects of the alternatives.

3.9.4 Effects of Alternatives on Noxious Weeds

Noxious weeds are those plant species designated by Federal or state law as generally possessing one or more of the characteristics of being aggressive and difficult to manage, parasitic, a carrier or host of serious insects or disease, a serious threat to biodiversity and other resource values, and a nonnative (new to or not native to the United States). Noxious weeds degrade native ecosystems by displacing native plants, decreasing native plant diversity and abundance, altering natural ecosystem processes, and competing with rare plants.

On BLM-administered land in the Slick Sand project area, 16 sites of 5 species of noxious weeds (see Table F-1) have been documented during surveys over the last 17 years, including the surveys conducted during summer 2004 in the proposed Slick Sand treatment units. Most populations are along roads; two are inside proposed regeneration units and several are adjacent to fuels treatment units.

See Appendix F, Noxious Weeds, for a full discussion of the effects of the alternatives.

3.9.5 Effects of Alternatives on Cultural Resources

There will be no direct environmental consequences to cultural resources, because all sites will be buffered and protected. Indirectly, the increased activity in the project area could lead to the possibility of further looting of some of the sites.

See Appendix G, Cultural Resources, for a full discussion of the effects of the alternatives.

3.9.6 Effects of Alternatives on Economics

3.9.6.1 Alternative 1 (No Action)

Since no harvesting would occur under this Alternative, there would be no return to the Federal Treasury. No forestry-related jobs would be created.

3.9.6.2 Alternative 2

Under Alternative 2, approximately 3.7 million board feet would be harvested, with a return to the Federal Treasury of $770,000. Direct employment resulting from timber harvest and processing of a commodity would provide for approximately 35 jobs.

3.9.6.3 Alternative 3

Under Alternative 3, approximately 1.9 million board feet would be harvested, with a return to the Federal Treasury of $270,000. Direct employment resulting from timber harvest and processing of a commodity would provide for approximately 18 jobs.

3.9.6.2 Alternative 4

Under Alternative 4, approximately 1.0 million board feet would be harvested, with a return to the Federal Treasury of $100,000. Direct employment resulting from timber harvest and processing of a commodity would be approximately 9 jobs.

3.10 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, February 11, 1994) requires that all federal agencies "make achieving Environmental justice part of [their] mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of it program, policies, and activities on minority populations and low-income populations."

Based on experience with other projects in the Butte Falls Resource Area, none of the proposed actions would substantially affect minority or low-income individuals. Implementation of these projects is expected to provide job opportunities in communities such as Gold Hill, Rogue River, Wimer, Eagle Point, White City, Medford, and Grants Pass. These communities include minority and low income populations that may benefit from the economic effects. Small or minority-owned business would have the opportunity to compete for some of the work.

3.11 Relationship between Short-Term Uses and Long-Term Productivity

Short-term use of the land includes day-to-day and even year-to-year activities that affect the landscape. It includes activities that remove resources from the land, such as fishing and hunting, as well as activities that do not, such as photography, sight-seeing, and hiking. Short-term actions include management activities, such as vegetation management and harvesting of trees. As a

renewable resource, trees and vegetation can reestablish and grow again if the productivity of the land is not impaired. Maintaining the productivity of the land is a complex, long-term objective. All action alternatives protect the long-term productivity of the project area through the use of specific standards and guidelines, mitigation measures, and BMPs. Long-term productivity could change as a result of various management activities.

Soil and water are two key factors in ecosystem productivity. These resources would be protected in all action alternatives to avoid damage that could take many decades to rectify. Timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the project area may fluctuate as a result of short-term uses, but no long-term effects to the water resources are expected to occur as a result of the alternatives.

3.12 Unavoidable, Irreversible, and Irretrievable Effects

Implementing any alternative would result in some degree of environmental effects that cannot be avoided. While standards, guidelines, Best Management Practices, and mitigation measures are intended to keep the extent and duration of these effects within acceptable levels, effects cannot be completely eliminated. Although standards, guidelines, and BMPs are designed to prevent effects to soil and water, the potential for impacts does exist. Sediment could be produced by surface erosion and channel erosion. Air quality would be affected by smoke from prescribed fires and burning of slash piles. Ground-disturbing activities have the potential to temporarily increase sediment loads in some streams. Mitigation measures for ground-disturbing activities would include using existing skid trails, pulling slopes back to the natural slope when removing culverts, restricting mechanical operations to slopes less than 35 percent, water-barring skid trails during the same season as constructed, seeding and mulching decommissioned, placing fish structures during the instream work period, and limiting road renovation and/or improvement work to the dry season, generally May 15 to October 15.

Under the Northwest Forest Plan, the BLM has a commitment to offer timber for sale from Matrix lands. Riparian Reserves, 100-acre owl cores, snags, and 15 percent older seral will be maintained in order to minimize unavoidable impacts. Regeneration harvest units are capable of becoming old-growth in 200 years.

4.0 List of Preparers

John Bergin	Team Lead
Jean Williams	NEPA Coordinator
Jim Keeton	Management Direction
Shawn Simpson	Hydrology/Soil
Jim Harper	Wildlife
Leanne Mruzik	Fuels
John Osmanski	Silviculture
Marcia Wineteer	Botany
Mike Korn	Layout
Dianne Keller	GIS/Maps
Diane Parry	Cultural Resources
Gene Shull	Fisheries
Randy Bryan	Transportation
George Rentz	Volume/Economics
Phil Ritter	Contract Administrator
Robyn Wicks	Writer/Editor

References Cited

Acheson, A., C. Stanich, and M. Story. 2000. "Describing air resource impacts from prescribed fire projects in NEPA documents for Montana and Idaho Region 1 and Region 4." USDA Forest Service, Missoula, MT. 38 pp.

Agee, J.K. 1993. *Fire Ecology of Pacific Northwest Forests* Island Press, Washington, D.C. Covelo, CA. 493 pp.

Agee, J.K. 1996. "The influence of forest structure on fire behavior." In *Proceedings of the 17th Annual Forest Vegetation Management Conference, January 16-18, 1996, Redding, CA*. pp. 52-68.

Anthony, R.G., et al. 2004. "Status and trends in demography of northern spotted owls 1989-2003." In Press *Journal of Wildlife Management Monograph* 179pp. [Online] http://www.reo.gov/nso

Atwood, K.C. 1995. *As Long as the World Goes On: Environmental History of Evans Creek Watershed* Prepared for the Bureau of Land Management, Medford District, Butte Falls Resource Area.

Atzet, T. and D.L. Wheeler. 1982. "Historical and ecological perspectives on fire activity in the Klamath geological providence of the Rogue River and Siskiyou National Forests." USDA Forest Service, Pacific Northwest Region, Portland, OR. 16 pp.

Aubrey, K.B. and J.C. Lewis. 2003. "Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states." In *Biological Conservation* 114:79-90.

Aubrey, K.B. and C. Raley. 2002. "Ecological characteristics of fishers in the southern Oregon Cascade range – final progress report: June 2002." USDA Forest Service, Pacific Northwest Research Station, Olympic Forest Research Lab, Olympia, WA. 14pp.

Bennett, W.S. and D.A. Maguire. 1995. "A field procedure for thinning by relative density specifications: development, implementation and relationship to stand structure." In *Western Journal of Applied Forestry* 10(3):58-90.

Berg, D.R. and M.J. Maki. 2003. "Riparian forest planning and management of agricultural riparian buffers." *Association for Temperate Agroforestry 2003 Conference Proceedings*. pp. 38-58.

Beschta, R.L., R.E. Bilby, G.W. Brown, L.G. Holtby, and T.D. Hofstra. 1987. "Stream temperature and aquatic habitat: fisheries and forestry interactions." In *Streamside Management: Forestry and Fishery Interactions*. Edited by E.O. Salo and T.W. Cundy. University of Washington, Institute of Forestry Resources, Seattle, WA. pp. 191-232.

Bjornn, T.C. 1969. "Embryo survival and emergence studies." Job No. 5, Federal Aid in Fish and Wildlife Restoration. Job Completion Report, Project F-49-R-7. Idaho Fish and Game Department. 11pp.

Bramblett, R.G., M.D. Bryant, E.W. Brenda, and R.G. White. 2002. "Seasonal use of small tributary and main-stem habitats by juvenile steelhead, coho salmon, and dolly varden in a southeastern Alaska drainage basin." In *Transactions of the American Fisheries Society* 131(3):498-506

Brown, R. 2000. "Thinning, fire and forest restoration: a science based approach for National Forests in the Interior Northwest." Defenders of Wildlife, December 2000, Washington D.C. 26 pp.

Burns, R.M. and B.H. Honkala, Technical Coordinators, 1990. *Silvics of North America: Vol. 1 Conifers; Vol. 2 Hardwoods* Agriculture Handbook 654, USDA Forest Service, Washington D.C. Vol. 2, p. 877

Chapman, D.W. 1988. "Critical review of variables used to define effects of fines in redds of large salmonids." *Transactions of the American Fisheries Society* 117(1):1-21

Courtney, S.P., et al. 2004. "Scientific evaluation of the status of the Northern Spotted Owl." Sustainable Ecosystems Institute, Portland, OR. [Online] http://www.SEI.org

Cunjak, R.A. 1996. "Winter habitat of selected stream fishes and potential impacts from land-use activity." *Canadian Journal of Fisheries and Aquatic Sciences* 53(Supplement 1):267-282

Curtis, R.O. 1982. "A simple index of stand density for Douglas-fir." *Forest Science* 28(1):92-94.

Dissmeyer, G. E., editor. 2000. "Drinking water from forests and grasslands: a synthesis of the scientific literature." General Technical Report SRS-GTR-39. USDA Forest Service, Southern Research Station, Asheville, NC. 246pp.

DOE, Office of Science and Office of Fossil Energy, 1999. "Chapter 4 Carbon Sequestration in Terrestrial Ecosystems" In *Carbon Sequestration Research and Development* pp. 4-1 to 4-29

Duncan, S. 2002. "Volume, value and thinning: logs for the future." *Science Findings.* USDA Forest Service, Pacific Northwest Research Station, Portland, OR. November (48):1-5

Duncan, N., T. Burke, S. Downlan, and P. Hohenlohe. 2003. "Survey protocol for survey and manage terrestrial mollusk species from the Northwest Forest Plan, Ver. 3.0." Portland, OR. 70pp.

Elliot, W.J., D. Page-Dumroese, P.R. Robichaud. 1999. "The effects of forest management on erosion and soil productivity." *Proceedings of the Symposium on Soil Quality and Erosion Interaction, Keystone, Colorado, July 7, 1996.* Soil and Water Conservation Society, Ankeney, IA. 16pp.

Emmingham, W.H. and N.E.Elwood. 2002. *Thinning: An Important Timber Management Tool* Pacific Northwest Extension Service Publication 184. Oregon State University, Washington State University, University of Idaho, Corvallis, OR. 6pp.

Erman, D.C., J.D. Newbold, and K.B. Roby. 1977. "Evaluation of streamside buffer strips for protecting aquatic organisms." Publication number 165. California Water Resources Center, University of California, Davis, CA. 48pp.

Everest, F.H., R.L. Beschta, J.C. Scrivener, K.V. Koski, J.R. Sedell, and C.J. Cederholm. 1987. "Fine sediment and salmonid production: a paradox." Edited by E.O. Salo and T.W. Cundy. In *Streamside Management: Forestry and Fishery Interactions*. Contribution 57. University of Washington, College of Forest Resources, Seattle, WA. pp. 98-141.

FEMAT. 1993. *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment.* USDA, Forest Service; US Department of Commerce, National Oceanic and Atmospheric Administration; USDI, Bureau of Land Management, US Fish and Wildlife Service, and National Park Service; and Environmental Protection Agency. Washington, D.C. I1-IX-41.

Filip, G.M. 1998. "Effects of insects and diseases on short-term and long-term tree yields." *Tech Notes* USDA Forest Service, Blue Mountains Natural Resources Institute, La Grande, OR. BMNRI-TN-11, May 1998. 4pp.

Forsman, E.D. 1983. "Methods and materials for locating and studying spotted owls in Oregon." General Technical Report, PNW-GTR-162. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 8pp.

Forsman, E.D., et al. 1996. "A color band for spotted owls." In *Journal of Field Ornithology* 67(4):507-510.

Franklin, J.F. 1992. "Scientific basis for new perspectives in forest and streams." In *Watershed Management: Balancing Sustainability and Environmental Change,* edited by R.J. Naiman. Springer-Verlag, NY. pp. 27-72.

Franklin, J.F., H.H. Shugart, and M.E. Harmon. 1987. "Tree death as an ecological process." *BioScience* 37(8):550-556.

Graham, T.G., A.E. Harvey, T.B. Jain, and J.R. Tonn. 1999. "The effects of thinning and similar stand treatments on fire behavior in western forests." General Technical Report PNW-GTR-463. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. 27pp.

Gresswell, R.E. 1999. "Fire and aquatic ecosystems in forested biomes of North America." In *Transactions of the American Fisheries Society* 128:193-221.

Habeck, R.J. 1992. *Pinus Ponderosa* var. *Ponderosa*. Fire Effects Information System. USDA Forest Service, Rocky Mountain Research Station, Fire Science Lab, Missoula, MT. 10 pp.

Hall, J.D. and R.L. Lantz. 1969. "Effects of logging on the habitat of coho salmon and cutthroat trout in coastal streams." In *Symposium on Salmon and Trout in Streams,* edited by T.G. Northcote. MacMillan Lectures in Fisheries, University of British Columbia. Vancouver, BC.

Hann, D.W. 2003. *Organon User Manual, Edition 7.0*. Oregon State University, Department of Forest Resources, Corvallis, OR. 129pp.

Hann, D.W. and C.H. Wang. 1990. "Mortality equations for individual trees in the mixed conifer zone of southwest Oregon." Research Bulletin 67. Oregon State University, Forest Research Lab, Corvallis, OR. 17 pp.

Hansen, A.J., T.A. Spies, F.J. Swanson, and J.L. Ohmann. 1991. "Conserving biodiversity in managed forests: lessons from natural forests." *BioScience* 41(6):382-392.

Hardy, C.C., D.L. Bunnell, J.P. Menakis, D.G. Schmidt, D.G. Long, D.G. Simmerman, and C.M. Johnston. 1999. "Coarse-spatial data for wildland fire and fuel management." USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, MT. http://www.fs.fed.us/fire/fuelman/

Harmon, M.E. and C. Hua. 1991. "Coarse woody debris dynamics in two old-growth ecosystems." *BioScience* 41(9):604-610.

Hartman, G.F., J.C. Scrivener, L.B. Holtby, and L. Powell. 1987. "Some effects of different streamside treatments on physical conditions and fish population processes in Carnation Creek, a coastal rain forest stream in British Columbia." In *Streamside Management: Forestry and Fishery Interactions*, edited by E.O. Salo and T.W. Cundy. University of Washington, Institute of Forestry Resources, Seattle, WA. pp. 330-371.

Hausle, D.A. and D.W. Coble. 1976. "Influence of sand in redds on survival and emergence of brook trout (*Salvelinus fontinalis*)." In *Transactions of the American Fisheries Society* 105(1):57-63.

Hilderbrand, R.H. and J.L. Kershner. 2000. "Movement patterns of stream-resident cutthroat trout in Beaver Creek, Idaho-Utah." In *Transactions of the American Fisheries Society* 129(5):1160-1170.

Holtby, L.B. 1988. "Effects of logging on stream temperatures in Carnation Creek, British Columbia, and associated impacts on coho salmon (*Oncorhynchus kisutch*)." In *Canadian Journal of Fisheries and Aquatic Science* 45:502-515.

Hunter, M. 1995. "Residual trees as biological legacies" In *Communiqué Number 2* Cascade Center for Ecosystem Management, Oregon State University and USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR. 27 pp.

Johnson, S.L. and J.A. Jones. 2000. "Stream temperature responses to forest harvest and debris flows in western Cascades, Oregon." In *Canadian Journal of Fisheries and Aquatic Science* 57(Supplement 2):30-39.

Kahler, T. H., P. Roni, and T. P. Quinn. 2001. "Summer movement and growth of juvenile anadromous salmonids in small western Washington streams." *Canadian Journal of Fisheries and Aquatic Science* 58:1947-1956.

Kelly, E.G., E.D. Forsman, and R.G. Anthony. 2003. "Are barred owls displacing spotted owls." In *Condor* 105:45-53.

Kramer, P.J. and J.W. Kozlowski. 1979. *Physiology of Woody Plants* Academic Press, Orlando, FL. 811 pp.

Latham, P. and J. Tappeiner. 2002. "Response of old growth conifers to reduction in stand density in western Oregon forests." *Tree Physiology* 22:137-146.

Lint, J., et al. 1999. "Northern spotted owl effectiveness monitoring plan for the Northwest Forest Plan." General Technical Report PNW-GTR-440. USDA Forest Service, Pacific Northwest Research Station.

Lloyd, D.S., J.P. Koenings, and J.D. LaPeriere. 1987. "Effects of turbidity in fresh waters of Alaska." *North American Journal of Fisheries Management* 7:18-33.

Madej, M. 2001. "Erosion and sediment delivery following removal of forest roads." In *Earth Surface Processes and Landforms* 26:1-16.

McComb, W.C. and A.J. Hansen. 1992. "An introduction to forest wildlife ecology." In *Silvicultural Approaches to Animal Damage in Pacific Northwest Forests* General Technical Report PNW-GTR-287. USDA Forest Service, Pacific Northwest Research Station, Portland, OR. pp. 93-122

McCuddin, M.E. 1977. "Survival of salmon and trout embryos and fry in gravel-sand mixtures." Master's thesis, University of Idaho, Moscow, ID. [as cited in Chapman 1988]

Meehan, W.R. Editor. 1991. "Influences of forest and rangeland management on salmonid fishes and their habitats." American Fisheries Society Special Publication 19, Bethesda, MD.

Megahan, W.F., M. Wilson, and S.B. Monsen. 2001. "Sediment production from granitic cutslopes on forest roads in Idaho, USA." In *Earth Surface Processes and Landforms* 26:153-163.

Meleason, M.A., S.V. Gregory, and J.P. Bolte. 2003. "Implications of riparian management strategies on wood in streams of the Pacific Northwest." In *Ecologic Applications* 13:1212-1221.

Montgomery, D.R. and J.M. Buffington. 1997. "Channel-reach morphology in mountain drainage basins." General Services Administration Bulletin 109:596-611.

Moore, K.M.S. 1997. "Habitat benchmarks." Unpublished manuscript. Oregon Department of Fish and Wildlife, Portland, OR.

Murphy, M.L. and K.V. Koski. 1989. "Input and depletion of woody debris in Alaska streams and implications for streamside management." In *North American Journal of Fisheries Management* 9(4):427-436.

National Council of the Paper Industry for Air and Stream Improvement, Inc. (NCASI). 1999. "Scale considerations and the detectability of sedimentary cumulative watershed effects." Technical Bulletin No. 776. Research Triangle Park, NC.

National Interagency Fire Center. 2004. *Fire Effects Guide*. NFES 2394. National Wildlife Coordinating Group, Fire Use Working Team. Boise, ID. 313 pp. [Online] http://www.nwcg.gov/pms/RxFire/FEG.pdf

Nehlsen, W., J.E. Williams, and J.A. Lichatowich. 1991. "Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho, and Washington." In *Fisheries* 16(2):4-21.

Nelson, R.L., M.L. McHenry, and W.S. Platts. 1991. "Mining." In *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats,* edited by W. R. Meehan. American Fisheries Society, Special Publication 19, Bethesda, MD. pp. 425-457.

Newbold, J.D., D.C. Erman, and K.B. Roby. 1980. "Effects of logging on macroinvertebrates in streams with and without buffer strips." In *Canadian Journal of Fisheries and Aquatic Sciences* 37:1076-1085.

Newcombe, C.P. and D.D. MacDonald. 1991. "Effects of suspended sediments on aquatic ecosystems." *North American Journal of Fisheries Management* 11:72-82.

Nickelson, T.E., J.D. Rodgers, S.L. Johnson, and M.F. Solazzi. 1992. "Seasonal changes in habitat use by juvenile coho salmon (*Oncorynchus kisutch*) in Oregon."

Oliver, W.W., G.T. Ferrell, and J.C.Tappeiner. 1996. "Chapter 11 Density Management of Sierra Forests" In *Summary of the Sierra Nevada Ecosystem Project Report, Final Report to Congress* University of California, Sierra Nevada Ecosystem Project Science Team and Special Consultants. pp. 1-7.

Omi, P.N. and E.J. Martinson. 2002. "Effect of fuels treatment on wildfire severity." Unpublished final report to the Joint Science Program Governing Board. Western Forest Fire Research Center, Colorado State University, Fort Collins, CO. 40 pp.

Oregon Department of Fish and Wildlife. 1994. Aquatic Habitat Inventories. Available at Butte Falls Resource Area, Medford District Bureau of Land Management, 3040 Biddle Road, Medford, OR.

Oregon Department of Fish and Wildlife. 1995. Aquatic Habitat Inventories. Available at Butte Falls Resource Area, Medford District Bureau of Land Management, 3040 Biddle Road, Medford, OR

Oregon Department of Forestry. 1999. "Dead branches, dead tops, and dead conifer trees – the interaction of drought, water stress, insects and disease." *Forest Health Note* May 1999. Salem, OR. 10pp.

Pearson, T.N. H.W. Li, and G.A. Lamberti. 1992. "Influence of habitat complexity on resistance to flooding and resilience of stream fish assemblages." *Transactions of the American Fisheries Society* 121(4):427-436.

Perry, D.A. 1994. *Forest Ecosystems* The Johns Hopkins University Press. Baltimore, MD and London, England. 256pp.

Perry, D.A. 1995. "Landscapes, humans and other system-level considerations: a discourse on ecstasy and laundry." In *Symposium Proceedings of Ecosystem Management in Western Interior Forests, May 3-5, 1994, Spokane, WA*. pp. 177-188.

Phillips, R.W., T.L. Lantz, E.W. Claire, and J.R. Moriing. 1975. "Some effects of gravel mixtures on emergence of coho salmon and steelhead trout fry." *Transactions of the American Fisheries Society* 104:461-466.

Pollet, J. and P.N. Omi. 2002. "Effect of thinning and prescribed burning on wildfire severity in ponderosa pine forests." In *Proceedings from the Joint Fire Science Conference and Workshop, June 15-17, 1999, Boise, ID*. 5pp.

Poole, G.C. and C.H. Berman. 2001. "Pathways of human influence on water temperature in stream channels." In *Environmental Management* 27:787-802.

Powell, D.C. 1999. "Suggested stocking levels for forest stands in northeast Oregon and southeast Washington: an implementation guide for the Umatilla National Forest." Technical Publication F14-SO-TP-03-99. USDA Forest Service, Pacific Northwest Region, Umatilla National Forest. April 1999.

Raley, C. 2004. Personal communication. PNW researcher, Prospect, OR.

Roni, P., T.J. Beechie, R.E. Bilby, F.E. Leonetti, M.M. Pollock, and G.R. Pess. 2002. "A review of stream restoration techniques and a hierarchical strategy for prioritizing restoration in Pacific Northwest watersheds." In *North American Journal of Fisheries Management* 22(1):1-20.

Rosenfeld, J.S., M. Porter, and E. Parkinson. 2000. "Habitat factors affecting the abundance and distribution of juvenile cutthroat trout (*Oncorhynchus clarki*) and coho salmon (*Oncorhynchus kisutch*)." In *Canadian Journal of Fisheries and Aquatic Science* 57:766-774.

Salo, E.O. and T.W. Cundy, editors. 1987. *Streamside Management: Forestry and Fishery Interactions* University of Washington, Seattle, WA.

Sandberg, D.V., R.D. Ottmar, J.L. Peterson, and J. Core. 2002. "Wildland fire in ecosystems: effects of fire on air." General Technical Report RMRS-GTR-42-volume 5. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 86pp.

Satterthwaite, T.D. 2002. *Klamath Mountains Province Steelhead Project, 1999 Annual Report*. Monitoring Program Report Number OPSW-ODFW-2002-09. Oregon Department of Fish and Wildlife, Portland, OR.

Schmidt, K.M., Menakis, J.P., Hardy, C.C., Hann W.J., and Bunnell, D.L. 2002. "Development of coarse-scale spatial data for wildland fire and fuel management." General Technical Report RMRS-GTR-87. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 50pp.

Scott, J.H. and E.D. Reinhardt. 2001. "Assessing crown fire potential by linking models of surface and crown fire behavior." Research Paper RMRS-RP-29. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 59 pp.

Simpkins, D.G., W.A. Hubert, C. Martinez Del Rio, and D.C. Rule. 2003. "Physiological responses of juvenile rainbow trout to fasting and swimming activity: effects on body composition and condition indices." In *Transactions of the American Fisheries Society* 132(3):576-589.

Skinner, C.N. 1997. "Fire history in riparian reserves of the Klamath Mountains." S. Cooper and N. Sugihara, technical coordinators. In *Proceedings of Fire in California Ecosystems: Integrating Ecology, Prevention, and Management, November 17-20, 1997, San Diego, CA*. International Association of Wildland Fire.

Solazzi, M.G., T.E. Nickelson, S.L. Johnson, and J.D. Rodgers. 2000. "Effects of increasing winter rearing habitat on abundance of salmonids in two coastal Oregon streams." In *Canadian Journal of Fisheries and Aquatic Sciences* 57:906-914.

Sommarstrom, S. and E. Kellog. 1990. "Scott River watershed granitic sediment study." A study completed for the Siskiyou Resource Conservation District, Etna, California. [Online] http:www.krisweb.com/biblio/Klamath_scrd_sommarstrometal_1990.pdf

Stednick, J.D. 1996. "Monitoring the effects of timber harvest on annual water yield." *Journal of Hydrology* 176:79-95.

Sullivan, K. T.E. Lisle, C.A. Dolloff, G.E. Grant, and L.M. Reid. 1987. "Stream channels: the link between forests and fishes." In *Streamside Management: Forestry and Fishery Interactions*, edited by E.O. Salo and T.W. Cundy. University of Washington, Institute of Forestry Resources, Seattle, WA. pp. 39-97.

Switalski, T.A., J.A. Bissonette, T.H. DeLuca, C.H. Luce, and M.A. Madej. 2004. "Benefits and impacts of road removal." In *Front. Ecol. Environ.* 2(1):21-28.

Tappel, P.D. and T.C. Bjornn. 1983. "A new method of relating size of spawning gravel to salmonid embryo survival." In *North American Journal of Fisheries Management* 3(2):"123-135.

USDA, Forest Service. 1996. "Field guide to the forested plant associations of southwestern Oregon." Technical Paper, R6-NR-ECOL-TP-17-96.

USDA, Forest Service. 2000. "Survey methodology for northern goshawks in the Pacific southwest region." 17pp.

USDA, Forest Service and USDI, Bureau of Land Management. 1994a. *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*. Government Printing Office.

USDA, Forest Service and USDI, Bureau of Land Management. 1994b. *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*. Government Printing Office.

USDA, Forest Service and USDI, Bureau of Land Management. 2000. *National Fire Plan, A Report to the President in Response to the Wildfires of 2000: Managing the Impact of Wildfires on Communities and the Environment*. 17pp.

USDA, Forest Service and USDI, Bureau of Land Management. 2004a. *Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.*

USDA, Forest Service and USDI, Bureau of Land Management. 2004b. *Record of Decision to Remove or Modify the Survey and manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.*

USDA, Forest Service and USDI, Bureau of Land Management. 2004c. *Sufficiency Analysis for Stream Temperature: Evaluation of the Adequacy of the Northwest Forest Plan Riparian Reserves to Achieve and Maintain Stream Temperature Water Quality Standards.*

USDI, Bureau of Land Management, Medford District Office. 1994. *Medford District Proposed Resource Management Plan/ Environmental Impact Statement Volumes I-III*. Medford, OR.

USDI, Bureau of Land Management, Medford District Office. 1995a. *Medford District Record of Decision and Resource Management Plan*. Government Printing Office. Medford, OR.

USDI, Bureau of Land Management, Medford District Office, Butte Falls Resource Area. 1995b. *Watershed Analysis of West Fork of Evans Creek*. Medford, OR.

USDI, Bureau of Land Management, Medford District Office, Butte Falls Resource Area. 2004. West Fork Evans Creek Riparian Surveys.

USDI, Fish and Wildlife Service. 1992. "Final rule to establish critical habitat." *Federal Register* 57(10):1796-1838. January 15, 1992.

USDI, Fish and Wildlife Service. 2003. *Rogue River/South Coast Biological Assessment FY 04-08 for Activities that may affect listed species in the Rogue River/South Coast Province for Medford District, Bureau of Land Management, Rogue River and Siskiyou National Forests.* Biological Assessment 11 July 2003, Biological Oopinion #1-15-03-F-511, 20 October 2003.

Vargas, M. 2004. Personal communication. Biologist, Oregon Department of Fish and Wildlife, Medford, OR.

Vogt, J. 1998. Upper Rogue smolt trapping project, 1998. Oregon Department of Fish and Wildlife. Available at Butte Falls Resource Area, Medford District BLM, 3040 Biddle Road, Medford, OR.

Vogt, J. 1999. Upper Rogue smolt trapping project, 1999. Oregon Department of Fish and Wildlife. Available at Butte Falls Resource Area, Medford District BLM, 3040 Biddle Road, Medford, OR.

Vogt, J. 2000. Upper Rogue smolt trapping project, 2000. Oregon Department of Fish and Wildlife. Available at Butte Falls Resource Area, Medford District BLM, 3040 Biddle Road, Medford, OR.

Vogt, J. 2002. Upper Rogue smolt trapping project, 2001. Oregon Department of Fish and Wildlife. Available at Butte Falls Resource Area, Medford District BLM, 3040 Biddle Road, Medford, OR.

Vogt, J. 2004. Upper Rogue smolt trapping project, 2004. Oregon Department of Fish and Wildlife. Available at Butte Falls Resource Area, Medford District BLM, 3040 Biddle Road, Medford, OR.

Vogt, J. 1999. Upper Rogue smolt trapping project, 1999. Oregon Department of Fish and Wildlife. Available at Butte Falls Resource Area, Medford District BLM, 3040 Biddle Road, Medford, OR.

Waters, T. F. 1995. "Sediment in streams: sources, biological effects, and control." *American Fisheries Society Monograph 7*, Bethesda, MD.

Wenger, K.F. 1984. *Forestry Handbook,* edited by K.F. Wenger. Society of American Foresters Publication Number SAF 84-01, John Wiley and Sons, New York, 1335 pp.

Woodbridge, B. and C.D. Hargis. 2005. "Northern goshawk inventory and monitoring technical guide." USDA Forest Service, Washington, DC.

Appendices

Appendix A

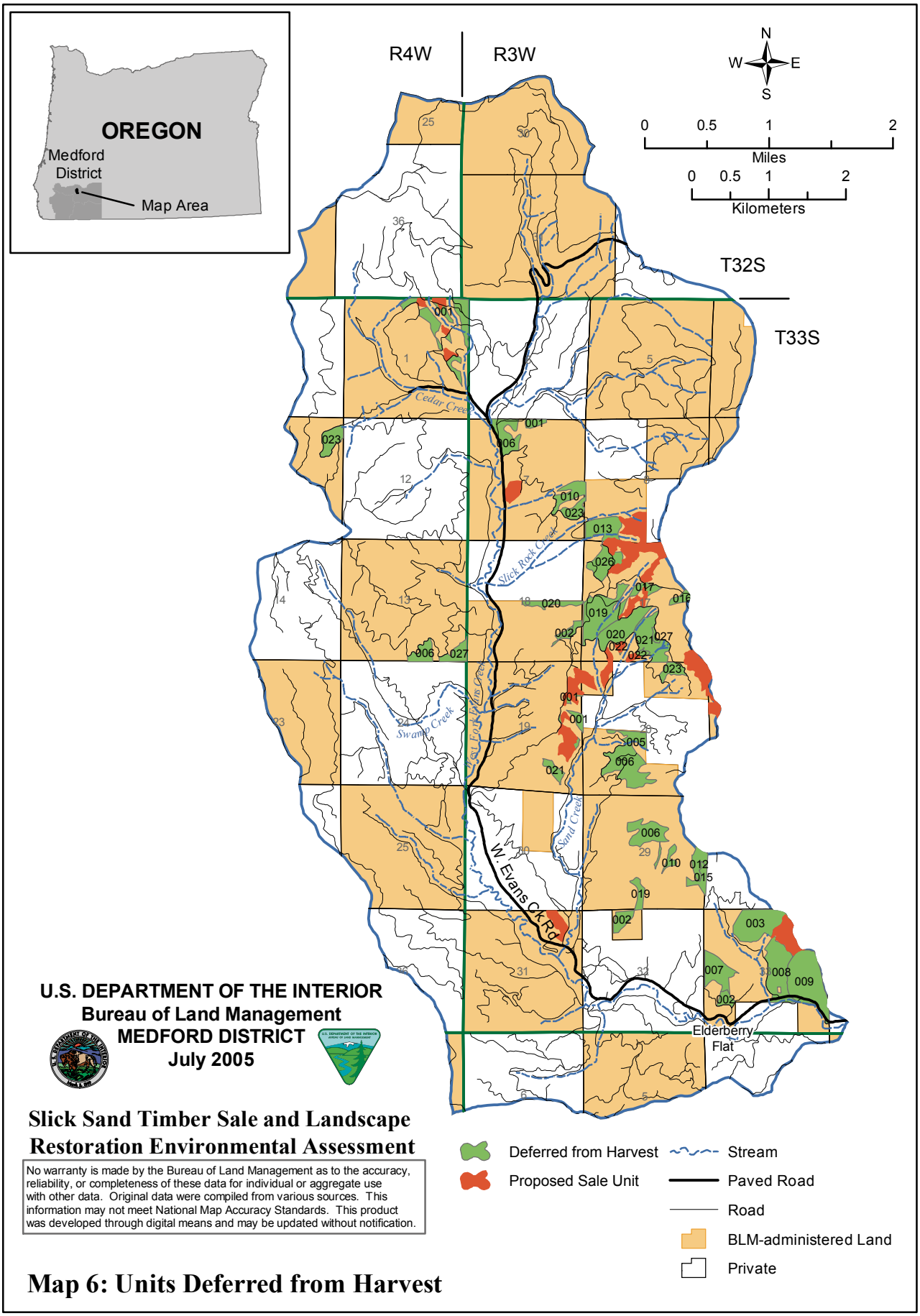
Silvicultural Prescriptions

Table A-1. Operational Inventory (OI) Units Deferred from Harvest Entry

Legal Description	OI Unit	Acres	Remarks
T33S, R3W, Sec. 7	001	6	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, precommercial thin (PCT) understory conifers and girdle hardwoods <12″ DBH; 9 trees per acre (TPA) >20″ DBH
T33S, R3W, Sec. 7	006	28	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <12″ DBH. 16 TPA>20″ DBH
T33S, R3W, Sec. 7	010	20	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <12″ DBH. 7 TPA >20″ DBH
T33S, R3W, Sec. 7	023	12	No commercial entry. Knobcone is 60% of the conifers > 8″ DBH. 1 TPA >20″ DBH
T33S, R3W, Sec. 8	013	30	Narrow strip of OI adjacent to east/west section line is commercial thin and is part of timber sale. The remainder is no commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <12″ DBH.
T33S, R3W, Sec. 17	016	7	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <12″ DBH. 18 TPA>20″ DBH
T33S, R3W, Sec. 17	017	10	No commercial entry; density of conifers >8″ DBH at or below target level. Knobcone is 30% of basal area of the stand, with hardwoods at 50% of the basal area and conifers at 20%. Future treatment: Girdle hardwoods around healthy conifers. 15 TPA >20″ DBH
T33S, R3W, Sec. 17	019	58	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <12″ DBH. 13 TPA>20″ DBH.
T33S, R3W, Sec. 17	020	39	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <12″ DBH. 14 TPA>20″ DBH.
T33S, R3W, Sec. 17	021	43	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <12″ DBH. 22 TPA>20″ DBH.
T33S, R3W, Sec. 17	026	25	Western ½ of OI dropped, density of Douglas-fir >8″ DBH at or below target level. About 45% of basal area is madrone or knobcone pine.
T33S, R3W, Sec. 18	002	12	Wildlife habitat
T33S, R3W, Sec. 18	020	12	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <8″ DBH. 3 TPA >20″ DBH.

Table A-1. Operational Inventory (OI) Units Deferred from Harvest Entry

Legal Description	OI Unit	Acres	Remarks
T33S, R3W, Sec. 19	001	33	Northern part of OI (15 acres) included in timber sale unit. Basal area on matrix is 70% hardwoods and 30% conifers. 22 TPA >20″ DBH, most located with Riparian Reserves.
T33S, R3W, Sec. 19	021	6	No commercial entry; density of conifers >8″ DBH at or below target level. Future treatment: Release around dominant and codominant conifers, PCT understory conifers and girdle hardwoods <12″ DBH.
T33S, R3W, Sec. 20	005	14	No commercial entry; density of conifers>8″ DBH at or below target level. Knobcone is about 45% of basal area, hardwoods 20% and Douglas-fir 35%. Future treatment: Release around Douglas-fir. 10 TPA>20″ DBH.
T33S, R3W, Sec. 20	006	51	No commercial entry, density of conifers >8″ DBH at or below target level. Knobcone and madrone is about 60% of the basal area, with the remaining 40% conifers. Future treatment: Release around Douglas-fir
T33S, R3W, Sec. 20	023	11	No commercial entry; density of Douglas-fir >8″ DBH at or below target level. Knobcone and hardwoods are dominant stand components.
T33S, R3W, Sec. 29	006	30	No commercial entry; density of Douglas-fir >8″ DBH at or below target level. Knobcone and hardwoods are about 35% of basal area. 14 TPA >20″ DBH
T33S, R3W, Sec. 29	010	10	Riparian Reserve buffer leaves small matrix area with poor access.
T33S, R3W, Sec. 29	012	13	No commercial entry; density of Douglas-fir >8″ DBH at or below target level. Knobcone overstory, with a Douglas-fir understory of 1-4″ DBH Douglas-fir.
T33S, R3W, Sec. 29	015	9	No commercial entry; density of Douglas-fir >8″ DBH at or below target level. Knobcone overstory, with a Douglas-fir understory of 1-4″ DBH Douglas-fir.
T33S, R3W, Sec. 29	019	9	No access makes helicopter logging only option. No nearby units, drop OI from consideration.
T33S, R3W, Sec. 32	002	12	Riparian Reserves buffers leave narrow matrix strips. Poor access, drop OI from consideration.
T33S, R3W, Sec. 33	003	53	No commercial entry; density of conifers >8″ DBH at or below target level. Logged and planted in the early 1960s. Scattered pockets of trees > 8″ DBH remain.
T33S, R3W, Sec. 33	007	30	No commercial entry; density of conifers >8″ DBH at or below target level. Knobcone pine is about 25% of the basal area, with madrone also common. Average DBH of overstory knobcone and Douglas-fir is 14-16″ DBH. Douglas-fir understory is 1-5″ DBH. 23 TPA >20″ DBH
T33S, R3W, Sec. 33	008	54	No commercial entry; density of conifers >8″ DBH at or below target level. Logged and planted in the early 1960s. Widely scattered individual and small pockets of trees >8″ DBH remain.
T33S, R3W, Sec. 33	009	74	No commercial entry; density of conifers >8″ DBH at or below target level. Logged and planted in the early 1960s. Widely scattered individual and small pockets of trees >8″ DBH remain.
T33, R4W, Sec. 1	001	85	Riparian Reserves and leave patches of matrix. Based on density and tree condition, part of the matrix lands were dropped from timber sale consideration.
T33, R4W, Sec. 11	023	18	Scattered overstory of sugar pine and Douglas-fir at 10 TPA >20″ DBH. Understory of hemlock, madrone, and chinquapin, minimal Douglas-fir. Brush is heavy with rhododendron 4-6′ common.
T33, R4W, Sec. 13	006	15	No commercial entry; density of conifers >8″ DBH at or below target level.
T33, R4W, Sec. 13	027	14	No commercial entry; density of conifers >8″ DBH at or below target level. 10 TPA >8″ DBH.
	Total	**843**	



Map 6: Units Deferred from Harvest

I. Management Direction and Objectives

Management Direction

On matrix lands, as defined by the Medford District Resource Management Plan (RMP) and the Record of Decision (ROD) for the Northwest Forest Plan the following objectives are to be met:

- Produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability.
- Provide connectivity (along with other allocations such as riparian reserves) between late-successional reserves.
- Provide habitat for a variety of organisms associated with both late-successional and younger stands.
- Provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags and large trees
- Provide early successional habitat
- Reduce tree mortality and restore the vigor, resiliency, and stability of forest stands

Treatment Objectives

Implement management activities that would initiate the development of a landscape that has the ability to buffer and absorb disturbances, such as fire, insects, disease, drought, floods and potential climate change, rather than to magnify those disturbances. To meet this objective the following management treatments are planned:

- Reduce densities in overstocked forest stands to increase tree vigor and redistribute growth to the largest and healthiest trees.
- Manage mature forest stands to develop and maintain healthy large conifer trees, favoring drought tolerant species (ponderosa pine, sugar pine, incense cedar and Douglas-fir).
- Regenerate forest stands that are declining, retaining structural and functional components and provide for the reestablishment of shade intolerant conifer species.

II. Site/Stand Condition

1. General Description of the Site

The proposed treatment area is located within Jackson County and approximately 25-30 air miles northeast of the city of Medford. The area is located in Township 33S, Range 4W, portions of Sections 1 and 13; Township 32S, Range 4W, Section 35; Township 33S, Range 3W, Sections 7, 8, 17, 19, 20, 21, 29, 31, 32 and 33.

2. Drainage/Watershed

The proposed treatment area is located within the West Fork of Evans Creek.

3. Abiotic Conditions

a. Soil Type

The project area is composed predominantly of soils formed from decomposed granite. Granitic soils are highly erodible and prone to gully erosion and debris slides. These soils have low clay content and a coarse single grain structure that contributes to a lack of cohesion. This lack of cohesion makes stabilizing these soils difficult after a disturbance. Granitic soils are also low in organic matter content and are subsequently sensitive to the impacts of high intensity wildfires that consume the organic layer. Small areas of serpentine soils are also present within the northwest portion of the watershed. These soils are characterized by an unusually high ratio of magnesium to calcium, creating soils with an imbalanced nutrient content. Vegetative growth on serpentine sites is typically stunted as compared to areas with nonserpentine soils.

b. Site Index

Site index is the average height of the dominant trees at 50 years. Site index is relatively independent of stand density and provides a comparable measure of site productivity between different forest stands. The site index for Douglas-fir within the treatment area averages 74 based on Hann-Scrivani site index equations (Hann and Scrivani 1987).

c. Topography/Precipitation

The elevation in the treatment area ranges from a low of 2,040 feet above sea level (ASL) to 4,120 feet ASL at the top of watershed boundary in T32S, R4W, Section 35. Slopes in most of the project area can be classified as moderate, with most ranging from 10-50 percent. Areas of steeper slopes greater than 55 percent occupy a small percentage of the total project area. Annual precipitation ranges from 35 to 50 inches. Most precipitation occurs in the late fall, winter, and early spring as rainfall, with the exception of the upper ridges where snow may accumulate.

d. Existing Site Problems

Small areas of serpentine soils are present within the project area; these soils have nutrient imbalances that restrict vegetative growth. Serpentine soils are low in calcium and have high levels of magnesium, chromium and nickel.

Elevation and aspect influence site productivity by influencing temperature and moisture availability. Low elevation sites on south and west aspects have the lowest site capability for plant growth and greatest susceptibility for conifer mortality during drought conditions. The high demand for moisture during prolonged hot and dry summer days causes greater tree stress particularly in overstocked forest stands. Plants require at least 75 percent water content in functional cells (Bradford and Hsiao 1982). During hot, dry periods, the uptake of moisture can not keep up with the loss through transpiration. When this occurs, the plant closes leaf stomates to maintain adequate cell water content. With the leaf stomates closed, carbon dioxide is not taken into the plant through photosynthesis and the conversion of carbon dioxide and water into carbohydrates or "food" does not occur. Without the creation of "food," the life processes of the tree are interrupted, resulting in increased tree stress and a higher risk of insect attack or disease infection. Reduced resin flow in water-stressed trees enables insects to successfully attack the tree (Kramer and Kozlowski 1979).

4. Biotic Conditions

a. Plant Series

Abrupt changes in aspect, slope, soil type, and past disturbances (wildfire, insects, disease, and logging) affect forest structure and the type of tree species present. These landscape changes result in a mosaic of forest conditions. This mosaic includes different levels of canopy closure, shifting tree species dominance, and varying tree age and size classes.

The Douglas-fir plant series is the most common in the project area. Ponderosa pine, sugar pine, and incense-cedar make up a small percentage of the overstory tree canopy with Douglas-fir the dominant overstory as well as understory tree species. Madrone and black oak are the main hardwood species. Shrub competition within this plant series is generally low to moderate following canopy opening disturbances. Shrub species present in varying amounts are ocean spray, hazel, deerbrush ceanothus, Oregon grape (dwarf and piper's), poison oak, and vine maple (at the higher elevations). Douglas-fir, ponderosa pine, black oak, and incense-cedar are the most appropriate species for regeneration. Slope aspect influences the location and amount of these plant species, with the dry, south aspects containing the most drought tolerant species.

The most common plant associations are PSME-CADE27/BEPI2 (Douglas-fir-Incense Cedar/Piper's Oregon grape), PSME-ABCO/SYMO (Douglas-fir-White fir/Creeping Snowberry), and PSME-PIPO/RHDI6 (Douglas-fir-Ponderosa Pine/Poison Oak).

b. Stand History

Much of the proposed project area has been logged within the past 40-50 years. Timber harvesting in this area has consisted of partial cutting, overstory removal, clearcutting, and salvage of dead and dying trees. The last harvest entry on any BLM-managed lands within the West Evans Watershed occurred in 1997, under the Salty Bones Timber Sale.

Prior to harvest activities, wildfire was the primary disturbance event. Frequent, low to moderate intensity fires were common in the watershed. These fires periodically removed the smaller and less fire-resistant trees and shrub species, thereby reducing the competition between the remaining trees for site resources.

c. Structure Description

The stands can be classified as single-layer, even-aged or multi-layer, uneven-aged stands. Where wildfires burned intensively, crown fires occurred and even-aged stands became established. When wildfires burned at a lower level of intensity and were confined to the ground level, multi-layered, uneven-aged stands developed. With decades of fire suppression, the establishment of dense, stagnant understories in many forest stands has occurred. In the absence of periodic wildfires, the natural thinning effect of low to moderate fires has been lost and the amount of understory vegetation continues to increase.

Hardwoods make up the middle layer of many stands and occur as clumps or a widely scattered stand component. Hardwoods represent an early drought tolerant seral tree component. Competition between adjacent trees and conifer canopy closure has reduced the vigor and increased the mortality of many of the large hardwood trees.

The current pattern of vegetation, both structurally and successionally, is considerably different than historic conditions. Fire suppression, simplification of forest structure, and changes in the spatial pattern of forest vegetation has altered biological diversity, connectivity and landscape function. The checkerboard ownership pattern in the watershed has lead to distinctive arrangement and distribution of forest conditions, with younger forests on private lands and a combination of younger and older forests on federally-managed lands.

d. Coarse Woody Debris (CWD)

Coarse woody debris provides habitat for wildlife, invertebrate, microbial, and fungal species, as well as providing for important ecological functions such as moisture retention, soil stabilization, and nutrient recycling. Within the project area, coarse woody debris amounts are low with decay class 1 or 2 coarse woody debris greater than 16″DBH limited. Decay classes 3, 4, and 5 coarse woody debris larger than 16″ DBH is also limited on sites below 3,000′ ASL. The lack of the older decay classes may be linked to lower historic (prior to fire suppression) stand densities and the frequent wildfires that occurred prior to fire suppression. These repeated fires would have kept the understory and surface layer relatively clean and void of large buildups of woody debris.

Where coarse woody debris does occur, it will not be removed from the site and will be protected from disturbance. In forest stands identified for regeneration harvests, trees would be designated and reserved to meet coarse woody debris requirements.

e. Snags

ROD standards and guidelines require that over time, 1-2 snags per acre be present to meet the requirement for cavity nesting birds at 40 percent of potential population levels. All classes of snags will be retained as part of the silvicultural prescription. During harvest operations, existing snags will be reserved from felling where they are not a safety hazard and, where necessary, additional green trees will be reserved to meet the target levels. If a snag needs to be fallen for safety concerns, the snag will be left on-site to function as coarse woody debris.

f. Tree and Stand Health, Insect and Disease

Bark beetle activity is currently low within the project area. Flatheaded wood borers (*Melanophila drummond*), western pine beetles (*Dendroctonus brevicomis*), and fir engraver beetles (*Scolytus ventralis* LeConte) are active at endemic levels in and adjacent to the project area. High stocking levels and low moisture availability will continue to create environmental conditions favorable to bark beetle infestation of stressed trees.

Stem rots (*Phellinus pini, Oligoporus amarus*, and *Phaelos schweinitzii)* are present in a small number of trees, but do not pose a serious concern for stand health. The trees infected with stem rots enhance forest diversity by providing trees with unique structural defects that serve as plant and wildlife habitat, as well as future coarse woody debris.

The greatest concern and impact upon individual tree and stand health is the level of intertree competition resulting from the high numbers of trees within many forest stands. Overstocked stands contain more trees than the site has resources (moisture, nutrients, and growing space) to provide for (Figure 1). This condition leads to increased tree stress, particularly during prolonged hot summer days without any precipitation. Decreased tree vigor is magnified during periodic drought years when the cumulative effects of below average amounts of precipitation causes the interruption of basic functional processes (photosynthesis, transpiration, respiration, translocation assimilation) over an extended period of time. In forest stands proposed for management, entry stand exams were completed to determine the “relative density.” Relative density is a measure of crowding in a stand of trees. It compares the number of trees present to the number of trees the site has resources

to support. Relative density (RD) levels within the units proposed for treatment range between 50 and 100 percent with an average relative density of 97 percent. As a point of reference, crowns begin to close when the RD approaches 15 percent and the mortality of suppressed trees begins after the relative density reaches 65 percent (Perry 1994; Hann and Wang 1990). Maintaining the relative density in forest stands between an upper end of 50 percent and a lower end of 25 percent prevents excessive tree loss from competition.

Tree senescence or "aging" also plays a role in the condition and vigor of individual trees. As a tree increases in size and builds up a complex branch system, it shows a decrease in metabolism; gradual reduction in growth of vegetative and reproductive tissues; loss of apical dominance; increase in dead branches; slow wound healing, heartwood formation; increased susceptibility to injury from certain insects, diseases, and unfavorable environmental conditions; and loss of geotrophic responses (growth of stems upward and of roots downward in response to gravity). There is also a decrease in the proportion of photosynthetic to nonphotosynthetic tissue. This reduction results in less carbohydrates being produced (Kramer and Kozlowski 1979). Movement of food, water, and minerals becomes more difficult as the distance from the roots to the top of the tree increases. This problem is magnified when water becomes a limiting resource in tall trees. Water deficits may cause needle and stem mortality as evident by snag tops or dead branches and needles in the upper part of the crowns

In addition to the high numbers of trees per acre and tree aging, other factors contribute to individual tree health and vigor. Factors such as the amount of understory shrub growth, soil type, precipitation, aspect, crown position in the canopy, topography, root pathogens, and insects all combine to affect tree vigor and its ability to maintain basic functional processes.

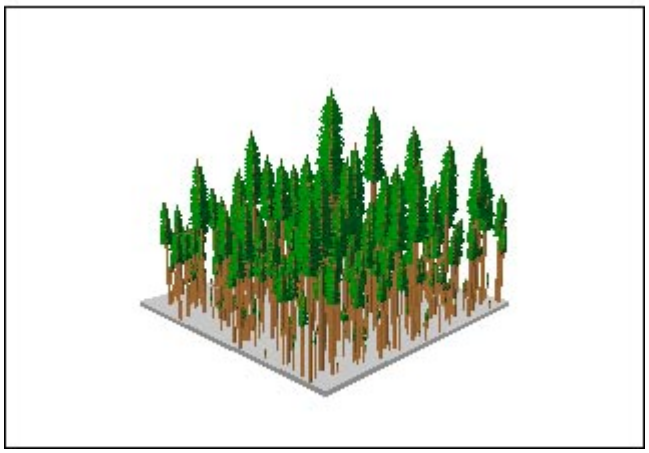


Figure 1. Present Conditions
Forest stands are overstocked with more trees than the site has water, nutrients and growing space to sustain. Without reducing tree density levels to the carrying capacity of the site, tree and stand vigor will decline. As trees increase in size they require more growing space and a larger volume of soil to supply an increasing need for water and nutrients.

III. Analysis in Support of the Prescription

The target stand reflects not only what is planned for the future but also what is expected immediately after treatment. The target stand represents optimum conditions to strive for through management.

Four types of silvicultural treatments are proposed for the project area: individual tree selection, understory reduction, regeneration harvest and density management. Individual operational inventory (O.I.) units have been grouped under one of these categories based on the proposed treatment.

1. Density Management (DM)

The O.I. units proposed for this treatment are listed in the marking guidelines.

a. Present Conditions

Stand densities are high, with the number of trees per acre above the long term carrying capacity of the site. In the forest stands identified for this type of treatment, the average relative density is 88 percent. At relative density levels greater than 55 percent, the following tree and stand changes begin to occur: competition-related mortality becomes significant, sensitivity to the effects of drought increases, self thinning starts, growth declines, volume growth per acre is offset by mortality, and the susceptibility of trees to insect and disease attack increases. The tree species composition of these stands is a mixture of Douglas-fir and minor amounts of ponderosa pine and sugar pine. Hardwood species include madrone and black oak.

b. Target Stand - Density Management (DM)

The main objective within these stands is to improve individual tree and stand health. Harvesting within these units will be targeted toward reducing the stocking levels within those areas where overstocked conditions of sapling, pole, and mature timber exists. Density levels will be reduced by removing the suppressed crown class trees and increasing the spacing of the intermediate and dominant/codominant crown classes. Remaining trees will have crown ratios greater than 35 percent and will be the better formed trees. Ponderosa pine, sugar pine, incense-cedar, and Douglas-fir will make up the preferred leave species. Large (>20″ DBH) healthy ponderosa and sugar pine will be favored over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35 percent, needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. The residual crown closure of these stands will range within 40-60 percent.

Large (>12″ DBH), healthy hardwoods (madrone and black oak) will remain as a scattered stand component. Removal of competing trees will provide the necessary top light required for the continue growth of these trees.

Survey and manage species may occur within the stands. Where sites do occur, sites will be buffered and protected. These buffer patches will provide for additional within-stand structural diversity.

All stage 1 and 2 snags >20″ DBH will remain for wildlife, future coarse woody debris, and structural diversity. To provide structural habitat and to maintain the existing microenvironment, trees immediately surrounding these stand components would be left.

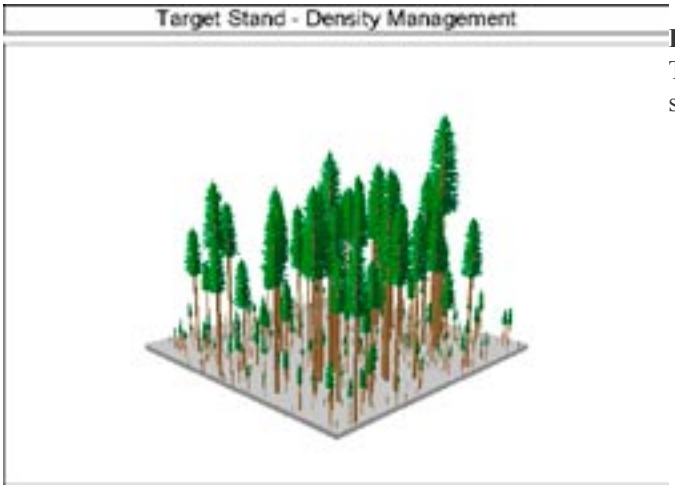


Figure 2. Stand structure following density management. This is a visual reference only; results will vary from stand to stand (McGaughey 2004).

Table A-2. Density Management	
Year	**Treatment**
0	Harvest • Thin from below first, removing the suppressed component of the stand, followed by the thinning of the main canopy to reduce densities and to remove any trees that are insect or disease infected or otherwise declining (based upon crown ratio and form). In designated stands, healthy conifer trees less than 8″ DBH that are not in competition with healthy trees larger than 8″ DBH will be thinned at an approximate 14′ spacing (space off of existing leave trees). Madrone clumps would be cut or girdled to the largest stem, when not in direct competition with residual conifers. • Residual stocking will range from a relative density of 35-50+ and crown closures of 40-60%. • Favored leave species are ponderosa pine, sugar pine, incense-cedar, and Douglas-fir. • Reserve ponderosa and sugar pine >20″ DBH, to maintain genetic and structural diversity. • Use existing and widely spaced skid trails and directional falling to reduce impacts to the site and residual stands. • Reserve the largest hardwoods 12″DBH or greater, 2-4 per acre. • Heavy slash concentrations will be hand piled. • Slash all sprung, severely damaged, spindly crowned, low crown ratio (<40%) conifers and hardwoods between 1 to 7″ DBH.
10-20	Conduct stand exam to assess stand conditions. Evaluate the health of the stand for excess tree mortality, reduced radial growth and condition of large ponderosa and sugar pine to assure presence in the stands. A second thinning entry would likely occur to maintain tree vigor and species diversity.
20-50	Assess the stands for current objectives. Possible additional partial cut entries or regeneration harvest may be necessary.

2. Regeneration Harvest (RH)

Two different regeneration silvicultural methods will be implemented: Structural Retention and Modified Even-aged. The target stand conditions for each of these methods are the same, except for the number of trees >20″ DBH that are left. Listed below is the number of trees > 20″ DBH to be left:

- Structural Retention - 16-25 trees per acre > 20″ DBH
- Modified Even-aged - 6-8 trees per acre > 20″ DBH.

The O.I. units proposed for these treatments are listed in the marking guidelines.

a. Present Conditions

Most of these forest stands have been tractor logged in the past. Selective harvesting was the primary silvicultural method applied. This resulted in stands developing multiple tree canopy layers. The overstory tree component is declining due to high stand density levels, root pathogens, and tree senescence. Overstory tree species are primarily Douglas-fir with lesser amounts of white fir; the minor species include sugar pine, incense-cedar and ponderosa pine.

The shrub species present across most of these units consists of Oregon grape (dwarf and piper's), deerbrush ceanothus, hazel, oceanspray and vine maple (common in the higher elevations). In most units, shrub cover is low to moderate, occurring in patches or as a scattered vegetative component. Hardwood species include madrone, and black oak. Generally, the hardwoods are widely scattered or occur in small clumps and are a minor compositional component of the stands.

Natural regeneration (seedlings and saplings) of Douglas-fir, incense-cedar, and a lesser amount of white fir is present in most of these units, with density levels varying from stand to stand.

b. Target Stand

The minimum number of remaining large (>20″ DBH), overstory green trees will vary from 6-25 trees per acre. Douglas-fir, sugar pine, ponderosa pine, incense-cedar, and hardwood species will be the preferred leave species. In areas of laminated

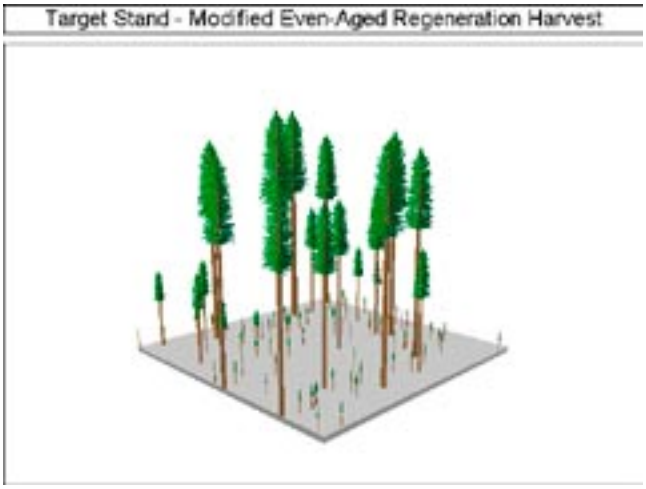
root rot, healthy co-dominant and dominant ponderosa pine, sugar pine, incense cedar and hardwood species would be favored over Douglas-fir when available. Leave trees will be the largest, full-crowned, healthy trees.

Preharvest snags would remain and additional healthy or cull green trees >20″ DBH, will be reserved if needed to meet the required 1-2 wildlife snags per acre, or to meet coarse woody debris requirements. Two to four large (>12″ DBH) hardwoods will be reserved per acre for wildlife and stand diversity. Tree form (height and crown condition) will determine which hardwoods to leave.

Survey and manage species may occur within the stands. Where sites do occur; sites will be buffered and protected, these buffer patches will provide for additional within stand structural diversity.

To prepare nonstocked sites for tree planting, logging slash, severed shrubs, and regeneration with poor crowns will be piled and burned. Piling will be accomplished by hand or excavator. Excavator piling will occur where side slopes are <30 percent. To promote species diversity within these units where planting is required, a mixture of Douglas-fir, resistant sugar pine, ponderosa pine, and incense-cedar will be planted following site preparation activities. Plant approximately 300-500 trees per acre. Species mix will be approximately Douglas-fir 70 percent, sugar or ponderosa pine 20 percent, and incense-cedar 10 percent.

Figures 3 and 4. Stand structure following structural retention and modified even-aged regeneration harvest.
These illustrations are a visual reference only; results will vary from stand to stand.



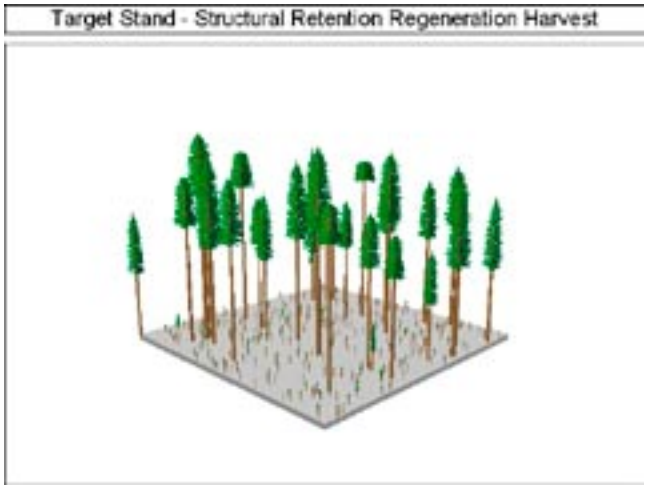


Table A-3. Regeneration Harvest	
Year	**Treatment**
0	Harvest • Leave target number of green conifer trees per acre >20″DBH and all vigorous ponderosa pine, incense cedar, sugar pine, and hardwoods 8-20″ DBH. • Leave a minimum of 1.8 snags/acre (stage 1 and 2) and 120 linear feet coarse woody debris (decay class 1 and 2, 16″ x 16′). • Use widely spaced designated skid trails, directional falling, and log length skidding to reduce site impacts. Site preparation • Slash trees (1-6″ DBH) damaged from logging activities. Leave all healthy, unmerchantable trees. • Brush and hardwoods are to be treated either by excavator removal or slashing. • Excavator or hand pile brush and slash and burn. Limit piling of logging slash to pieces < 16″ DBH. Rip skid trails.
0-1	Plant with a mix of ponderosa pine, Douglas-fir, sugar pine, and incense-cedar. Apply appropriate maintenance (vexar tubing, mulching, shading, scalping, baiting) treatments to insure planting success.
1	Conduct 1st year survival survey. Assess need for supplemental planting or additional maintenance treatment.
3	Conduct 3rd year survey. Assess need for replanting and/or additional maintenance needs.
5	Conduct 5th year stocking survey. Target stand will have a minimum of 280 well-spaced trees per acre. Competing vegetation has been controlled and trees are growing rapidly.
10	Precommercial thin the understory if more than 400 trees per acre. Favor pine species, Douglas-fir, and incense-cedar. Favor ponderosa pine, sugar pine, and incense-cedar over Douglas-fir and white fir in laminated root rot areas. Thin to approximately 300 trees per acre.
35	Trees average 10″ DBH. Commercial thin if stand density is appropriate. Otherwise, delay until crown closure and competition reduces growth rates. Thin to approximately 200 trees per acre.
45-80	Commercial thin if appropriate. Favor leaving the pines, Douglas-fir, and incense-cedar.
100+	Assess stand and watershed conditions for possible regeneration harvest.

3. Selective Cut (SC)

The O.I. units proposed for this treatment is listed in the marking guidelines.

a. Present condition

In the stands recommended for selective cut, a large percentage of the trees have good crown ratios and vigor. A smaller percentage of the trees are showing symptoms of decline (poor crown ratios, chlorotic thinning foliage, or crown form is declining). Competition between trees for limited site resources is intense as stand densities are high. The average relative density for these stands is 92 percent. Past logging activities have created small canopy gaps resulting in stands with a variable stand structure. The tree species composition is a mixture of predominantly Douglas-fir with lesser amounts of ponderosa pine, sugar pine, incense cedar, black oak, and madrone.

b. Target stand

Following the harvest entry, these stands are composed of healthy trees of all species and diameter classes. Large, healthy ponderosa pines have been retained to insure their continued presence in the stand. Species composition is dominated by Douglas-fir, followed by smaller amounts of ponderosa pine, sugar pine, incense-cedar, and large hardwoods. Vertical and

biological diversity is present through the retention of trees of all ages and size classes. Survey and manage species may occur within the stands. Where sites do occur, patches of less than one acre will be buffered and protected. These patches will provide for additional within-stand structural diversity. The estimated range of canopy closure is between 40-60 percent. Coarse woody debris is present and provides conditions favorable for nutrient recycling, soil mychorrizae, and the development of nitrogen fixing bacteria. Cull trees have been left to insure that a near-term "pulse" of CWD and snags will be available. Large (>12″ DBH), healthy hardwoods (madrone and black oak) will remain as a scattered stand component. Removal of competing trees will provide the necessary top light required for the continue growth of these trees.

Figure 5. Stand structure following a selective cut.
This is a visual reference only; results will vary from stand to stand.

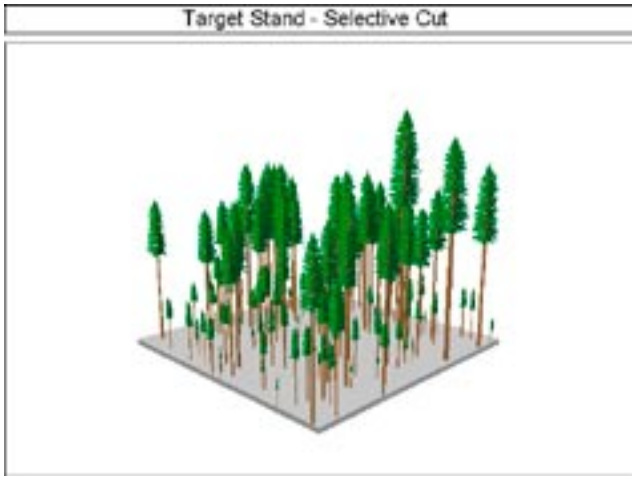


Table A-4. Selective Cut

Year	Treatment
0	Initial harvest • Reduce stand densities by marking risk trees in all diameter classes; do not mark *any* trees 50″ DBH or greater. • Use tree vigor, as defined by crown form and crown condition, as the primary factor to determine risk trees. • Thin even-aged pockets where appropriate. • Use widely spaced designated skid trails, directional falling, and log length skidding to reduce site impacts. • Treat logging slash by lopping and scattering heavy slash concentrations. • Slash all sprung or severely damaged conifers and hardwoods from 1-6″ DBH.
10-20	Conduct stand exam to assess stand conditions and to determine if any additional management treatments are needed.

IV. Monitoring

Implementation of the standard and guidelines in the Record of Decision (ROD) and management direction contained within the Medford District Resource Management Plan and Final Environmental Impact Statement (RMP/FEIS) requires a monitoring system to insure effective on-the-ground results. The ROD states the following: "Monitoring is an essential component of natural resource management because it provides information on the relative success of management strategies. The implementation of these standards and guidelines will be monitored to ensure that management actions are meeting the objectives of the prescribed standards and guidelines, and that they will comply with laws and management policy. Monitoring will provide information to determine if the standards and guidelines are being followed (implementation monitoring), verify if they are achieving the desired results (effectiveness monitoring), and determine if underlying assumptions are sound (validation monitoring). Some effectiveness and most validation monitoring will be accomplished by formal research."

Monitoring of the proposed actions will follow the outline in the Medford District RMP/EIS, Volume II, Appendices 147-163. Monitoring will be specific to the land allocations and resources affected in the West Evans Creek Watershed.

Monitoring should:

- Detect changes in ecological systems from both individual and cumulative management actions and natural events,
- Provide a basis for natural resources policy decisions,
- Provide standardized data,
- Compile information systematically,
- Link overall information management strategies for consistent implementation,
- Ensure prompt analysis and application of data in the adaptive management process, and
- Distribute results in a timely manner.

Monitoring begins with resource assessment and data collection which describes the existing conditions prior to management actions. Data collection is in the form of sampling which provides a representative description of the proposed treatment area. Stand exams were completed in the proposed sale area. Stand information was collected, using a comprehensive stand exam process. Within stands, a systematic sampling grid was used to establish plot centers. From the plot centers, a variable plot and two nested fixed plots were used to record tree and site data.

This information is then used in a BLM stand exam program that provides a variety of analysis reports. These reports provide a description of stand characteristics and a detailed assessment of stand conditions and health.
Post harvest monitoring can then be implemented, using the pre-harvest stand information to determine if the objectives have been met.

Silviculture References

Bradford, K.J. and T.C. Hsiao 1982. Physiological responses to moderate water stress. In *Encyclopedia of Plant Physiology, Vol.12B*. Edited by O.L. Lange, P.S. Nobel, C.B. Osmond, and H. Zeigler. Springer-Verlag, Berlin. pp 265-364.

Hann, D.W. and J.A. Scrivani 1987. Dominant-Height-Growth and site index equations for Douglas-fir and ponderosa pine in southwest Oregon. Research Bulletin 59. College of Forestry, Oregon State University.

Hann, D.W. and C.H.Wang, 1990. Mortality equations for individual trees in the mixed conifer zone of southwest Oregon. Forest Research Lab, Research Bulletin 67. Oregon State University, Corvallis, Oregon.

Kramer,P.J. and J.W. Kozlowski 1979. *Physiology of Woody Plants* Academic Press, Orlando Florida. pp 610 and 678.

McGaughey, R. J. 2004. *Stand Visualization System, Version 3.3*. USDA Forest Service. Pacific Northwest Research Station. 141 pp.

Perry, D.A. 1994. *Forest Ecosystems* The Johns Hopkins University Press, Baltimore and London. p. 256.

Table A-5. Slick Sand Marking Guidelines - Summary of Treatment Objectives
• To reduce density levels toward the carrying capacity of the site. In second growth stands, to thin from below to redistribute growth to vigorous dominant and co-dominant trees. In selectively cut stands, remove low vigor trees across all diameter classes to reduce inter-tree competition while maintaining or promoting the development of large healthy trees and multiple canopy layers. • To maintain healthy ponderosa pine and sugar pine as a stand and landscape component. • Maintain approximately 40-60% canopy closure in all density management, understory thinning, and selectively cut stands. This range of canopy closure will minimize canopy openings, the growth of understory brush, maintain connectivity, and provide a variety of plant and animal habitat across the landscape. • To regenerate stands with declining growth rates or deteriorating conditions and to prepare units for seedling establishment and growth by providing suitable site conditions for planting. Within treatment areas, retain coarse woody debris, snags, and large green conifers for long-term site productivity and biological legacies.

Density Management (DM)

1. Density reduction and the retention of approximately 40-60 percent canopy closure are the primary objectives for these stands. Thin from below in second growth stands/clumps. Low vigor codominant or dominant trees may be removed for density reduction and if tree vigor is lower than adjacent trees.
   - Stocking will be reduced to a relative density of 35 percent with the average residual basal area of treated stands between 120 to 160 square feet per acre. Spacing will vary from 17 to 25 tpa, dependent upon tree diameter and vigor. See Table A-5 for the target basal area for each stand.
   - Leave dominant and codominant trees with the best crown ratios.
   - Favor healthy ponderosa pine, sugar pine, Douglas-fir, and incense-cedar over white fir.
   - Large (>20″ DBH) healthy ponderosa and sugar pine should be favored over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35 percent, needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns characterized by a ragged appearance as well as foliage which is bunchy and of poor color should be removed, do **not** retain.
   - In stands with moderate to high amounts of understory trees less than 8″ DBH, release healthy residual trees 8″ DBH by slashing all trees 7″ DBH and less underneath the dripline. Between the released conifers, smaller and less vigorous trees between 1 and 7″ DBH should be thinned. On north or east aspects, thin to approximately 14-16′ x 14-16′ spacing. On south or west facing slopes, thin to an 18-20′ x 18-20′ spacing. The spacing criteria is a “rough″ guideline; the most important detail is that the retained conifers 7″ and less have at least a 35 percent crown ratio, full crown, dark green foliage, a minimum of 3-4″ leader growth, and a straight bole. Leave species in order of preference are sugar pine, ponderosa pine, Douglas-fir, incense cedar, white fir, and knobcone pine. Conifers less than 2′ in height would not be treated. Unless needed to meet stocking/spacing requirements, all madrone less than 7″ DBH would be slashed and madrone from 8-12″ would be girdled. Minor species, such as Pacific yew, black oak, big leaf maple and alder, would be reserved.
2. Leave all large fire remnant trees >50″ DBH, regardless of condition.
3. Leave all snags (stages 1-5).

Table A-6. Target Basal Areas for Alternatives 2, 3, and 4

Operations Inventory	Unit Number	Target Basal Area (ft^2/acre)		Operations Inventory	Unit Number	Target Basal Area (ft^2/acre)
33S-3W-7 OI 015	7-1	130		33S-3W-20 OI 001	20-2, 21-1	140
33S-3W-8 OI 014	8-1, 8-2	160		33S-3W-21 OI 007	20-2, 21-1	120
33S-3W-17 OI 005	17-2, 17-3	150		33S-3W-31 OI 002	31-1	120
33S-3W-17 OI 026	17-1	140		33S-3W-33 OI 002	33-1	130
33S-3W-17 OI 024	20-2	130		34S-4W-1 OI 001	1-1	140
33S-3W-19 OI 021	19-2	140				

Density Management (DM)

NOTE: The stand data provided below is not absolute, rather it is an estimate based upon sampling. It is intended to provide a general description/measure of stand density, composition, and structure. The recommendations for the treatment of logging slash and trees<8″ DBH may change following post harvest surveys.

RD-Relative Density; BA-Basal Area; PCT-Precommercial Thin

33S-3W-7 OI 015

Trees/acre <8″ DBH: 806
Trees/acre >8″ DBH: 148
Basal Area: 199 sq. ft.
Canopy Closure: 100%
Aspect: West
Relative Density Index: .83

Laminated root rot is affecting Douglas-fir and white fir on the flat portion of the OI. When available, favor healthy pine species and incense cedar in this area and throughout the stand. To the east in this unit the topography changes from relatively flat to sloping terrain; no root rot was noted in this area.

Prescription: DM; RD 35% (BA 140 sq. ft.); PCT <8″ DBH; Hand Pile and Burn.

33S-3W-8 OI 014

Trees/acre <8″ DBH: 434
Trees/acre >8″ DBH: 69
Basal Area: 271 sq. ft.
Canopy Closure: 100%
Aspect: East
Relative Density Index: .93

A variable stand with scattered individual and small pockets of large diameter trees intermixed with second growth Douglas-fir and madrone. The crown form and condition of the predominant trees is generally good.

Prescription: DM; RD 35% (BA 140 sq. ft.); Reduce densities by thinning even-aged clumps and by removing overstory trees with risk characteristics; PCT <8″ DBH; Hand Pile and Burn.

33S-3W-17 OI 005

Trees/acre <8″ DBH: 458
Trees/acre >8″ DBH: 119
Basal Area: 286 sq. ft.
Canopy Closure: 100%

Aspect: South
Relative Density Index: 1.0

Even-aged stand dominated by Douglas-fir.

Prescription: DM; RD 35% (BA 140 sq. ft.); PCT <8″ DBH; Hand Pile and Burn.

33S-3W-17 OI 026
Trees/acre <8″ DBH: 947
Trees/acre >8″ DBH: 57
Basal Area: 178 sq. ft.
Canopy Closure: 100%
Aspect: West
Relative Density Index: .76

The area adjacent to the southern boundary has basal areas of 200 to 260 sq. ft., with knobcone representing 20-40 sq. ft. basal area. Reduce stand densities by thinning the 8-16″ DBH class, leaving dominant overstory trees with good crown ratios and form.

Prescription: DM; RD 35% (BA 140 sq. ft.); PCT <8″ DBH; Hand Pile and Burn.

33S-3W-17 OI 024
Trees/acre <8″ DBH: 0
Trees/acre >8″ DBH: 251
Basal Area: 320 sq. ft.
Canopy Closure: 100%
Aspect: Southwest
Relative Density Index: .93

Closed canopy, even-aged Douglas-fir stand. Understory vegetation and large CWD is minimal.

Prescription: DM; RD 35% (BA 140 sq. ft.); Lop and Scatter.

33S-3W-19 OI 021
Trees/acre <8″ DBH: 1,626
Trees/acre >8″ DBH: 227
Basal Area: 378 sq. ft.
Canopy Closure: 100%
Aspect: Southwest
Relative Density Index: 1.0

Hardwoods and knobcone pine make up about 20% of the basal area in this stand. The remaining 80% consists of Douglas-fir of varying diameter classes.

Prescription: DM; RD 35% (BA 140 sq. ft.); PCT <8″ DBH; Hand Pile and Burn.

33S-3W-20 OI 001
Trees/acre <8″ DBH: 198
Trees/acre >8″ DBH: 149
Basal Area: 272 sq. ft.
Canopy Closure: 100%
Aspect: West
Relative Density Index: .87

Closed canopy, even-aged stand Douglas-fir stand with minimal understory vegetation or large CWD. East of the section line into section 21, the timber type changes from even-aged Douglas-fir to a stand with well distributed large madrone, Douglas-fir of variable size classes, and widely scattered predominant (50″ DBH+) Douglas-fir.

Prescription: DM; RD 35% (BA 140 sq. ft.); Lop and Scatter.

33S-3W-21 OI 007
Trees/acre <8″ DBH: 783
Trees/acre >8″ DBH: 113
Basal Area: 268 sq. ft.

Canopy Closure: 100%
Aspect: West
Relative Density Index: 1.0

Knobcone pine, madrone and chinquapin are common throughout this stand and account for about 40% of the basal area.

Prescription: DM; RD 35% (BA 140 sq. ft.); PCT <8″ DBH; Hand Pile and Burn

33S-3W-31 OI 002
Trees/acre <8″ DBH: 471
Trees/acre >8″ DBH: 122
Basal Area: 206 sq. ft.
Canopy Closure: 100%
Aspect: East
Relative Density Index: .78

The topography within this stand is dissected. Knobcone pine is a common stand component. 70-year old Douglas-fir 8-20″ DBH is intermixed. 1-2 large (50″ DBH) Douglas-fir and ponderosa pine occur per acre as widely scattered overstory trees.

Prescription: DM; RD 35% (BA 140 sq. ft.); PCT <8″ DBH; Hand Pile and Burn.

33S-3W-33 OI 002
Trees/acre <8″ DBH: 198
Trees/acre >8″ DBH: 183
Basal Area: 210 sq. ft.
Canopy Closure: 100%
Aspect: West
Relative Density Index: .69

A marginal commercial stand, with Douglas-fir 8-14″ DBH the primary size classes that would be thinned.

Prescription: DM; RD 35% (BA 140 sq. ft.); Girdle hardwoods <8″ DBH; Lop and Scatter.

Selection Harvest

1. Reducing stand densities, removing low vigor trees and retaining approximately 40-60% canopy closure, are the primary objectives for these stands.
   - Dependent upon the spatial arrangement of low vigor trees, canopy closure will vary across the stand.
   - Tree selection criteria should be based upon the retention of the desired basal area with tree vigor (risk factors) used as the primary aid in determining individual trees to mark. Refer to the attached low vigor and high risk of mortality guidelines. Ideally, trees selected for removal should be proportional to their presence within the stand, although this will not always be possible. For example, if the size class distribution within a stand is 70% of the trees are 8-20″ DBH, 20% of the trees are 20-32″ DBH and 10% of the trees are 32″DBH or greater, then the majority of the trees selected would be in the 8-20″ DBH size class with lesser amounts marked in the 20-32″ DBH size class and even fewer marked in the 32″ DBH or greater size class.
   - The average residual basal area of treated stands will range between 130 to 180 square feet per acre. See below for the approximate residual basal area for each stand.
   - Clumpiness of residual trees is okay; meeting the target basal area is more important than meeting a spacing requirement. Spatial and structural variability is a desired stand condition.
   - In stands with moderate to high amounts of understory trees less than 8″ DBH, release healthy residual trees 8″ DBH by slashing all trees 7″ DBH and less underneath the dripline. Between the released conifers, smaller and less vigorous trees from 1-7″ DBH should be thinned. On north or east aspects, thin to approximately 14-16′ x 14-16′ spacing and on south or west facing slopes, thin to an 18-20′ x 18-20′ spacing. The spacing criteria is a “rough” guideline; the most important detail is that the retained conifers 7″ DBH and less have at least a 35% crown ratio, full crown, dark green foliage, a minimum of 3-4″ leader growth, and a straight bole. Leave species in order of preference are sugar pine, ponderosa pine, Douglas-fir, incense-cedar, white fir, and knobcone pine. Conifers less than 2′ in height would not be treated. Unless needed to meet stocking/spacing requirements, all madrone less than 7″ DBH would be slashed, madrone between 8 to 12″ DBH would be girdled. Minor species, such as Pacific yew, black oak, big leaf maple and alder, would be reserved.
2. Trees will be marked across all diameter classes. Minimize marking trees greater than 40″ DBH and do not mark *any* trees

50″ DBH or greater, regardless of condition.

3. Favor drought and fire-tolerant tree species, such as ponderosa pine, incense-cedar, Douglas-fir, and sugar pine.
4. Large (>20″ DBH) healthy ponderosa and sugar pine should be favored over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35%, needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns characterized by a ragged appearance, as well as foliage which is bunchy and of poor color should be removed; do not retain.
5. Leave all snags, stages 1-5. When available, leave green trees (any diameter) immediately adjacent to snags greater than 20″ DBH. These trees will provide additional structural and habitat diversity.
6. Leave all CWD, decay classes 1-5. When available, leave green trees (any diameter) immediately surrounding large (>20″ DBH and 8′ in length) pieces of CWD. Retention of green trees would minimize CWD disturbance and maintain the functional integrity of the CWD.
7. Minimize the marking of large (>20″ DBH), broken, fork top, and deformed trees. Retain for plant and animal habitat, as well as future sources of coarse woody debris and snags.

Table A-7. Selection Harvest

Operations Inventory	Unit Number	Basal Area (sq. ft.)	Operations Inventory	Unit Number	Target Basal Area (sq. ft.)
Alternative 2					
No selection harvest units.					
Alternative 3					
32S-4W-35 OI 023B	35-5	170	33S-3W-19 OI 001	19-1	140
32S-4W-35 OI 023D	35-3	180	33S-3W-20 OI 002	20-1, 20-3	140
33S-4W-1 OI 001	1-1, 1-2, 1-3, 1-7, 1-8	140	33S-3W-29 OI 019	29-3	140
33S-4W-1 OI 001	1-4,1-5	140	33S-3W-32 OI 002	32-1	150
33S-4W-1 OI 001C	1-6	150			
Alternative 4					
33S-4W-1 OI 001	1-2, 1-3, 1-7, 1-8	140	33S-4W-13 OI 006	13-1	150
33S-4W-1 OI 001	1-4, 1-5	140	33S-3W-17 OI 018	17-5, 17-6, 17-7	140
33S-4W-1 OI 001	1-6	150	33S-3W-29 OI 019	29-3	140

32S-4W-35 OI 023B
Trees/acre <8″ DBH: 458
Trees/acre >8″ DBH: 62
Basal Area: 240 sq. ft.
Canopy Closure: 100%
Aspect: Southeast
Relative Density Index: .85

This part of OI 023 is south of OI 023A and follows a topography change from relatively flat to moderate slopes; tree condition is variable.

Prescription: Selection Harvest, removing highest risk; PCT <8″ DBH; Hand Pile and Burn.

32S-4W-35 OI 023D
Trees/acre <8″ DBH: 19
Trees/acre >8″ DBH: 83
Basal Area: 313 sq. ft.
Canopy Closure: 96%
Aspect: SE

Relative Density Index: .77

This part of the OI is located south of the middle riparian reserve. The stand is characterized by greater structural diversity and occasional pockets of sapling and pole sized trees that are intermixed with large overstory trees. Some of these overstory trees have risk characteristics. In the southwestern portion, OIs 023 and 024 overlap. Within this area, the stand type changes. The overstory Douglas-fir is scattered and declining and the understory is smaller sapling and pole-size Douglas-fir, with canyon live oak throughout.

Prescription: Selection Harvest, removing highest risk; Lop and Scatter. In southwestern area PCT<8″ DBH and slash brush; Hand Pile and Burn.

32S-4W-35 OI 023G
Trees/acre <8″ DBH: 642
Trees/acre >8″ DBH: 83
Basal Area: 244 sq. ft.
Canopy Closure: 100%
Aspect: Northeast
Relative Density Index: .97

A multi-layered stand with individual tree risk present. In the southwest corner is a small even-aged stand approximately 80 years old with an average diameter of 18″ DBH. Surface gravel is common with wind throw along the western boundary adjacent to the ridgeline.

Prescription: Selection Harvest, removing highest risk; PCT <8″ DBH; Hand Pile and Burn.

33S-4W-1 OI 001A
Trees/acre <8″ DBH: 892
Trees/acre >8″ DBH: 80
Basal Area: 230 sq. ft.
Canopy Closure: 100%
Aspect: South and East
Relative Density Index: .94

Risk mark poor vigor trees.

Prescription: Selection Harvest, removing highest risk; PCT <8″ DBH; Hand Pile and Burn.

33S-4W-1 OI 001B
Trees/acre <8″ DBH: 677
Trees/acre >8″ DBH: 94
Basal Area: 238 sq. ft.
Canopy Closure: 100%
Aspect: Southeast
Relative Density Index: .92

Rocky surface with scattered overstory Douglas-fir with risk. IC/DF/MAD/CLO are present in the understory.

Prescription: Selection Harvest, removing highest risk; PCT <8″ DBH; Hand Pile and Burn.

33S-4W-1 OI 001C
Trees/acre <8″ DBH: 793
Trees/acre >8″ DBH: 109
Basal Area: 291 sq. ft.
Canopy Closure: 100%
Aspect: Southeast
Relative Density Index: 1.0

A multi-storied canopy with widely scattered predominant trees. Crown ratio, form, and condition is generally good. Tree risk is highest on dry ridgelines.

Prescription: Selection Harvest, removing highest risk; PCT <8″ DBH; Hand Pile and Burn.

33S-3W-19 OI 001
Trees/acre <8″ DBH: 1388
Trees/acre >8″ DBH: 38
Basal Area: 230 sq. ft.
Canopy Closure: 100%
Aspect: East
Relative Density Index: .92
Prescription: Selection Harvest, removing high risk trees; PCT pockets <8″ DBH; Hand Pile and Burn.

33S-3W-20 OI 002
Trees/acre <8″ DBH: 1,192
Trees/acre >8″ DBH: 52
Basal Area: 277 sq. ft.
Canopy Closure: 100
Aspect: S & E
Relative Density Index: 1.0

The condition of the overstory trees is variable; some have good crown ratios and form whereas others have low vigor characteristics. Understory reproduction occurs randomly and in pockets, with varying levels of tree vigor ranging from spindly tree form to releasable conifers with 4-5 " of leader growth. Leave large trees with conks for CWD, structural diversity, and wildlife.

Prescription: Selection Harvest, removing high risk trees; Thin pockets and PCT <8″ DBH; Hand Pile and Burn.

33S-3W-29 OI 019
Trees/acre <8″ DBH: 189
Trees/acre >8″ DBH: 55
Basal Area: 237 sq. ft.
Canopy Closure: 100%
Aspect:
Relative Density Index: .73

A mutli-layered stand with madrone comprising approximately 40% of the species mix.

Prescription: Selection Harvest, removing high risk trees; Girdle hardwoods <12″ DBH; Lop and Scatter.

33S-3W-32 OI 002
Trees/acre <8″ DBH: 742
Trees/acre >8″ DBH: 52
Basal Area: 230 sq. ft.
Canopy Closure: 100%
Aspect: Northwest
Relative Density Index: .90

The majority of this stand has been buffered for a riparian reserve leaving a strip between the riparian reserve and the ridgeline on the south side of the OI. On the west end of this strip, a small thinning pocket is present, the rest of the area to the northeast has scattered risk.

Prescription: Selection Harvest, remove high risk trees; Thin even-aged pockets; PCT <8″ DBH; Hand Pile and Burn.

Modified even-aged – Regeneration Harvest (RH)

The minimum requirements are:

1. 1.8 wildlife trees/acre.
2. 120 linear feet of CWD.
3. 6-8 green conifers/acre, >20″ DBH (proportionally representing the total range of tree sizes >20″ DBH). These are minimum levels; where additional healthy green trees are available they should be left. Determination of leave and take trees should be based upon tree vigor (live crown ratio and crown form), as opposed to the strict implementation of the 6-8 leave tree guideline. Let tree condition dictate where and how many trees are left. Leave trees should have the following attributes: a). Low susceptibility to wind, snow, and ice damage, measured by a height to diameter ratio of 70 or below; b). Crown ratio >35% with a healthy crown, dark foliage, and dense needles; c). Disease free; and d). Favor healthy seral species, ponderosa pine, sugar pine, incense cedar, where possible.
4. All healthy ponderosa pine, Douglas-fir, incense-cedar, sugar pine, and hardwoods regardless of size should be left (<1″-20″DBH). These trees should have the following attributes: a). crown ratios 35%, b). healthy foliage, and c). disease and insect free.
5. Retain all large hardwoods >12″ DBH.
6. Units do not have to be uniform in appearance; diversity and patchiness is desirable.

Table A-8. Modified Even-aged Regeneration Harvest

Operations Inventory	Unit Number
Alternative 2	
32S-4W-35 OI 023	35-3, 35-6, 35-7, 35-8
33S-4W-1 OI 001	1-2, 1-3, 1-4, 1-7, 1-8, 1-9, 1-10
Alternatives 3 and 4	
No modified even-aged regeneration harvest units.	

Structural Retention – Regeneration Harvest

The minimum requirements are:

1. 1.8 wildlife trees/acre.
2. 120 linear feet of CWD.
3. 16-25 green conifers/acre, >20″ DBH (proportionally representing the total range of tree sizes >20″ DBH). These are minimum levels; where additional healthy green trees are available they should be left. Determination of leave and take trees should be based upon tree/crown vigor, as opposed to the strict implementation of the 16-25 trees per acre leave tree guideline. Let tree condition dictate where and how many trees are left. Leave trees should have the following attributes: a). Low susceptibility to wind, snow, and ice damage, measured by a height to diameter ratio of 70 or below; b). Crown ratio >35% with a healthy crown, dark foliage, and dense needles; c). Disease free (specifically mistletoe-free Douglas-fir); and d). Favor healthy seral species, ponderosa pine, sugar pine, incense-cedar, where possible.
4. All healthy ponderosa pine, Douglas-fir, incense-cedar, sugar pine, and hardwoods regardless of size should be left (<1″-20″DBH). These trees should have the following attributes: a). Crown ratios 35%, b). Healthy foliage, and c). Disease and insect free.
5. Healthy residual trees should be released by slashing all trees 7″DBH and less underneath the dripline. Between the released conifers, smaller and less vigorous trees from 1-7″DBH should be thinned. Conifers from 1-7″DBH would be thinned to an approximate 14-16′ x 14-16′ spacing in stands located on north or east aspects and 18-20′ x 18-20′ spacing in stands located on south or west aspects. The spacing criteria is a “rough” guideline; the most important detail is that the retained conifers 7″DBH and less have at least a 35% crown ratio, full crown, dark green foliage, and a straight bole. Leave species in order of preference are: sugar pine, ponderosa pine, Douglas-fir, incense-cedar, white fir, and knobcone pine. Conifers less than 2′ in height would not be treated. Unless needed to meet stocking/spacing requirements, all madrone less than 7″DBH would be slashed and madrone from 8-12″DBH would be girdled. Minor species, such as Pacific yew, black oak, big leaf maple and alder, would be reserved.
6. Retain all large hardwoods >12″DBH.

7. Crown vigor should be the deciding factor for marking a tree, not tree diameter.
8. Units do not have to be uniform in appearance; diversity and patchiness is desirable.

Table A-9. Structural Retention – Regeneration Harvest

Operations Inventory	Unit Number
Alternative 2	
32S-4W-35 OI 023	35-1, 35-2, 35-6, 35-7
33S-4W-1 OI 001	1-5, 1-6
33S-4W-13 OI 006	13-1
33S-3W-17 OI 014	17-4
33S-3W-17 OI 018	17-5, 17-6, 17-7
33S-3W-17 OI 022	17-8, 17-9, 17-10
33S-3W-18 OI 002	18-1
33S-3W-19 OI 001	19-1
33S-3W-20 OI 001	20-1
33S-3W-29 OI 019	29-3
33S-3W-32 OI 002	32-1
Alternative 3	
32S-4W-35 OI 023	35-1, 35-2, 35-4
33S-3W-17 OI 014	17-4, 17-8, 17-9, 17-10
33S-3W-17 OI 018	17-5, 17-6
33S-3W-17 OI 022	17-8, 17-9, 17-10
33S-4W-13 OI 006	13-1
Alternative 4	
No Structural Retention Regeneration Units	

32S-4W-35 OI 023A
Trees/acre <8″ DBH: 390
Trees/acre >8″ DBH: 81
Basal Area: 317 sq. ft.
Canopy Closure: 99%
Aspect: Southeast
Relative Density Index: 1.0

This unit is on the southeast side of the watershed break between the Butte Falls Resource Area and the Glendale Resource Area. On the northwest side of the ridge line is a 10-year old clearcut that has altered the microclimate and wind flow patterns. The overstory trees within this area have thinning crowns, poor crown ratios, and tops that have experienced wind breakage.

Prescription: SGFMA regeneration harvest leaving 16-25 TPA >20″DBH; Excavator pile and burn.

33S-4W-13 OI 006
Trees/acre <8″ DBH: 1,631
Trees/acre >8″ DBH: 76
Basal Area: 315 sq. ft.
Canopy Closure: 100%
Aspect: North
Relative Density Index: 1.0

North-facing slope with a mix of size classes and stand structures.

33S-3W-17 OI 014
Trees/acre <8″ DBH: 1,291
Trees/acre >8″ DBH: 56
Basal Area: 386 sq. ft.
Canopy Closure: 100
Aspect: Southwest
Relative Density Index: 1.0

Narrow south facing unit; on the west side is a riparian reserve and on the east side is a ridgeline. Tree vigor is variable.

33S-3W-17 OI 018
Trees/acre <8″ DBH: 1,942
Trees/acre >8″ DBH: 56
Basal Area: 214 sq. ft.
Canopy Closure: 100%
Aspect: South
Relative Density Index: 1.0

Trees exhibiting risk characteristics are throughout the OI. The species mix of trees greater than 8″DBH in order of abundance are hardwoods (48%), Douglas-fir (30%), white fir (13%), knobcone pine (4%), incense-cedar (3%), and ponderosa pine (2%).

33S-3W-17 OI 022
Trees/acre <8″ DBH: 2,090
Trees/acre >8″ DBH: 81
Basal Area: 223 sq. ft.
Canopy Closure: 100%
Aspect: East, South, and West
Relative Density Index: 1.0

This OI is dissected by three riparian reserve buffers leaving three small pieces of matrix lands, ranging in size from 3 to 6 acres. The condition of the overstory trees is variable with risk common

Relative Density and Risk Guidelines

Estimate the average diameter of potential leave trees and determine the desired spacing in feet by referring to the table below. Follow the basal area and spacing table as closely as possible. Once the area has been marked verify the leave basal area using a relaskop or prism, adjust basal area as necessary. As the average diameter changes, spacing will also change holding stand density constant.

Table A-10. Leave Tree Basal Area and Spacing by Relative Density and DBH

Average DBH	Basal Area (sq. ft.)	Spacing
Relative Density - 35%		
8″	99	12′ x 12′
10″	111	15′ x 15′
12″	121	17′ x 17′
14″	131	19′ x 19′
16″	140	21′ x 21′
18″	148	23′ x 23′
20″	157	25′ x 25′
22″	164	26′ x 26′
24″	171	28′ x 28′
26″	178	30′ x 30′
28″	185	32′ x 32′
30″	191	33′ x 33′
Relative Density - 40%		
8″	113	12′ x 12′
10″	126	14′ x 14′
12″	139	16′ x 16′
14″	150	18′ x 18′
16″	160	20′ x 20′
18″	170	21′ x 21′
20″	179	23′ x 23′
22″	188	25′ x 25′
24″	196	26′ x 26′
26″	204	28′ x 28′
28″	212	30′ x 30′
30″	219	31′ x 31′

Characteristics of low vigor trees

1. Low vigor trees
   a. Low vigor ponderosa pine trees meet the following criteria:
      - Crowns are ragged and thin.
      - Foliage in parts of crown thin bunchy, or unhealthy, needles average to shorter than average in length.
      - Needle color poor to fair.
      - Some twigs or branches lack foliage and some twigs or branches are fading or dead.
      - Localized weaken parts of crowns present.
      - Crown top is rounded, and the crown width is narrow or flat on one or more sides.

   b. Low vigor Douglas-fir and white fir trees meet the following criteria:
      - Crown has thin appearance when viewed against the sky.
      - Short needle length.

- Needle color very poor, yellowish.
- Dead or dying twigs or branches in the crown forming holes, sparse and ragged crown appearance.
- Poor crown ratio.
- Mistletoe infected.

c. Trees affected by root rot have the following visual characteristics:
- Groups of trees affected with trees showing variable levels of decline.
- Trees have reduced height growth; look at top of trees for reduced increment growth.
- Yellow foliage; decline of the crown is from the top to the bottom.
- Distress cone crop.
- Bark beetles sometimes present because of the stressed trees.
- Windthrow trees common; wood at the base of the downed trees is soft and stringy or has begun to delaminate.

2. Insect infested trees
   a. Douglas-fir and white fir trees undergoing attack from Douglas-fir bark beetle, as identified by red boring dust present in bark crevices or on the ground near the base of the tree. Foliage is thinning and yellowish in appearance. Borers typically begin their attack in the top of the tree, and then may spread to the lower bole. Pitch streamers may also be present on the mid to upper bole.

   b. Ponderosa pine trees undergoing current attack from western pine beetle or red turpentine beetle. Pitch tubes should contain reddish/brown granular frass. Pitch tubes clear in color indicate the tree has been successful in expelling the beetle, these trees should not be marked if otherwise healthy.

All snags and coarse woody debris will be maintained as they presently occur; snags that are a safety hazard *may be felled but will be left on-site.*

Table A-11. Harvest Treatments, Logging Systems, and Post-Harvest Fuels Treatments by Alternative

OI Number	Unit	Acres	Alternative 2			Alternative 3			Alternative 4		
			Harvest Treatment	Logging System	Fuels	Harvest Treatment	Logging System	Fuels	Harvest Treatment	Logging System	Fuels
T32S, R4W, Section 35											
023	35-1	7.0	SGFMA	Tractor	1						
023	35-2	1.9	SGFMA	Cable	7	SGFMA	Cable	7			
023	35-2	14.6	SGFMA	Cable	7	Select	Helicopter	4			
023	35-2	11.6	SGFMA	Cable	7						
023	35-2	7.6	SGFMA	Cable	7	SGFMA	Cable	7			
023	35-2	11.1	SGFMA	Cable	7	Select	Cable	4			
023	35-3	2.1	NGFMA	Cable	7	Select	Helicopter	4			
023	35-3	10.4	NGFMA	Cable	7						
024	35-5	6.6	DM	Helicopter	3						
023	35-6	2.1	NGFMA	Helicopter	2						
023	35-6	2.8	SGFMA	Helicopter	2						
023	35-7	6.7	NGFMA	Helicopter	2						
023	35-7	2.0	SGFMA	Tractor	1						
023	35-8	10.4	NGFMA	Tractor	1						
T33S, R3W, Section 17											
001	17-1	23.0	DM	Helicopter	4	DM	Helicopter	4	DM	Helicopter	4
022	17-10	5.6	SGFMA	Cable	8	SGFMA	Cable	2			
005	17-2	5.6	DM	Cable	4	DM	Cable	4	DM	Cable	4
005	17-3	0.3	DM	Tractor	4	DM	Tractor	4	DM	Tractor	4
014	17-4	4.9	SGFMA	Helicopter	2	SGFMA	Helicopter	2			
018	17-4	0.4	SGFMA	Cable	2		Cable	10		Cable	10
018	17-5	7.3	SGFMA	Cable	2	SGFMA	Cable	2	Select	Cable	4
018	17-6	7.7	SGFMA	Helicopter	2	SGFMA	Helicopter	2	Select	Helicopter	4
027	17-7	2.5	SGFMA	Cable	8	Select	Cable	3	Select	Cable	3
022	17-8	3.0	SGFMA	Cable	8	SGFMA	Cable	8			
022	17-9	3.0	SGFMA	Cable	8	SGFMA	Cable	8			
024	20-2	6.6	DM	Cable	5	DM	Cable	5	DM	Cable	5

Table A-11. Harvest Treatments, Logging Systems, and Post-Harvest Fuels Treatments by Alternative

OI Number	Unit	Acres	Alternative 2			Alternative 3			Alternative 4		
			Harvest Treatment	Logging System	Fuels Treatment	Harvest Treatment	Logging System	Fuels Treatment	Harvest Treatment	Logging System	Fuels Treatment
T33S, R3W, Section 18											
007	18-1	8.9	SGFMA	Cable	8		Cable	10		Cable	10
T33S, R3W, Section 19											
002	19-1	18.2	SGFMA	Cable	8	Select	Cable	8			10
001	19-2	10.8	DM	Helicopter	4	DM	Helicopter	4	DM	Helicopter	4
021	19-2	8.6	DM	Helicopter	4	DM	Helicopter	4	DM	Helicopter	4
002	WS PTS	4.4	Progeny	Small Tractor	5	Progeny	Small Tractor	5	Progeny	Small Tractor	5
T33S, R3W, Section 20											
002	17-8	1.4	SGFMA	Cable	2	Select	Cable	4			
002	20-1	7.2	SGFMA	Tractor	1	Select	Tractor	4			
001	20-2	19.0	DM	Cable	3	DM	Cable	3	DM	Cable	3
024	21-1	0.3	DM	Tractor	3	DM	Tractor	4	DM	Tractor	4
001	21-1	3.9	DM	Tractor	4	DM	Tractor	3	DM	Tractor	3
T33S, R3W, Section 21											
06/07	21-1	5.7	DM	Tractor	6	DM	Tractor	6	DM	Tractor	6
007	20-2	5.8	DM	Cable	4	DM	Cable	4	DM	Cable	4
T33S, R3W, Section 29											
010	29-1	0.9	SGFMA	Helicopter	2	SGFMA	Helicopter	2	Select	Helicopter	2
010	29-2	2.7	SGFMA	Helicopter	2	SGFMA	Helicopter	2	Select	Helicopter	2
019	29-3	4.9	SGFMA	Helicopter	2	Select	Helicopter	2	Select	Helicopter	2
T33S, R3W, Section 31											
002	31-1	4.6	DM	Helicopter	4	DM	Helicopter	4	DM	Helicopter	4
002	31-1	3.6		Helicopter	10	RR_DM	Helicopter				10
T33S, R3W, Section 32											
002	32-1	6.0	SGFMA	Helicopter	2	Select	Helicopter	4			
002	32-1	1.8	SGFMA	Helicopter	2	Select	Helicopter	4			
T33S, R3W, Section 33											
02/04	33-1	22.3	DM	Helicopter	4	DM	Helicopter	4	DM	Helicopter	4
002	SB PTS	8.0	Progeny	Small Tractor		Progeny	Small Tractor		Progeny	Small Tractor	

Table A-11. Harvest Treatments, Logging Systems, and Post-Harvest Fuels Treatments by Alternative

OI Number	Unit	Acres	Alternative 2			Alternative 3			Alternative 4		
			Harvest Treatment	Logging System	Fuels Treatment	Harvest Treatment	Logging System	Fuels Treatment	Harvest Treatment	Logging System	Fuels Treatment
T33S, R3W, Section 7											
015	7-1	11.4	DM	Cable	4	DM	Cable	4	DM	Cable	4
T33S, R3W, Section 8											
014	8-1	15.6	DM	Helicopter	4	DM	Helicopter	4	DM	Helicopter	4
013	17-1	2.4	DM	Helicopter	4	DM	Helicopter	4	DM	Helicopter	4
014		6.1		Helicopter		RR_DM	Helicopter				
014		10.3		Helicopter							
T33S, R4W, Section 1											
001	1-1	3.2	DM	Cable	3	DM	Cable	3	DM	Cable	3
001	1-2	9.2	NGFMA	Cable	2						
001	1-3	1.9	NGFMA	Helicopter	2						
001	1-3	1.5	NGFMA	Helicopter	2	Select	Helicopter	4	Select	Helicopter	4
001	1-4	1.6	NGFMA	Cable	2	Select	Cable	4	Select	Cable	4
001	1-5	2.5	SGFMA	Tractor	1	Select	Tractor	6	Select	Tractor	6
001	1-6	6.8	SGFMA	Cable	2	Select	Cable	4	Select	Cable	4
001	1-7	2.7	NGFMA	Tractor	1	Select	Tractor	6	Select	Tractor	6
001	1-8	0.4	NGFMA	Cable	2	Select	Cable	4	Select	Cable	4
001	1-8	0.8	NGFMA	Cable	2						
001	1-9	3.2	NGFMA	Tractor	1	Select	Tractor	6	Select	Tractor	6
001	1-9	5.2	NGFMA	Tractor	1						
001	1-10	5.3	NGFMA	Cable	2	Select	Cable	4	Select	Cable	4
001	1-10	4.1	NGFMA	Cable	2						
T33S, R4W, Section 13											
	13-1	6.4	SGFMA	Cable	8	SGFMA	Cable	8	Select	Cable	4

Fuels Treatments
1 - Slash damaged residuals 1-6″, excavator pile and burn
2 - Slash damaged residuals 1-6″, hand pile and burn
3 - Lop and Scatter
4 - PCT 1-7″, Hand pile and burn
5 - Hand pile and burn
6 - PCT 1-7″, Excavator pile and burn
7 - Slash damaged residuals 1-6″, slash hardwoods 1-7″, hand pile and burn
8 - Slash damaged residuals 1-6″, underburn
10 - Fuels Density Management Treatment

Appendix B

Soil

Soil Types present in the Slick Sand Project Area

Lettia Sandy Loam (104E, 105E)

The Lettia sandy loam is a deep, well-drained soil located on hillslopes ranging from 12 to 35 percent. It is formed in colluvium and residuum derived from granitic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about two inches thick. The surface layer is dark brown sandy loam about 3 inches thick. The next layer is brown and reddish-brown loam about 11 inches thick. The upper 12 inches of the subsoil is a red clay loam and the lower 29 inches is red loam. Weathered bedrock is at a depth of about 55 inches with a range of bedrock from 40 to 60 inches. In some areas, the surface layer is a clay loam. Permeability is moderately slow and available water capacity is about eight8 inches.

Norling-Acker Complex (134F)

The Norling-Acker Complex is located on south slopes ranging from 35 to 55 percent.

The Norling soil is a moderately deep, well-drained soil. It is formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about two inches thick. The surface layer is brown, very gravelly loam about five inches thick. The next layer is brown, gravelly clay loam about five inches thick. The upper 12 inches of the subsoil is yellowish-brown, gravelly clay loam. The lower seven inches is yellowish-brown, very cobbly clay loam. Weathered bedrock is at a depth of about 29 inches with the depth to bedrock ranging from 20 to 40 inches. In some areas, the surface area is stony. Permeability is moderate and available water capacity is about four inches.

The Acker soil is very deep and well-drained which formed in colluvium derived dominantly from metamorphic rock. The surface is typically covered with needles, leaves, and twigs about four inches thick. The surface layer is brown gravelly loam about eight inches thick. The next layer is yellowish-brown gravelly clay loam about nine inches thick. The upper 11 inches of the subsoil is yellowish red gravelly clay loam. The lower 32 inches is strong brown gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas, the surface layer is stony. Permeability is moderately slow and available water capacity is about seven inches.

Steinmetz Sandy Loam (180G, 181G)

The Steinmetz sandy loam is very deep, somewhat excessively drained soil located on hillslopes ranging from 35 to 75 percent slopes. This soil formed in colluvium derived from granitic rock. Typically, the surface layer is covered with a layer of needles and twigs about one inch thick. The surface is very dark grayish-brown and brown sandy loam about 13 inches thick. The subsoil to a depth of 60 inches is dark yellowish-brown and brown sandy loam. The depth to bedrock is 60 inches or more. Permeability is moderately rapid in the Steinmetz soil and available water capacity is about 6 inches.

Tethrick Sandy Loam (193G, 194G)

The Tethrick sandy loam is very deep, well drained soil located on hillslopes ranging from 35 to 75 percent slopes. This soil formed in colluvium derived from granitic rock. Typically, the surface layer is covered with a layer of needles, leaves, and twigs about one inch thick. The surface layer is dark grayish brown and brown sandy loam about 10 inches thick. The subsoil is yellowish brown and very pale brown sandy loam about 39 inches thick. The substratum to a depth of 60 inches is very pale brown sandy loam. The depth to bedrock is 60 inches or more. Permeability is moderate in the Tethrick soil and available water capacity is about six inches.

Wolfpeak Sandy Loam (201E)

The Wolfpeak sandy loam is very deep, well drained soil located on hillslopes ranging from 12 to 35 percent south slopes. It formed in colluvium and residuum derived from granitic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about ½ inch thick. The surface layer is dark brown sandy loam about seven inches thick. The subsoil to a depth of

60 inches is yellowish brown and strong brown clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is a clay loam. Permeability is moderately slow in the Wolfpeak soil and available water capacity is about 8 inches.

Acker-Dumont Complex (3E, 4E)

The Acker-Dumont Complex is located on hillslopes ranging from 12 to 35 percent.

The Acker soil is a very deep and well-drained soil. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of leaves, needles, and twigs about 4 inches thick. The surface layer is brown gravelly loam about eight inches thick. The next layer is yellowish-brown, gravelly clay loam about nine inches thick. The upper 11 inches of the subsoil is yellowish-red gravelly clay loam. The lower 32 inches is strong brown gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony. Permeability in the Acker soil is moderately slow and available water capacity is about seven inches.

The Dumont soil is very deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about one inch thick. The surface layer is dark reddish brown gravelly clay loam about four inches thick. The next layer is dark reddish brown clay loam about 11 inches thick. The upper 36 inches of the subsoil is yellowish red clay. The lower nine inches is yellowish-red clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony. Permeability is moderately slow in the Dumont soil and available water capacity is about nine inches. The Dumont soil is subject to slumping.

Acker-Norling Complex (5F)

The Acker-Norling complex is 35 to 55 percent north slopes.

The Acker soil is very deep and well-drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of leaves, needles, and twigs about four inches thick. The surface layer is brown gravelly loam about eight inches thick. The next layer is yellowish brown gravelly clay loam about nine inches thick. The upper 11 inches of the subsoil is yellowish red gravelly clay loam. The lower 32 inches is strong brown gravelly clay loam. The depth to bedrock is 60 inches or more. In some areas the surface layer is stony. Permeability in the Acker soil is moderately slow and available water capacity is about seven inches.

The Norling soil is a moderately deep and well-drained soil which formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about two inches thick. The surface layer is brown very gravelly loam about five inches thick. The next layer is brown gravelly clay loam about five inches thick. The upper 12 inches of the subsoil is yellowish brown gravelly clay loam. The lower seven inches is yellowish-brown very cobbly clay loam. Weathered bedrock is at a depth of about 29 inches with the depth to bedrock ranging from 20 to 40 inches. In some areas, the surface area is stony. Permeability is moderate and available water capacity is about four inches.

Goolaway Silt Loam (72E, 72F)

The Goolaway silt loam is a moderately deep, well drained soil located on hillslopes ranging from 20 to 35 percent. It formed in colluvium derived dominantly from schist. Typically, the surface is covered with a layer of needles, leaves, and twigs about two inches thick. The surface layer is very dark grayish-brown silt loam about three inches thick. The next layer is dark grayish-brown silt loam about eight inches thick. The subsoil is olive gray and olive silt loam about 18 inches thick. Weathered bedrock is at a depth of about 29 inches. The depth to bedrock ranges from 20 to 40 inches. Permeability is moderate in the Goolaway soil and available water capacity is about six inches.

Kanid-Atring Very Gravelly Loams (94G, 95G)

The Kanid-Atring very gravelly loams are located on hillslopes ranging from 50 to 80 percent.

The Kanid soil is deep and well-drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about one inch thick. The surface layer is dark brown and brown very gravelly loam about 18 inches thick. The subsoil is yellowish-brown and light olive brown very gravelly clay loam about 29 inches thick. Weathered bedrock is at a depth of about 47 inches. The depth to bedrock ranges from 40 to 60 inches. In some areas the surface layer is stony. Permeability is moderately rapid in the Kanid soil. Available water capacity is at about four inches.

The Atring soil is moderately deep and well-drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about one inch thick. The surface layer is very dark brown, very gravelly loam about seven inches thick. The subsoil is brown and yellowish brown very gravelly loam about 33 inches thick. Weathered bedrock is at a depth of about 40 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony. Permeability is moderately rapid in the Atring soil. Available water capacity is about three inches.

Table B-1. Metamorphic Soils (Tractor Harvest on Slopes less than 35%)

		Alternative 2			Alternative 3			Alternative 4			Soil
OI	Acres	Unit	Treatment	System	Unit	Treatment	System	Unit	Treatment	System	Type
T32S, R4W, Section 35											
023	7.6	35-2	SGFMA	Cable	35-2	SGFMA	Cable	35-2	Select	Cable	134F
023	9.2	35-2	SGFMA	Cable	35-5	Select	Cable	35-2	Select	Cable	134F
023	1.8	35-2	SGFMA	Cable	35-4	SGFMA	Cable	35-4	Select	Cable	134F
023	0.6	35-2	SGFMA	Cable	35-3	Select	Helicopter	35-5	Select	Helicopter	134F
023	6.9	35-2	SGFMA	Cable	35-3	Select	Helicopter	35-5	Select	Helicopter	134F
023	0.2	35-3	NGFMA	Cable	35-3	Select	Helicopter	35-5	Select	Helicopter	134F
023	8.5	35-2	SGFMA	Cable							134F
023	8.3	35-3	NGFMA	Cable							134F
023	0.6	35-2	SGFMA	Cable							5F
023	0.3	35-3	NGFMA	Cable							5F
023	0.5	35-2	SGFMA	Cable	35-5	Select	Cable	35-2	Select	Cable	95G
023	0.1	35-2	SGFMA	Cable	35-4	SGFMA	Cable	35-4	Select	Cable	95G
023	1.3	35-2	SGFMA	Cable	35-5	Select	Cable	35-2	Select	Cable	95G
023	7.1	35-2	SGFMA	Cable	35-3	Select	Helicopter	35-5	Select	Helicopter	95G
023	1.9	35-3	NGFMA	Cable	35-3	Select	Helicopter	35-5	Select	Helicopter	95G
023	2.5	35-2	SGFMA	Cable							95G
023	1.7	35-3	NGFMA	Cable							95G
023	4.9	35-7	NGFMA	Helicopter							134F
023	0.0	35-6	NGFMA	Helicopter							3E
023	1.9	35-7	NGFMA	Helicopter							4E
023	2.8	35-6	SGFMA	Helicopter							5F
024	6.6	35-5	DM	Helicopter							5F
023	2.1	35-6	NGFMA	Helicopter							5F
023	7.0	35-1	SGFMA	Tractor	35-1	SGFMA	Tractor	35-1	Select	Tractor	134F
023	2.9	35-8	NGFMA	Tractor							3E
023	2.8	35-8	NGFMA	Tractor							4E
023	4.7	35-8	NGFMA	Tractor							5F
023	2.0	35-7	SGFMA	Tractor							5F
Total acres	96.8										
T33S, R4W, Section 1											
001	2.8	1-1	DM	Cable	1-1	DM	Cable	1-1	DM	Cable	134F
001	9.2	1-2	NGFMA	Cable							134F
001	0.6	1-4	NGFMA	Cable	1-4	Select	Cable	1-4	Select	Cable	134F
001	0.2	1-1	DM	Cable	1-1	DM	Cable	1-1	DM	Cable	4E
001	5.3	1-10	NGFMA	Cable	1-8	Select	Cable	1-8	Select	Cable	4E
001	3.7	1-10	NGFMA	Cable					Out		4E
001	0.4	1-8	NGFMA	Cable	1-9	Select	Cable	1-9	Select	Cable	4E

Table B-1. Metamorphic Soils (Tractor Harvest on Slopes less than 35%)

OI	Acres	Alternative 2			Alternative 3			Alternative 4			Soil Type
		Unit	Treatment	System	Unit	Treatment	System	Unit	Treatment	System	
001	0.8	1-8	NGFMA	Cable							4E
001	1.0	1-4	NGFMA	Cable	1-4	Select	Cable	1-4	Select	Cable	4E
001	5.3	1-6	SGFMA	Cable	1-6	Select	Cable	1-6	Select	Cable	4E
001	0.2	1-1	DM	Cable	1-1	DM	Cable	1-1	DM	Cable	94G
001	1.9	1-3	NGFMA	Helicopter					Out		134F
001	0.8	1-3	NGFMA	Helicopter	1-3	Select	Helicopter	1-3	Select	Helicopter	134F
001	0.6	1-3	NGFMA	Helicopter	1-3	Select	Helicopter	1-3	Select	Helicopter	4E
001	0.9	1-7	NGFMA	Tractor	1-2	Select	Tractor	1-2	Select	Tractor	134F
001	3.2	1-9	NGFMA	Tractor	1-7	Select	Tractor	1-7	Select	Tractor	4E
001	5.2	1-9	NGFMA	Tractor					Out		4E
001	1.9	1-7	NGFMA	Tractor	1-2	Select	Tractor	1-2	Select	Tractor	4E
001	2.5	1-5	SGFMA	Tractor	1-5	Select	Tractor	1-5	Select	Tractor	4E
Total acres	46.5										

DM – Density Management
SGFMA – Southern General Forest Management Area/Regeneration Harvest
NGFMA – Northern General Forest Management Area/Regeneration Harvest
Select – Selection Harvest

Table B-2. Fragile Soils (Tractor harvest on slopes less than 20%)

OI #	Acres	Alternative 2			Alternative 3			Alternative 4			Soil Type
		Unit	Treatment	System	Unit	Treatment	System	Unit	Treatment	System	
Schist Soils											
T33S, R3W, Section 33											
02/04	2.7	33-1	DM	Helicopter	33-1	DM	Helicopter	33-1	DM	Helicopter	72E
02/04	18.6	33-1	DM	Helicopter	33-1	DM	Helicopter	33-1	DM	Helicopter	72F
002	6.1	SB_ PTS	Progeny/ Thin	Small Tractor	SB_ PTS	Progeny/ Thin	Small Tractor	SB_ PTS	Progeny/ Thin	Small Tractor	72E
002	0.9	SB_ PTS	Progeny/ Thin	Small Tractor	SB_ PTS	Progeny/ Thin	Small Tractor	SB_ PTS	Progeny/ Thin	Small Tractor	72F
Total acres	28.3										
Granitic Soils											
T33S, R3W, Section 17											
024	4.2	20-2	DM	Cable	20-2	DM	Cable	20-2	DM	Cable	104E
005	1.6	17-2	DM	Cable	17-2	DM	Cable	17-2	DM	Cable	105E
024	0.1	20-2	DM	Cable	20-2	DM	Cable	20-2	DM	Cable	105E
018	0.4	17-4	SGFMA	Cable		out	Cable		out	Cable	180G
018	2.0	17-5	SGFMA	Cable	17-5	SGFMA	Cable	17-5	Select	Cable	180G
005	4.0	17-2	DM	Cable	17-2	DM	Cable	17-2	DM	Cable	181G
018	5.3	17-5	SGFMA	Cable	17-5	SGFMA	Cable	17-5	Select	Cable	181G
027	2.5	17-7	SGFMA	Cable	17-7	SELECT	Cable	17-7	Select	Cable	181G
022	4.9	17-10	SGFMA	Cable	17-10	SGFMA	Cable	17-10	Select	Cable	181G
024	0.0	20-2	DM	Cable	20-2	DM	Cable	20-2	DM	Cable	181G
024	2.3	20-2	DM	Cable	20-2	DM	Cable	20-2	DM	Cable	194G
022	3.0	17-9	SGFMA	Cable	17-9	SGFMA	Cable	17-8	Select	Cable	201E

Table B-2. Fragile Soils (Tractor harvest on slopes less than 20%)

		Alternative 2			Alternative 3			Alternative 4			
OI #	Acres	Unit	Treatment	System	Unit	Treatment	System	Unit	Treatment	System	Soil Type
022	3.0	17-8	SGFMA	Cable	17-8	SGFMA	Cable	17-8	Select	Cable	201E
022	0.7	17-10	SGFMA	Cable	17-10	SGFMA	Cable	17-10	Select	Cable	201E
001	6.0	17-1	DM	Helicopter	17-1	DM	Helicopter	17-1	DM	Helicopter	180G
014	1.4	17-4	SGFMA	Helicopter	17-4	SGFMA	Helicopter	17-4	Select	Helicopter	180G
018	5.4	17-6	SGFMA	Helicopter	17-6	SGFMA	Helicopter	17-6	Select	Helicopter	180G
001	16.9	17-1	DM	Helicopter	17-1	DM	Helicopter	17-1	DM	Helicopter	181G
014	3.5	17-4	SGFMA	Helicopter	17-4	SGFMA	Helicopter	17-4	Select	Helicopter	181G
018	2.4	17-6	SGFMA	Helicopter	17-6	SGFMA	Helicopter	17-6	Select	Helicopter	181G
005	0.3	17-3	DM	Tractor	17-3	DM	Tractor	17-3	DM	Tractor	105E
005	0.0	17-3	DM	Tractor	17-3	DM	Tractor	17-3	DM	Tractor	181G
Total acres	69.9										
T33S, R3W, Section 18											
007	3.7	18-1	SGFMA	Cable			Cable			Cable	180G
007	3.2	18-1	SGFMA	Cable			Cable			Cable	194G
007	0.1	18-1	SGFMA	Cable			Cable			Cable	194G
007	1.9	18-1	SGFMA	Cable			Cable			Cable	201E
007	0.0	18-1	SGFMA	Cable			Cable			Cable	201E
Total acres	8.9										
T33S, R3W, Section 19											
002	8.8	19-1	SGFMA	Cable	19-1	SGFMA	Cable	19-1	Select	Cable	194G
002	1.1	19-1	SGFMA	Cable	19-1	SGFMA	Cable	19-1	Select	Cable	201E
002	8.4	19-1	SGFMA	Cable	19-1	SGFMA	Cable	19-1	Select	Cable	201E
001	0.0	19-2	DM	Helicopter	19-2	DM	Helicopter	19-2	DM	Helicopter	193G
001	0.1	19-2	DM	Helicopter	19-2	DM	Helicopter	19-2	DM	Helicopter	193G
001	10.7	19-2	DM	Helicopter	19-2	DM	Helicopter	19-2	DM	Helicopter	194G
021	5.8	19-2	DM	Helicopter	19-2	DM	Helicopter	19-2	DM	Helicopter	194G
021	2.9	19-2	DM	Helicopter	19-2	DM	Helicopter	19-2	DM	Helicopter	201E
002	4.4	WS_ PTS	Progeny/ Thin	Small Tractor	WS_ PTS	Progeny/ Thin	Small Tractor	WS_ PTS	Progeny/ Thin	Small Tractor	201E
Total acres	42.2										
T33S, R3W, Section 20											
001	1.7	20-2	DM	Cable	20-2	Cable	Cable	20-2	DM	Cable	104E
001	0.0	20-2	DM	Cable	20-2	Cable	Cable	20-2	DM	Cable	193G
001	14.3	20-2	DM	Cable	20-2	Cable	Cable	20-2	DM	Cable	194G
002	1.4	17-8	SGFMA	Cable	20-3	Cable	Cable	17-8	Select	Cable	201E
001	3.0	20-2	DM	Cable	20-2	Cable	Cable	20-2	DM	Cable	201E
024	0.3	21-1	DM	Tractor	21-1	DM	Tractor	21-1	DM	Tractor	104E
001	1.3	21-1	DM	Tractor	21-1	DM	Tractor	21-1	DM	Tractor	104E
001	0.0	21-1	DM	Tractor	21-1	DM	Tractor	21-1	DM	Tractor	194G
002	7.2	20-1	SGFMA/ Regen	Tractor	20-1	Select	Tractor	20-1	SELECT	Tractor	201E
001	2.7	21-1	DM	Tractor	21-1	DM	Tractor	21-1	DM	Tractor	201E
Total acres	31.9										

Table B-2. Fragile Soils (Tractor harvest on slopes less than 20%)											
		Alternative 2			Alternative 3			Alternative 4			
OI #	Acres	Unit	Treatment	System	Unit	Treatment	System	Unit	Treatment	System	Soil Type
T33S, R3W, Section 21											
007	0.3	20-2	DM	Cable	20-2	DM	Cable	20-2	DM	Cable	194G
007	0.1	20-2	DM	Cable	20-2	DM	Cable	20-2	DM	Cable	194G
007	0.6	20-2	DM	Cable	20-2	DM	Cable	20-2	DM	Cable	194G
007	4.8	20-2	DM	Cable	20-2	DM	Cable	20-2	DM	Cable	201E
06/07	0.1	21-1	DM	Tractor	21-1	DM	Tractor	21-1	DM	Tractor	104E
06/07	0.0	21-1	DM	Tractor	21-1	DM	Tractor	21-1	DM	Tractor	194G
06/07	5.6	21-1	DM	Tractor	21-1	DM	Tractor	21-1	DM	Tractor	201E
Total acres	11.5										
T33S, R3W, Section 29											
019	0.3	29-3	SGFMA	Helicopter	29-3	Select	Helicopter	29-3	Select	Helicopter	193G
010	0.8	29-1	SGFMA	Helicopter	29-1	SGFMA	Helicopter	29-1	Select	Helicopter	194G
010	0.9	29-2	SGFMA	Helicopter	29-2	SGFMA	Helicopter	29-2	Select	Helicopter	194G
019	0.6	29-3	SGFMA	Helicopter	29-3	Select	Helicopter	29-3	Select	Helicopter	194G
019	2.1	29-3	SGFMA	Helicopter	29-3	Select	Helicopter	29-3	Select	Helicopter	194G
010	1.9	29-2	SGFMA	Helicopter	29-2	SGFMA	Helicopter	29-2	Select	Helicopter	201E
010	0.1	29-1	SGFMA	Helicopter	29-1	SGFMA	Helicopter	29-1	Select	Helicopter	201E
019	1.8	29-3	SGFMA	Helicopter	29-3	Select	Helicopter	29-3	Select	Helicopter	201E
Total acres	8.5										
T33S, R3W, Section 31											
002	0.1	31-1	DM	Helicopter	31-1	DM	Helicopter	31-1	DM	Helicopter	194G
002	4.5	31-1	DM	Helicopter	31-1	DM	Helicopter	31-1	DM	Helicopter	201E
002	3.6				31-1	DM	Helicopter	31-1	DM	Helicopter	201E
Total acres	8.2										
T33S, R3W, Section 32											
002	6.0	32-1	SGFMA	Helicopter	32-1	Select	Helicopter	32-1	Select	Helicopter	193G
002	0.7	32-1	SGFMA	Helicopter	32-1	Select	Helicopter	32-1	Select	Helicopter	193G
002	1.2	32-1	SGFMA	Helicopter	32-1	Select	Helicopter	32-1	Select	Helicopter	201E
Total acres	7.9										
T33S, R3W, Section 33											
02/04	0.0	33-1	DM	Helicopter	33-1	DM	Helicopter	33-1	DM	Helicopter	193G
02/04	0.9	33-1	DM	Helicopter	33-1	DM	Helicopter	33-1	DM	Helicopter	193G
002	1.1	SB_ PTS	Progeny/ Thin	Small Tractor	SB_ PTS	Progeny/ Thin	Small Tractor	SB_ PTS	Progeny/ Thin	Small Tractor	201E
Total acres	2.0										
T33S, R3W, Section 7											
015	2.7	7-1	DM	Cable	7-1	DM	Cable	7-1	DM	Cable	105E
015	8.7	7-1	DM	Cable	7-1	DM	Cable	7-1	DM	Cable	181G
Total acres	11.4										
T33S, R3W, Section 8											
014	3.7			Helicopter	8-2	DM	Helicopter	8-2	DM	Helicopter	180G
014	8.1	8-1	DM	Helicopter	8-1	DM	Helicopter	8-1	DM	Helicopter	180G
014	3.8			Helicopter	8-3	DM	Helicopter	8-3	DM	Helicopter	180G
013	2.4	17-1	DM	Helicopter	17-1	DM	Helicopter	17-1	DM	Helicopter	180G
014	2.1	8-1	DM	Helicopter	8-1	DM	Helicopter	8-1	DM	Helicopter	181G

Table B-2. Fragile Soils (Tractor harvest on slopes less than 20%)

		Alternative 2			Alternative 3			Alternative 4			
OI #	Acres	Unit	Treatment	System	Unit	Treatment	System	Unit	Treatment	System	Soil Type
014	2.4			Helicopter	8-2	DM	Helicopter	8-2	DM	Helicopter	181G
014	5.4	8-1	DM	Helicopter	8-1	DM	Helicopter	8-1	DM	Helicopter	181G
014	6.5			Helicopter	8-3	DM	Helicopter	8-3	DM	Helicopter	181G
Total acres	34.4										
T33S, R4W, Section 1											
001	0.3	1-10	NGFMA	Cable		out			out		105E
001	1.5	1-6	SGFMA	Cable	1-6	Select	Cable	1-6	Select	Cable	105E
Total acres	1.8										
T33S, R4W, Section 13											
	6.4	13-1	SGFMA	Cable		SGFMA	Cable	13-1	Select	Cable	181G

DM – Density Management
SGFMA – Southern General Forest Management Area/Regeneration Harvest
NGFMA – Northern General Forest Management Area/Regeneration Harvest
Select – Selection Harvest

Appendix C

Fuels and Air Quality

Fuels

Table C-1. Proposed Fuels Density Treatments by Seral Stage for Each Alternative					
Operations Inventory	Unit Number	Acres by Alternative			Fuels Treatment
		2	3	4	
Early Seral Stage					
33S-3W-17 OI 010	170	56	56	56	Slash, Hand Pile and Hand Pile Burn
33S-3W-17 OI 013, 011	172	17	17	17	Slash, Hand Pile and Hand Pile Burn
33S-3W-19 OI 004, 005, 013	195	27	27	27	Slash, Hand Pile and Hand Pile Burn
33S-3W-18, 19 OI 014, 022, 019, 004	197	13	13	13	Slash, Hand Pile and Hand Pile Burn
33S-3W-20 OI 012, 010	203	12	12	12	Slash, Hand Pile and Hand Pile Burn
33S-3W-21 OI 026	223	6	6	6	Slash, Hand Pile and Hand Pile Burn
Proposed Treatment Acres		**131**	**131**	**131**	
Mid-Seral Stage					
33S-3W-17 OI 004, 017, 018, 016	173	37	37	37	Slash, Hand Pile and Hand Pile Burn
33S-3W-17 OI 011	175	1	1	1	Slash, Hand Pile and Hand Pile Burn
33S-3W-17 OI 023	176	8	8	8	Slash, Hand Pile and Hand Pile Burn
33S-3W-19 OI 019, 024	194	30	30	30	Slash, Hand Pile and Hand Pile Burn
33S-3W-19 OI 23	196	6	6	6	Slash, Hand Pile and Hand Pile Burn
33S-3W-21 OI 007, 030	222	4	4	4	Slash, Hand Pile and Hand Pile Burn
33S-3W-20 OI 021	202	35	35	35	Slash, Hand Pile and Hand Pile Burn
33S-3W-29 OI 009, 012	294	10	10	10	Slash, Hand Pile and Hand Pile Burn
33S-3W-33 OI 003	333	54	54	54	Slash, Hand Pile and Hand Pile Burn
33S-3W-33 OI 009	339	75	75	75	Slash, Hand Pile and Hand Pile Burn
33S-3W-31 OI 010	310	3	0	3	Slash, Hand Pile and Hand Pile Burn
Proposed Treatment Acres		**263**	**260**	**263**	
Late Seral Stage					
33S-3W-17 OI 019, 030, 014, 018	171	74	74	75	Slash, Hand Pile and Hand Pile Burn
33S-3W-17 OI 028, 029, 032	174	7	7	7	Slash, Hand Pile and Hand Pile Burn
33S-3W-18 OI 007, 002, 017, 016	182	28	37	37	Slash, Hand Pile and Hand Pile Burn
33S-3W-19 OI 001, 018	193	33	33	44	Slash, Underburn

Table C-1. Proposed Fuels Density Treatments by Seral Stage for Each Alternative					
Operations Inventory	Unit Number	Acres by Alternative			Fuels Treatment
		2	3	4	
33S-3W-20 OI 006	204	51	51	51	Slash, Hand Pile and Hand Pile Burn
33S-3W-29 OI 002, 005, 016, 017	295	27	27	27	Slash, Hand Pile and Hand Pile Burn
Proposed Treatment Acres		**220**	**229**	**241**	
Total Acres Fuels Density Management		**614**	**620**	**635**	

Evaluation of Fuels Density and Forest Management Treatments Summary

The evaluation of fuels density and forest management treatments within the Slick Sand project area was completed using data collected through Fire Effects Monitoring and Inventory Protocol database FIREMON [Online]http://fire.org/firemon. FIREMON database and sampling protocols allow for sampling of the ecosystem characteristics directly affected by fire. Plot sizes were 0.1 acres, or 37.2′ radius, in size.

The location of each plot comprehensively represented current conditions of early, mid-, and late seral stage stands across the project area. Mature/old growth stand data was collected through forest stand exam plots. The number of plots was limited due to time constraints and available funding. A larger sample of each seral stage current condition would be recommended for future landscape projects. However limited, the sampling and data collected has provided enough information to complete a comprehensive assessment of the forest conditions and how these conditions relate to potential fire behavior activity. The data recorded for each plot included fuel loading, canopy cover, tree species, height, crown ratio and size, and understory vegetation characteristics. Each plot center location was marked and plotted for future monitoring.

The data collected was then entered into Fuels Management Analysis Plus (FMA) (http://www.fireps.com) CrownMass program. The CrownMass program does the following: (1) calculates the loading of foliage and woody biomass based on tree species, tree diameter at breast height, tree height, tree canopy ratio, and tree structural stage; (2) calculates and displays the vertical fuels profile of the tree crowns by one foot segments;(3) estimates crown fire parameters such as ceiling height, canopy base height, and canopy bulk density; and (4) calculates the potential fire behavior and effects based on fuel moistures and weather.

Weather and fuel moistures were entered into CrownMass along with timber Fuel Model 10 for mid- to late seral stage stands and brush Fuel Model 6 for early seral stage stands. The potential fire behavior activity was then calculated for pre-treatment condition of each seral stage represented. The transitions from surface to passive to active crown fires was determined based on wind speeds. A 12-year analysis of weather patterns during the fire season months of June 1 to September 30 (a 122-day period) was completed using the Evans Remote Automated Weather Station data. The analysis was accomplished using FireFamily Plus software and was based on the 90th percentile weather (high to extreme conditions). From this analysis, the number of days in which the wind blew at a certain speed was determined. This information was analyzed to determine the number of fire days specific fire activity is likely to occur based on current forest and fuels conditions (see Section 3.7, Fuels, Table 3-12).

Analysis of conditions following fuels treatments for early, mid-, and late seral stages were also completed using CROWNMASS. The inputs were generated using the treatment prescriptions identified for fuels density management under each forest condition. Again, the number of fire days associated with fire activity was calculated and summarized in Section 3.7, Fuels, Table 3-14. Post-treatment conditions for forest management activities were analyzed using late seral stage stands.

Reports and bulk density graphs were generated for each seral stage pre- and post-treatment forest conditions. Each report contains crown fuel characteristics, fire environment, fire behavior results, and the effects on the forest stands. The graphs show the critical bulk density levels necessary to provide vertical propagation of fire. This information is available for review at the Medford District BLM Office.

Air Quality

Affected Environment

In the process of treating natural and activity-related fuels, the generation of particulate pollutants can temporarily impact air quality. Current air quality and visibility conditions are not monitored within the project area. Because no permanent sources of particulate matter production exist in the project area, the air quality and visibility throughout the area is thought to be good.

Smoke from prescribed fire has the potential to affect the air quality within the project area as well as the immediate surrounding areas. The project area is not located near any communities that would be affected by smoke from prescribed fire.

Prescribed fire is a fire applied in a knowledgeable manner to forest fuels, under selected weather conditions, to accomplish management objectives.

The Medford District BLM is required to be in full compliance with the Oregon Smoke Management Plan. Prior to conducting prescribed burning activities, registration of prescribed burn locations is required. The specific location, size of the burn, fuel loadings, ignition source, time, and duration of ignition are reported prior to ignition. Advisories or restrictions are generated on a daily basis by the State Meteorologist. This information is used to determine the appropriate time to conduct the planned prescribed burn.

Prescribed burning generally occurs from mid-October to April 1. Hand pile burning is conducted when storm events are occurring or when unstable atmospheric conditions are present in order to maximize mixing and lessen smoke impacts to localized areas. In addition, all piles are covered to facilitate rapid consumption of fuels and minimize the amount of residual smoke produced. Underburning is conducted in the spring months. Burning in the spring reduces fire intensities, damage to residual trees, and consumption of large woody material. This allows for facilitation of rapid mop-up thereby reducing residual smoke impacts.

Prescribed burning is regulated by the Oregon State Forester who is authorized to coordinate the administration and operation of the Oregon Smoke Management Plan [ORS 477.515(3)(a)]. The State Forester has the authority to issue daily burning instructions and additional restrictions on prescribed burning in situations where the air quality would be adversely affected by smoke.

Environmental Consequences

Effects of Alternative 1 on Air Quality

Under Alternative 1, no prescribed burning treatments or forest management activities proposed under this EA would occur. The potential for future wildfire and the impacts of smoke from a large wildfire event would continue.

Direct and Indirect Impacts

Impacts to air quality from wildfires are closely related to the amount of biomass material (surface and ladder fuel loads) consumed and atmospheric conditions. Wildfires generally occur during the hot, dry summer months when atmospheric conditions are stable, and fuel moistures are low and readily available to burn. A high intensity wildfire with heavy fuel loading could cause a high rate of pollutant emissions.

Particulate matter (PM) and carbon monoxide are the primary pollutants of concern in smoke from both wildland and prescribed fires. Particulate matter produced from wildfires limits visibility, absorbs harmful gasses, and aggravates respiratory conditions in susceptible individuals (Sandberg, et al. 2000). Over 90 percent of the particulate matter produced is smaller than 10 microns (PM10) and 70 percent is smaller than 2.5 microns (PM2.5) (Sandberg, et al. 2000). These small particles can be most harmful to individuals because they have the ability to penetrate deep into the lungs. Carbon monoxide produced is more of a concern to firefighter health and safety when working on the fireline. Carbon monoxide becomes a concern for citizens when an inversion sets up and traps the carbon monoxide near communities. The level of exposure to firefighters and the public depends on the duration of exposure, carbon monoxide concentration, and the level of physical activity during exposure (Ottmar 2000). If a wildfire were to occur, the emissions would present health concerns to those individuals living downwind and in nearby low lying areas.

Cumulative Impacts

Evidence of impacts from past activities within the West Evans Creek Watershed is unknown. No permanent sources of particulate matter production exist within the watershed and air quality and visibility is thought to be good. Activities such as, residential wood burning, traffic exhaust, and road dust on private and public lands throughout the watershed may have had localized impacts with a short duration time.
The heaviest impacts likely occurred when stable atmospheric conditions created inversions in lower laying areas. Past wildfires, such as Pleasant Creek, Angel, Sykes, and Grave Creek, may have impacted local communities and rural residential areas during the active fire activity but have not presented any long-term impacts. Past and present prescribed burning activities on private and BLM-administered forest lands are regulated and would have had negligible impacts on air quality.

Impacts from a wildfire event would be dependent on the size, intensity, location, atmospheric conditions and duration. Emissions from a small wildfire would be localized and short in duration and impacts would be within local drainages. The potential health hazards to individuals living in the vicinity or down wind from a large intense fire could be substantial. The duration, amount, and exposure to pollutant emissions would increase, impacting human health and public welfare. This would continue until the fire was out and atmospheric conditions allowed for sufficient dispersion of the smoke.

Effects on Air Quality Common to All Action Alternatives

Proposed culvert replacement for fish passage, roadside stabilization, road projects, and pump chance renovation would have no effect on air quality.

Effects of Alternative 2 on Air Quality

Direct and Indirect Effects

Under Alternative 2, hand pile burning, excavator pile burning, landing pile burning and underburning would occur to reduce the surface fuel loading created from fuels density management and commercial logging activities.

Prescribed burning would affect air quality by the addition of carbon monoxide, Particulate Matter (PM_{10}) and Particulate Matter ($PM_{2.5}$). Hand pile, landing pile and excavator pile burning would account for less than 25 tons/acre of fuel loading, producing on average less than 725 pounds of emissions per acre. The fuel loading for the area identified for underburning is approximated at 12 to 20 tons/acre producing approximately 396 to 660 pounds of emissions. At these levels and by following the prescribed fire management guidelines in the Oregon Smoke Management Plan there would be negligible direct or indirect effects on air quality within the project areas. A large portion of particulate matter emissions from prescribed burning are “lifted” by convection into the atmosphere where they are dissipated by horizontal and downward dispersion. At distances greater than 10 miles, the air concentrations for these emissions are expected to be small (Describing Air Resource Impacts March 2000).

Prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan and the Visibility Protection Plan. Prescribed burning is not expected to effect visibility within the Crater Lake National Park and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Rogue Wilderness Areas). Prescribed burning emissions are not expected to adversely effect annual PM_{10} attainment within the Grants Pass and Medford/Ashland nonattainment areas.

The project area is approximately 22 miles from the Grants Pass nonattainment area and 18 miles from the Medford/Ashland nonattainment area. These nonattainment areas are far enough away that they would not be affected by prescribed fire activities within the project area.

Hand pile, landing pile and excavator pile burning would be scheduled primarily from October to January. Pile burning would likely take place during unstable atmospheric conditions (rain, snow, or storm events). All piles would be covered to facilitate rapid ignition and consumption of fuels to minimize residual smoke. Underburning would be scheduled for the spring months, March through the end of April. Burning in the spring reduces impacts to the soil, consumption of large woody materials and duff layer, and allows for rapid mop-up following ignition. Localized concentration of smoke may occur in adjacent drainages and low lying areas during prescribed burning operations and days immediately following burning.

Cumulative Effects

Short-term increase of particulates in the air, primarily from smoke, would be anticipated. Road construction, maintenance and decommissioning, vehicle emissions, and dust, along with silvicultural practices, also contribute slightly to the temporary degradation of air quality in the project area.

The use of prescribed fire to reduce flammability and excess levels of fuels would affect long-term forest productivity by reducing the risks and consequences of a major wildfire. The temporary impacts of smoke from prescribed fire would have minor effects on the use of forest resources, such as recreation sites and scenic resources. Long-term benefits of using prescribed fire to reduce natural fuels would more than outweigh the short-term impacts to air quality.

Effects of Alternative 3 on Air Quality

Direct and Indirect Effects

Under Alternative 3, hand pile burning, excavator pile burning, landing pile burning and underburning would occur to reduce the surface fuel loading created from fuels density management and commercial logging activities.

Effects to air quality would be the same as those listed in Alternative 2.

Cumulative Effects

The cumulative effects of Alternative 3 would be the same as those listed in Alternative 2.

Effects of Alternative 4 on Air Quality

Direct and Indirect Effects

Under Alternative 4, hand pile burning, excavator pile burning, landing pile burning, and underburning would occur to reduce the surface fuel loading created from fuels density management and commercial logging activities.

Effects to air quality would be the same as those listed in Alternative 2.

Cumulative Effects

Cumulative effects would be the same as those listed in Alternative 2.

Appendix D

Wildlife

Northern Spotted Owl Critical Habitat

The following are quotes from the Federal Register Notice (43 pages) for the designation of Critical Habitat Units for the northern spotted owl. This information is the only guidance statement available from US Fish and Wildlife Service on how these lands should be managed. It precedes the NW Forest Plan by two years.
Federal Register, 50 CFR Part 17, Vol. 57 No 10, Wed. Jan 15, 1992, pages 1796-1838.

Page 1796.
"Critical habitat is defined . . . as the specific areas . . . on which are found those physical and biological features (i) essential to the conservation of the species, and (ii) that may require special management considerations or protection."

". . . critical habitat serves to preserve options for a species eventual recovery. Critical habitat helps focus conservation activities by identifying areas that contain essential habitat features (primary constituent elements) regardless of whether or not they are currently occupied by the listed species . . ." "Aside from the added protection provided under Section 7, the Act does not provide other forms of protection to lands designated as critical habitat."

Page 1797
"Specific management recommendations for critical habitat are more appropriately addressed in recovery plans, management plans, and through section 7 consultation."

Primary Constituent Elements: "Such physical and biological features . . . include, but are not limited to, the following: space for individual and population growth, and for normal behavior; food, water, or other nutritional or physiological requirements: cover or shelter; sites for breeding, reproduction, rearing of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species."

Page 1803
"The Service's primary objective in designating critical habitat was to identify existing spotted owl habitat and to highlight specific areas where management considerations should be given highest priority to manage habitat." ". . . the Service relied upon the following principles: develop and maintain large contiguous blocks of habitat to support multiple reproducing pairs of owls; minimize fragmentation and edge effect to improve habitat quality; minimize distance to facilitate dispersal among blocks of breeding habitat; and maintain range-wide distribution of habitat to facilitate recovery."

"The definition of 'suitable habitat' was generally equivalent to the structure of Douglas-fir stands 80 or more years of age (with adjustments for local variation or condition)." "Critical habitat units minimize distance between adjacent units, thereby facilitating dispersal and linkage."

Page 1804
"Since critical habitat designation is not a management plan, there was not a limitation on the size of the area added to any HCA . . . . Primary consideration was given to existing suitable habitat and known pairs of spotted owls, particularly where the Service felt that additional protection should be considered and would enhance the existing HCA."

Page 1805
"Although the designation of critical habitat emphasizes the importance of maintaining suitable habitat for all four constituent habitat elements, nesting and roosting habitat should be emphasized to improve opportunities for successful linkage." "Not all suitable nesting and roosting habitat was included in critical habitat."

Page 1806
"The emphasis for future management will be on maintaining or developing habitat that has the characteristics of suitable nesting and roosting habitat and to avoid or reduce the adverse effects of current management practices." "The Service analyzed the economic effects of the . . . proposal to designate critical habitat."

Page 1809
"The revised proposed rule for the designation of critical habitat ... published on August 13 1991 . . . encompassed a total of approximately 8.2 million acres." "As a result of the exclusion process, the Service is designating approximately 1.4 million acres less . . . ." "The final rule . . . encompassing a total of nearly 6.9 million acres . . . 62 percent of the total originally identified in the May 6 proposal." 1.2 million acres of Bureau land.

Page 1801
"State, private, tribal, and other non-Federal lands are not designated as critical habitat even if they are physically situated within the boundaries of critical habitat units."

Page 1822
"Section 7 prohibitions against the destruction or adverse modification of critical habitat apply to actions that would impair survival and recovery of the listed species, thus providing a regulatory means of ensuring that Federal actions within critical habitat are considered in relation to the goals and recommendations of a recovery plan. As a result of the link between critical habitat and recovery, the prohibition against destruction or adverse modification of the critical habitat should provide for the protection of the critical habitat's ability to contribute fully to the species' recovery."

Table D-1. Spotted Owl History, Current Status, and Current Suitable Habitat

Site #	Site Name/ Year Designated	Monitoring History					Color Banded		Suitable Habitat (acres)	
		2000	2001	2002	2003	2004	M	F	¼ mile radius	½ mile radius
254	White Rock/ 1992	Pair; NN	Pair; NN	Pair; NN	Pair; L; (2)	Pair; L; (2)	Yes	Yes	97	195
2286	Sand Creek/ 1990	not checked	not checked	Pair (late)	M (late)	NR	Vacant Site	Vacant Site	80	186
0963	Skeleton Mountain/ 1981	NR	F	M	M	M Subadult	Yes	No Bird	62	235
4032	Slick Rock Creek/ 1993	Pair; L; (1)	Pair; L; (0)	Pair; L; (1)	Pair; NN	Pair; NN	Yes	Yes	92	257
4609	Section One Pit/ 2002	F Unknown	NR	Pair; NN	M Unknown	Pair; L; (1)	Yes	Yes	77	121
4619	Last Go Round/ 2003	–	–	–	Pair; (2)	M Unknown	M 03 04 ?	No	18	27

NN - not nesting, L - nest tree located, (#) - number of young, NR – No Response

The Sand Creek site is probably an alternate of the White Rock site. The White Rock male was detected at Sand Creek in late 2003 and the pair was probably the late season detection in 2002.

Skeleton Mountain was historically a productive site, but has only had floater singles in recent years.

Last Go Round was discovered in late July 2003. In 2004, only a lone male was heard at night in different areas during each detection.

Table D-2. Acres of Timber Harvest Units near Spotted Owl Activity Centers			
Activity Center Name	**Alternative 2**	**Alternative 3**	**Alternative 4**
¼-mile radius buffer			
Section One Pit	55.9	13.9	0
Sand Creek	0	0	0
White Rock	1.6	1.6	1.6
Slick Rock Creek	8.9	0	0
Total	66.4	15.5	1.6
½-mile radius buffer			
Section One Pit	95.5	42.9	0
Sand Creek	7.8	7.8	7.8
White Rock	15	15	8.5
Slick Rock Creek	23.6	14.7	3.2
Total	141.9	80.4	19.5

Table D-3. Acres of Fuel Management Projects near Spotted Owl Activity Centers			
Activity Center Name	**Alternative 2**	**Alternative 3**	**Alternative 4**
¼-mile radius buffer			
Sand Creek	1.9	1.9	1.9
Slick Rock Creek	45.8	54.7	54.7
Total	47.7	56.6	56.6
½-mile radius buffer			
Sand Creek	43	43	43
White Rock	17.6	17.6	17.6
Slick Rock Creek	115.7	124.6	128.9
Total	176.3	185.2	189.5

2005 Special Status Species List Review and Analysis
Butte Falls Resource Area

▲▲▲▲▲▲

The following list of species is compiled from two sources which identify species that are special status for BLM in Southwestern Oregon. Species known or suspected to be present within the boundary of Butte Falls Resource Area (BFRA) are addressed. Some species that occur on the list from USFWS which are not known to be present on BFRA administered lands are also addressed.

The sources are the latest available information from BLM Oregon State Office and USFWS. The BFRA list will be updated as new information becomes available. The following information was used in compilation:

BLM Oregon State Office Sensitive Species List: *BLM Oregon /Washington Special Status Species List Database Key*, July 2002 and

U.S. Fish and Wildlife Service (USFWS) list: *Federally Listed and Proposed Endangered and Threatened Specie, candidate species and Species of Concern That May Occur in Jackson County*" received from USFWS biologist, Dave Clayton in December 2003.

▲▲▲▲▲▲

Category description:

FT - *Federal Threatened* - "Threatened" under the Federal Threatened and Endangered Species Act. Consultation with USFWS must be done and a Biological Opinion received prior to beginning an action which would impact these species

FC - *Federal Candidate* - proposed and being reviewed for listing as "Threatened or Endangered"

ST - *State Threatened* - listed by the state of Oregon as likely to become endangered

BS - *Bureau Sensitive* (BLM) - eligible for addition to Federal Notice of Review, and known in advance of official publication. Generally these species are restricted in range and have natural or human caused threats to their survival. Bureau 6840 policy requires that any Bureau action will not contribute to the need to list any of these species.

BA - *Bureau Assessment Species* (BLM) - not presently eligible for official federal or state status, but of concern which may at a minimum need protection or mitigation in BLM activities. Impacts will be determined and recommendations for the species will be considered on a case by case basis through NEPA and in balance with other resource considerations.

BT - *Bureau tracking* (BLM) - not considered as a special status species for management purposes. Tracking will enable early warning for species which may become of concern in the future. Districts are encouraged to collect occurrence data on species for which more information is needed to determine status.

SOC - *USFWS species of concern*. These species were formerly candidate species.

2005 Special Status Species List Review and Analysis
Butte Falls Resource Area

▲▲▲▲▲▲

Federally Threatened or Endangered

Mammals

Canada lynx ***Lynx canadensis*** **T** **(Absent)**
Medford BLM was excluded from the known range due to the absence of lynx habitat characteristics (involving elevation and snow depth) and lack of historic sightings. Although lynx have been taken in Oregon, "available evidence suggests that the lynx has never been a part of the resident fauna of Oregon" (Bull et al 2001). Lynx are known to disperse exceptionally long distances (as far as 300 km south of the known breeding range) as prey populations decline. Verts and Carraway found that collection dates of most lynxes in Oregon closely follow peaks in populations further north. Their conclusion was that "self-maintaining populations of lynxes likely have not existed in historic times in Oregon, but records of their occurrence here likely are of dispersers from within currently occupied areas farther north that immigrate and persist for a short time" (Verts and Carraway 1998).

Lynx occur in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare. In North America the distribution of lynx is nearly coincident with that of snowshoe hares. (Ruediger et al 2000). Snowshoe hares are the primary prey of lynx, comprising 35-97% of the diet throughout the range of the lynx. Snowshoe hares are not found on BFRA administered lands.

Birds

Bald eagle ***Haliaeetus leucocephalus*** **FT** **(Present)**
Five nesting pairs of bald eagles have been located within BFRA. Three nests are on BLM lands: Elk Creek, Big Butte Creek and Parsnip Creek. One of the other nests is on private lands (South Slough) and the second is on lands managed by US Army Corps of Engineers lands (Lost Creek). One historic nest on private lands near the Rogue River and Lower Table Rock was lost when the tree blew down in the winter of 2002-2003. An alternate replacement nest has not been found, although the eagles were present during the mid-winter eagle count in January 2003 and there were reports of adult bald eagles in the area in the summer of 2003. Observations will be tracked. Nest searches will continue until the eagles are absent from the area or a new nest is located. Known nests will be monitored annually.

In Oregon, the majority of nests (84%) are located within one mile of lakes, reservoirs, large rivers, and coast estuaries. Nest trees are larger, dominant or co-dominant trees in the stand and are usually components of old growth or older second growth forests. Prey of bald eagles is fish, waterfowl, small mammals (rabbits, etc.), and carrion.

Northern spotted owl ***Strix occidentalis caurina*** **FT** **(Present)**
Approximately 200 northern spotted owl "activity centers," 100 acres of the best habitat around known sites (as of 1/1/94), have been designated and mapped as late-successional reserves (LSR) in the Medford BLM district. Critical habitat has been designated by US Fish and Wildlife Service on Medford BLM lands. Critical habitat for spotted owl on BFRA administered lands is present south of Lost Creek Lake in the A and B road area. Critical habitat is also located near Elk Creek LSR 0224 north of Lost Creek Lake and Trail Creek. A corner of another Critical Habitat Unit is in the NW corner of the resource area, mostly on the Glendale Resource Area.

In 2004, approximately 60 recently active Northern spotted owl sites were present in BFRA, with anther 70 historic locations not thought to be active. Approximately 2/3 of the known historic sites on BFRA are monitored annually. 100 acre activity centers are maintained around sites known as of 1/1/94. Currently surveys are done prior to habitat disturbing actions near a known site or activity center and/or a seasonal restriction from March through June established when a project is planned near a known nest site.

Old growth coniferous forest is preferred nesting, roosting and foraging habitat. Spotted owls also use areas with some old growth characteristics, multi-layered, closed canopies with large diameter trees with abundant dead and down woody material.

Northern spotted owls commonly nest in cavities 50 or more feet above the ground in large decadent old growth trees. Other nest sites include large mistletoe clumps, abandoned raptor nests, and platforms formed by whorls of large branches Prey is primarily small arboreal mammals, such as flying squirrels, woodrats, voles, etc. and occasionally small birds.

Invertebrates

Vernal pool fairy shrimp ***Branchinecta lynchi*** **FT** **(Present)**

Vernal pool fairy shrimp have been found in two places on lands administered by BFRA, a vernal pool on Upper Table Rock and one on Lower Table Rock. Critical habitat, designated in 2003, is primarily on private and Jackson County lands in the Agate Desert just north of Medford near White City and Eagle Point. BFRA administers 344 acres of Critical Habitat on the flat terrain on the top of both Table Rocks. In the short term, recreation use will be monitored to determine if there are negative impacts to the vernal pools. A management plan for the Table Rock ACEC will be written. The timeframe for the management plan has not been determined.

Habitat for vernal pool fairy shrimp is vernal pools, small shallow pools that fill with water during the wet winter and early spring months and are dry during the remainder of the year. These pools are present in various locations where flat topography and soil types allow the development of the pools during the wet season. Most vernal pools occur on private or state/county owned lands in the Agate Desert. Some vernal pools may develop in a few isolated areas on BFRA near Poverty Flat. Sampling of the vernal pools at Poverty Flat and near the settlement of Lincoln in the Ashland Resource area was negative for vernal pool fairy shrimp.

▲▲▲▲▲▲

Federal Candidate Species

Mammals

Fisher ***Martes pennanti pacifica*** **BS** **(Present)**

Two fisher detections on BFRA lands occurred during the Rogue River National Forest Fisher Study conducted from 1995 – 2001 by the Wildlife Ecology Team, USDA Forest Service Pacific Northwest Research Station (Aubrey and Raley 2002a). These sightings occurred near Red Rock Canyon above Lost Creek Lake, and between North Fork of Big Butte Creek and Cur Creek. Near Cur Creek, an adult female fisher was found using a pileated woodpecker nest for a natal den on BFRA administered land. This animal was subsequently found dead. Cause of death was by gunshot (Raley personal communication).

A third detection occurred a few miles east of BFRA on Prospect Ranger District USFS lands in the Bitterlick Creek Drainage, a tributary of Elk Creek. The USFS study was completed in 2002. Fishers are present in the eastern part of BFRA and could occur across the resource area in limited numbers. Currently, there are no management requirements or recommendations in place for fisher, and surveys are not planned. New regulations will be incorporated into management decisions as they become available.

Fisher are found in forests with a coniferous component, large snags or decadent live trees, and logs for denning and resting, and complex physical structure near the forest floor to support adequate prey populations (Aubry and Lewis 2002).They appear to be closely associated with riparian areas in these forests. They seem to prefer 40-70% canopy cover. They mainly use large living trees, snags and fallen logs for denning. In live trees, both female and male fishers used mistletoe brooms as resting platforms (Raley 2002). Little information is available about the distribution and density of fishers in southwestern Oregon. Preliminary information from the RRNF fisher study indicates that fisher home range for females was approximately 25 $km^{2.}$ Male home range size was approximately 147 km^2 during the breeding season (Aubrey and Raley 2002).

Amphibians

Oregon spotted frog ***Rana pretiosa*** **FC** **(Absent)**

Oregon spotted frogs are not present in BFRA. The closest known location for Oregon spotted frog is the Wood River in Klamath County. A breeding population of spotted frogs was found in the Cascade-Siskiyou National Monument (Parker, personal communication). Historical records of spotted frogs in Jackson County have been subsequently determined not to be spotted frogs (Arnold, personal communication).

Invertebrates

Mardon skipper butterfly ***Polites mardon*** **FC** **(Absent)**

Mardon skipper butterflies are present in the Ashland Resource Area near Hyatt Lake and near Soda Mountain. They have not been found in Butte Falls Resource Area. Surveys in 2005 did not detect this species at the Table Rocks. There are no other plans to survey for butterflies in BFRA.

Habitat in the Southern Cascades is small, open grassland sites within the Ponderosa pine savanna/woodland, at elevations ranging from 1,900′ to 5,100′. Site conditions range from dry, open ridgetops to areas associated with wetlands or riparian habitats (Potter 1999).

▲▲▲▲▲▲

Oregon State Threatened or Endangered

Mammals

California Wolverine ***Gulo gulo luteus*** **ST** **(Absent)**

Wolverines are not present in BFRA. There are two historic reports of wolverine, which cannot be verified. The last report was in the 1960's near Dry Creek. Snow tracking surveys in the early 1990's in BFRA were negative. Snow tracking surveys on adjacent lands administered by Rogue River NF were also negative. There are no surveys planned in BFRA, as the area is not considered to provide habitat.

Some helicopter surveys in the Rogue-Umpqua, Mt. Thielson, Mt McLoughlin, and Sky Lakes Wilderness areas have been conducted. There have been some suspected wolverine sign in the high elevations above tree lines, but to date, there have been no confirmed wolverines in these wilderness areas.

▲▲▲▲▲▲

Bureau Sensitive

Mammals

Townsend's big-eared bat ***Corynorhinus (=Plecotus) townsendii*** **BS** **(Present)**

Two maternity colonies are known on BFRA administered lands. One is located in a natural cave near Poverty Flat and another is located in a mine adit at Cinnabar Mines north of Meadows Road. Townsend's big-eared bats have been found roosting and hibernating in adits and caves throughout BFRA. These bats are also known to use cavities in trees and attics of buildings. One big-eared bat was captured in a mist net in the Salt Creek area on the east side of BFRA. Current management is establishment of a 250 foot buffer around sites known to contain bats. Mine adits, shafts, and caves where human disturbance is determined to be impacting the bats or which are unsafe will be identified and closed using current guidelines and procedures, as funding allows. Mines will be assumed to contain bats if they cannot be inventoried due to safety concerns.

Townsend's big-eared bats have low tolerance to changes in temperature and humidity and removal of trees around sites where they are present may change airflow patterns to make the area less desirable as a hibernaculum, maternity, or roosting site. Food consists primarily of moths, and other arthropods.

Birds

Black-backed woodpecker ***Picoides arcticus*** **BS** **(Absent)**

There are no records of presence in BFRA. The nearest known location is near Crater Lake National Park in the Rogue River National Forest (Barrett, personal communication). Black-backed woodpeckers have been documented in Cascade Mountains in Jackson County and in the Siskiyou Mountains in Josephine County. They could be attracted to newly burned forests. Limited surveys of areas burned in the Timbered Rock Fire and in adjacent Morine Creek in 2003 were negative for black-backed woodpeckers. ONHP records will be checked periodically for any detection recorded on BFRA lands.

In Oregon, the black-backed woodpecker tends to occur in lower elevation forests of lodgepole pine, ponderosa pine, or mixed pine/conifer forests. Lodgepole pine forests are not present in BFRA administered lands. Dead trees used for foraging have generally been dead three years or less.

Lewis' woodpecker **M*elanerpes lewis*** **BS** **(Present)**

Lewis' woodpeckers are present in some locations in BFRA during the spring and summer but have not been documented nesting on BLM lands. They are observed during the summer on private, low elevation fields and oak woodlands in Sam's Valley. Lewis' woodpeckers migrate out of the Rogue Valley in winter. Flocks of Lewis' woodpeckers have been observed wintering near Copco and Irongate Lake in Northern California, just south of the Oregon border (Hale, personal observation). ONHP records will be checked periodically for detections recorded on BFRA land.

Lewis' woodpeckers breed sparingly in the foothill areas of the Rogue and Umpqua River valleys in Douglas, Jackson, and Josephine counties. Habitat preference is hardwood oak stands with scattered pine near grassland shrub communities. Breeding areas in the Rogue valley are uncertain. In some locales, the woodpeckers breed in riparian areas having large cottonwoods and in oak conifer woodlands. They usually do not excavate nest cavities, but most often use cavities excavated by other woodpecker species. They winter in low elevation oak woodlands.

Northern Goshawk ***Accipiter gentiis*** **BS** **(Present)**

Goshawk nest in suitable older forests in BFRA. Approximately 15 known nest territories have been identified. The majority of the nest sites are in the east part of BFRA, on the west slopes of the Cascade Mountains. The western-most known nest site is north of Elderberry Flat near White Rock. Known goshawk nest sites are checked for presence, and as time allows for reproductive status, annually. Active nest sites are protected with a 30 acre buffer and a seasonal restriction. Surveys prior to habitat disturbing actions that could affect nesting goshawks, where they are suspected to be present, are planned.

Goshawks are found in a variety of mature forest types, including both deciduous and conifer types. Dense overhead foliage or high canopy cover is typical of goshawk nesting habitat. Perches where they pluck their prey, known as plucking posts, are provided by stumps, rocks, or large horizontal limbs below the canopy.

Oregon vesper sparrow ***Pooecetes gramineus affinis*** **BS** **(Suspected)**

There are no records of presence in lands administered by BFRA. They are most likely to be present in the private lands in the low elevations of the Rogue Valley. They are considered sensitive in Oregon BLM for the Willamette Valley and Klamath Mountain Provinces. They are not known to be present on lands administered by BFRA. ONHP records will be checked periodically for any detection recorded on BFRA lands.

Abundance of the Oregon vesper sparrow is greatest in dry, grassy foothills of the Rogue valley, where it is an uncommon to locally common breeding species (Marshall 2003). There may be a breeding population near Howard Prairie. Occasional birds are reported to winter in the Rogue Valley. In the Rogue River basin vesper sparrow were reported in open habitats of the mixed-conifer forest zone in the breeding season and throughout the valley during migration. No other data from southwestern Oregon are available.

Diet of the vesper sparrow consists of a mix of invertebrates and seeds, although it is primarily insectivorous during breeding season. During the winter months, it feeds mostly on arthropods and seeds. They nest on the ground, often with a nest placed against a clump of vegetation, crop residue, clod of dirt, or at the base of shrub or small tree. In eastern Oregon, they nest in dry, open woodlands and openings in forested habitat such as clearcuts.

Peregrine falcon ***Falco peregrinus*** **BS** **(Present)**

Five peregrine falcon nesting territories are known to be present within BFRA boundaries. Two of those are on BLM administered lands. These nests are monitored annually. Peregrine falcons are reported near the Medford sewage treatment plant and near Table Rocks in the winter months. Other sightings are occasionally reported during the winter months, but these are thought to be migrating/wintering individuals. Other sightings and possible nesting locations have been reported, but no nests have been located on follow-up. Peregrine falcon nest sites are present on USFS lands in at least four known sites to the north of BFRA boundary. Nests will be protected according to current management guidance. Suitable cliffs near any proposed disturbance action will be checked for peregrine falcon presence.

The primary nest substrate is tall cliffs. Forest lands provide habitat for prey species for peregrine falcons. Prey is mostly birds, especially doves and pigeons. Peregrines also prey on shorebirds, waterfowl, and passerine birds. Peregrines do not require forested habitat for foraging.

Purple martin ***Progne subis*** **BS** **(Absent)**

Purple martins are not present in lands administered by BFRA. Historically a colony was present in the Hyatt Lake and Howard Prairie region of the Medford BLM, but they are considered to be extirpated from these areas and are not considered to be present in Medford BLM administered lands. No surveys are planned.

Streaked horned lark ***Eremophila alpestris strigata*** **BS** **(Migrant)**

Breeding by streaked horned larks was confirmed in Jackson County as late as 1976, but it now may be extirpated based on a personal conversation with Otis Swisher, a local bird expert (Marshall 2003). There are no known nesting sites in BFRA. No surveys are planned. Oregon Natural Heritage Program (ONHP) database will be checked periodically for current sightings.

They may occasionally migrate through the area in the spring and fall and are occasionally seen foraging along the banks of Lost Creek Lake in the fall (Barrett, personal communication).

Three-toed woodpecker ***Picoides tridactylus*** **BS** **(Absent)**

There are no records of three-toed woodpeckers on BFRA administered land. BFRA is outside the range and does not have spruce or lodgepole pine forests. Limited surveys of burned areas in the Timbered Rock fire and in adjacent Morine Creek in 2003 were negative for three-toed woodpeckers. ONHP records will be checked periodically for any detection recorded on BFRA lands.

The range of the species overlaps the range of spruce trees (Marshall 2003). In eastern Oregon, three-toed woodpeckers nest and forage in lodgepole pine forests. Bark beetle larvae are primary food source.
Their range is along the crest of the Cascade Range and eastward. They are generally found in higher elevation forests, above 4000 feet. In Oregon they are rare and local. There have been two reports from southwest Oregon, one near Roxy Anne Peak and one near Mt. Ashland.

White-headed woodpecker ***Picoides albolarvatus*** **BS** **(Vagrant)**

White-headed woodpeckers may be rare migrants through BFRA. A single bird was reported in the eastern part of BFRA near Rogue River National Forest boundary. This was likely a wandering or vagrant bird as preferred habitat is not present in BFRA. The bird was not seen in subsequent visits to the area. They have not been documented nesting or present during in the breeding season in BFRA. ONHP records will be checked periodically for any detection recorded on BFRA lands.

White headed woodpeckers occur in open ponderosa pine and mixed conifer forests dominated by ponderosa pine. They are present on the east side of the Cascades, but suitable habitat is restricted. A small population of white-headed woodpeckers is present in true firs in the Siskiyou Mountains southwest of Ashland (Marshall 2003). They forage mainly on trunks of living conifers for insects. Nest cavities are within 15 feet of ground in dead trees which have heart rot. Standing and leaning snags and stumps are used.

Reptiles

Northwestern pond turtle ***Clemmys marmorata marmorata*** **BS** **(Present)**

Northwestern pond turtles are present in BFRA in Elk, Big Butte, East and West Evans, and main stem Evans Creeks. They have not been found during surveys of the small pump chances on BFRA administered lands. Most of these ponds are small and may not be large enough to provide the needed structures (aquatic vegetation and basking spots). The pump chances are small pools constructed for fire suppression use in headwater streams and springs. Two larger ponds on BOISE lands which are surrounded by BFRA administered lands have northwestern pond turtles. Pump chances are usually checked at least once very one to five years for presence of sensitive frogs and turtles.

Northwestern pond turtles live in most types of freshwater environments with abundant aquatic vegetation, basking spots, and terrestrial surroundings for nesting and over-wintering. Some northwestern pond turtles leave water in late October to mid-November to over-winter on land. They may travel up to 1/4 mile from water, bury themselves in duff and remain dormant throughout winter. Turtles have been found to generally stay in one place in areas with heavy snow pack, but may move up to

5-6 times in a winter in areas with little or no snow. General habitat characteristics of over wintering areas appear to be broad. There may be specific microhabitat requirements, which are poorly understood at this time.

Northwestern pond turtles are the only native turtle that is found in southwest Oregon. They appear to be declining in number in the northernmost part of the range. They are more common in large river basins in southern Oregon. Major threat to native turtles is predation on young turtles by exotic bullfrogs and fish.

Invertebrates

Crater Lake tightcoil (snail) ***Pristiloma arcticum crateris*** **BS** **(Unknown)**

Survey and Manage surveys have not located this mollusk on BFRA lands. The closest location to BFRA is at a high elevation spring in Crater Lake National Park. A review of survey Pre-disturbance surveys in suitable habitat will continue in the short term (in the next year) to determine if they are present in BFRA. Due to the high number of acres surveyed with negative impacts, they will be recommended for removal from the list of mollusks suspected to be present in Medford BLM lands.

Crater Lake tightcoil have been found from Crater Lake to the Bull Run Watershed in northern Oregon (Burke et al 1999). They may be found in perennial wet situations in the mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 meters of open water in wetlands, springs, seeps, and riparian areas. They are found generally in areas which remain under snow for long periods in the winter. Riparian habitats in Eastern Oregon may be limited to the extent of permanent surface moisture, which is often much less than 10 meters from open water. Crater Lake tightcoil are found in moderate to high elevations, roughly 2,000 to 7,000 feet.

Oregon shoulderband (snail) ***Helminthoglypta hertleini*** **BS** **(Present)**

In BFRA, Oregon shoulderbands were commonly encountered during surveys in oak woodlands, open dry conifer forests with grass and forbs and in open grassland in rocky areas along stream. In Glendale Resource Area, it has also been found at the edges of roads in roadside ditches where rocks have raveled off cut-banks. Oregon shoulderband were removed from Survey and Manage requirements in 2002 because it is not an old-growth obligate. Currently no pre-disturbance surveys are planned prior to habitat disturbing actions. Expected impacts will be assessed in pre-project planning.

This species is known from rocky areas including talus deposits, but not necessarily restricted to these areas. Suspected to be found within its range wherever permanent ground cover and/or moisture is available. This may include rock fissures or large woody debris sites. They are adapted to somewhat xeric conditions during a part of the year.

Monadenia chaceana **BS** **(Present)**

Monadenia were found in the higher elevations south of Lost Creek Lake in two locations during mollusk surveys. Another specimen was found in Clark Creek Quarry east of Big Butte Creek.

▲▲▲▲▲▲

Bureau Assessment

Mammals

Fringed myotis (bat) ***Myotis thysanodes*** **BA** **(Present)**

A fringed myotis was captured in a mist nets at Fredenberg pond. This is the only confirmed location of this species in BFRA. Eleven ponds have been mist netted in BFRA since 1993. Some sampling of ponds will continue as time and money allows, but there are no plans for annual surveys. Expected impacts will be assessed in pre-project planning.

Fringed myotis is a crevice dweller which may be found in caves, mines, buildings, rock crevices, and large old growth trees. They have been captured in openings and in mid-seral forest habitats. Food consists of beetles, butterflies, and moths.

Birds

Tri-colored blackbird **Agelaius tricolor** **BA** **(Absent)**

Although tri-colored blackbirds are present near the Rogue River and along the marshes on Denman wildlife refuge as well as in Sam's Valley, they are not known to be nesting on lands administered by BFRA. There is no suitable marsh habitat administered by BFRA in the low elevations along the Rogue River. While most tri-colored blackbirds retreat south to California in winter, some remain in Oregon, mainly in the Rogue Valley (Marshall 2003). ONHP records will be checked periodically for any detection recorded on BFRA lands.

Tri-colored blackbirds are found in the lowland interior valleys of southern Oregon, near freshwater marshes and crop lands. Oregon breeding colonies occur in hardstem bulrush, cattail, nettles, willows, and Himalayan blackberry.

Reptiles

Common kingsnake ***Lampropeltis getulus*** **BA** **(Suspected)**

There are no records of presence on BFRA administered lands, but an adult was observed in Sam's Valley, crossing highway 234 (Hale, personal observation). They could be present in the thick vegetation along streams on BFRA administered lands in the Sam's Valley and Evans Creek valleys. No surveys are planned. Expected impacts will be assessed in pre-project planning.

In Oregon, common kingsnake are found only in Douglas, Jackson, and Josephine Counties in the more mesic river valleys. Elevation records are from 780 feet to 2,200 feet (Brown, et al. 1995). Common kingsnakes are usually associated with thick vegetation near streams. They inhabit oak/pine woodlands, open brushy areas, and river valleys, often along streams, and in thick vegetation. They may also be found in farmlands, especially near water areas.

There are eight subspecies of the common kingsnake in the United States. The subspecies of the western states, including the Oregon populations, is the California kingsnake, *Lampropeltis getula californiae* (Brown, et al. 1995).

Amphibians

Cascades frog ***Rana cascade*** **BA** **(Present)**

Cascades frogs have been found in some pump chances in the Cascade mountain foothills on lands administered by BFRA. They are not observed every year, and it is unclear if they are present on an annual basis, or use the ponds intermittently. The pump chances where they have been found are small pools adjacent to perennial springs or small streams. One pump chance at Summit Prairie is monitored annually. The frogs are not seen in the pump chances every year. It is unclear if they are present, hiding under vegetation in the pool, or if they move away from the pools during the majority of the year and return intermittently to breed and lay eggs. Ponds which have been checked with negative detections earlier in the year may have adults present later in the year. All pump chances where Cascades frogs are known to be present are monitored on an irregular basis as time and money allow. Pump chances where they are known to be present will be checked prior to implementing habitat altering actions nearby.

Cascades frogs are found in mountain meadows and moist forests. They breed in ponds with cold springs or snowmelt in early to mid spring (Corkran and Thoms 1996). They are also found in small lakes, bogs, and marshy areas that remain damp thorough the summer. They occur at elevations between 2,500 and 6,000 feet.

Foothill yellow-legged frog ***Rana Boylii*** **BA** **(Present)**

Foothill yellow-legged frogs are present in various creeks throughout BFRA. They have been documented in Maple Gulch and Elk Creek. They are often observed by fish survey crews during surveys. No surveys have been done, but incidental sightings are reported. No surveys are planned. Expected impacts will be assessed in preproject planning.

These frogs are closely associated with water. Their habitat is permanent streams with rocky, gravelly bottoms. Their distribution is west of the Cascade crest from sea level to 1,800 feet (Leonard, et al. 1993).

Northern red-legged frog ***Rana aurora*** **BA** **(Absent)**

There are no reports of Northern red-legged frogs in BFRA administered lands. The area is considered to be outside the range (Cross and Parker, personal communications). They are found in the western part of Jackson County in the areas with moist coastal influence. Pump chances will be checked sporadically.

Breeding habitat for Northern red legged frogs is marshes, swamps, ponds, lakes, and slow-moving streams. They are frequently encountered in woodlands adjacent to streams outside the breeding season.

Siskiyou Mountains salamander ***Plethodon stormi*** **BA** **(Absent)**

Lands administered by the BFRA are outside the range of the Siskiyou Mountains salamander. They occur in Oregon in the Applegate River drainage.

Tailed frog ***Ascaphus truei*** **BA** **(Present)**

There are no recorded locations of tailed frogs in BFRA, although there is anecdotal information they are present in the upper tributary streams of Trail and Elk creeks. No surveys are planned. Expected impacts will be assessed in preproject planning.

Habitat for tailed frogs is cold, fast-flowing, permanent streams in forested areas. Their temperature tolerance range is low, 41-61°F. Tailed frogs are stream dwellers that are rarely seen. They may hide under rocks in clear-flowing streams during the daytime and at night the adults may emerge to feed upon insects near the stream and in the moist woods nearby (Leonard, et al. 1993).

▲▲▲▲▲▲

Bureau Tracking

Mammals

American martin ***Martes Americana*** **BT** **(Present)**

There are anecdotal sightings of martin in the BFRA. They are thought to be present in the forested habitats across the lands administered by the BFRA. Martins were recorded during fisher surveys in adjacent lands on Rogue River National Forest and are on BFRA-administered lands. No surveys are planned.

Martins inhabit forested habitats at any elevation and will use openings in forests if there are downed logs to provide cover (Csuti, et al. 1997). They are a forest species capable of tolerating a variety of habitat types if food and cover are adequate. They prefer mature forests that contain large quantities of standing and downed snags and other coarse downed woody material, often near streams. They often use down logs for hunting and nesting. Martins are not found in dry woodlands. They feed on small mammals, birds, fruits, and insects.

Long-eared myotis ***Myotis evotis*** **BT** **(Present)**

Long-eared myotis appear to be distributed across the BFRA. They were captured in 8 of 11 ponds mist-netted at various locations and times in the 10 years between 1993 and 2003. Some sampling of ponds on BFRA lands will continue as time and money allows, but there are no plans for annual surveys.

These bats are crevice dwellers found in coniferous forests in the mountains in much of Oregon. They forage in openings in dense forest, between the trees beneath the canopy. The species roosts in buildings and many other natural and man-made structures, including caves, mines, bridges, hollow trees, loose bark on trees, and fissures in rock outcrops. They have also been found beneath the loose bark of trees.

Long-legged myotis ***Myotis volans*** **BT** **(Present)**

Long-legged myotis have been captured in mist nets in 5 of 11 ponds mist-netted during various years in the BFRA between 1993 and 2003. They appear to be distributed across the BFRA, as they have been captured in ponds from the headwaters of East Evans Creek to Fredenberg Butte. Some sampling of ponds will continue as time and money allows, but there are no plans for annual surveys.

Long-legged myotis is a montaine conifer forest dweller that uses buildings, hollow trees and crevices in rock outcrops. They also use caves and mines. They forage heavily on moths in western Oregon.

Pallid bat ***Antrozous pallidus*** **BT** **(Present)**

Pallid bats were captured at 2 of 11 ponds mist-netted in the BFRA between 1993 and 2003. They were found in ponds near Rancheria Road and Doubleday Road in the eastern part of the resource area near Rogue River National Forest lands. They do not appear to be common in the BFRA. Some sampling of ponds will continue as time and money allows, but there are no plans for annual surveys.

West of the Cascade Range, pallid bats are restricted to the drier interior valleys of the southern portion of the state. This bat is a crevice dweller. Rock crevices and human structures are used as day roosting sites. Recent radio telemetry studies indicate that these bats also use interstitial spaces in the bark of large conifer trees as a roost site. One colony of pallid bats was observed roosting in a hollow tree. The species feeds mostly on beetles and moths, mostly by gleaning them from the ground.

Red tree vole ***Arborimus longicadus*** **S&M** **(Present)**

Red tree voles are present in the northern part of the BFRA. The highest concentrations are found along the Rogue-Umpqua divide where fog commonly occurs throughout the year, even in the hot, dry summer months. They were not found in surveys south and east of the Rogue River in the BFRA, and this area is considered to be outside the range. Red tree voles were previously Survey and Manage species. No surveys are planned.

Red tree voles are arboreal voles which live in Douglas-fir, spruce, and hemlock forests. Their food consists entirely of needles of the tree in which they are living. They build a bulky nest; up to the size of a half bushel measure in the branches, usually near the trunk, 15-100 feet above the ground. The nest is constructed of resin ducts from conifer needles, lichens, feces, and fine twigs.

Ringtail ***Bassariscus astutus*** **BT** **(Present)**

Incidental sightings have been reported in the BFRA. They are encountered infrequently across the Medford BLM District. Southwest Oregon is the northern extent of the range of the ringtail. They are nocturnal and not commonly seen. They have been observed on Table Rocks (Wineteer personal communication) and at Taggarts Creek south of Lost Creek Lake (Harper, personal communication). No surveys are planned.

Ringtails are most commonly found in areas with cliffs, rocky terrain near water, riparian hardwoods, and sometimes conifers. These nocturnal mammals nest in hollow trees, brush piles, caves, and abandoned buildings. They eat a variety of foods, including small mammals, berries and seeds.

Silver-haired bat ***Lasionycteris noctivagans*** **BT** **(Present)**

Silver-haired bats appear to be distributed across the BFRA. They were captured in 8 of 11 ponds mist-netted at various locations and times in the 10 years between 1993 and 2003. They were found from ponds in the headwaters of East Evans Creek to the Doubleday Road area near Rogue River National Forest lands east of the BFRA. Some sampling of ponds will continue as time and money allows, but there are no plans for annual surveys.

The species is a tree dweller, primarily associated with coniferous forests in Oregon. They live mostly under bark and in tree trunks and may also be found roosting in foliage of trees.

Western gray squirrel ***Sciurus griseus*** **BT** **(Present)**

Western gray squirrels are commonly seen across the lands administered by the BFRA. There are few recorded sightings because they are common and people do not record the sightings. There are no plans to survey for western gray squirrels.

The squirrels are an arboreal squirrel found in mixed forest, including oak, oak-pine, hardwood-mixed conifer, and mixed conifer forests. They feed mostly on acorns and conifer seeds. Other foods include berries, buds, bark, sap and seeds and fungi. Gray squirrels nest in tree cavities or in nests made of sticks and shredded bark.

White-footed vole ***Arborimus albipes*** **BT** **(Absent)**

These voles are not known to be present in the BFRA. There are no records of their presence in Jackson County. They are present in areas with more coastal influence, in riparian areas (Cross, personal communication). No surveys are planned.

Little is known about white-footed voles. They are rarely captured and little information is available about their food habits or life history. They occur along the entire Oregon coast where they are associated with the riparian alder/small stream habitat

(Maser 1981). White-footed voles are herbivores that are thought to be "obligate browsers" (Verts and Carraway 1998). White-footed voles occur from northern Oregon south through the Coast Range to Arcata, CA. In Lane County, the range extends to the west slope of the Cascade Range.

Yuma myotis ***Myotis yumanensis*** **BT** **(Present)**

Yuma myotis have not been identified as being captured in mist-nets in various ponds in BFRA. However, they are believed to be present. Yuma myotis are easily confused with little brown myotis (*Myotis lucifigus*). There may be cases where the species are misidentified. A genetic study in Oregon is currently on-going, and membrane plugs are being collected in the Medford BLM when *M. yumanensis* or *Y. lucifigus* are identified. Some sampling of ponds will continue as time and money allows, but there are no plans for annual surveys.

Yuma myotis is commonly found in human structures, closely associated with water nearby. They will use caves as night roost areas. The species is colonial and hangs in a closely clumped group, often under bridges, in mines, and in caves.

Birds

Acorn woodpecker ***Melanerpes formicivorus*** **BT** **(Present)**

Acorn woodpeckers are common in the lower elevation BFRA-administered lands where white oak woodlands and open mixed hardwood conifer stands occur. They are found from Rogue River to Butte Falls in the valleys and low elevation foothills. No surveys are planned.

Habitat for these woodpeckers is oak woodlands or pine forests where oak trees are abundant. These areas are in the valleys and foothills where white oak woodlands are present. They are found in the oak woodlands and open grassland/chaparral where oaks are present and other open forests with oaks. They use power poles and conifer snags for granary trees to store acorns.

Bank swallow ***Riparia riparia*** **BT** **(Migrant)**

There are no known locations where nesting bank swallows are present on BFRA-administered lands.An historic location was flooded when Lost Creek Lake was built. They have been observed migrating through in the spring or fall (Barrett, personal communication). There are no surveys planned.

Bank swallows nest communally in borrows in sand banks and road cuts and forage near nest colony. Bank swallows usually live near water, fields, marshes, lakes, and streams.

Great gray owl ***Strix nebulosa*** **BT** **(Present)**

Approximately 20 documented locations of great gray owls are present in the BFRA. Most of the currently known nests are in the eastern part of the BFRA. The BFRA is near the western edge of the range of great gray owl and it is unknown how common they are. Nest sites are checked annually and will be monitored for reproductive success as time and budget permit. Nest sites will be buffered according to current management guidelines. With the deletion of the Survey and Manage program, surveys for GGO are no longer required.

Habitat preference for great gray owls is open forest or forest with adjoining deep-soil meadows. They nest in broken top trees, abandoned raptor nests, mistletoe clumps, and other platforms created by whorls of branches. The majority of nests in are in over-mature or remnant stands of Douglas-fir and grand fir forest types on north-facing slopes. However, in the BFRA nests have been found in openings with little or no canopy cover, and in a broken top tree in a clear-cut near the edge of a timber stand.

Greater sandhill crane ***Grus Canadensis tabida*** **BT** **(Migrant)**

Sandhill cranes have been observed in the BFRA on occasion. They have been seen at Rancheria meadows and in marshy meadows along North Fork Big Butte Creek near the confluence with a small tributary (shown as Mule Creek on some maps). There are no known nest locations in the BFRA. Suitable habitat in the large wet meadows is entirely on private land in the Rancheria Road area. In the BFRA, sandhill cranes have been observed near the communities of Prospect and Butte Falls, but nesting has not been documented. Sandhill cranes may nest on the large wet meadows along South Fork Big Butte Creek on private lands of Rancheria Ranch/Cook Ranch near Big Butte Springs. The BFRA does not administer any of the wet meadow lands in this area. No surveys are planned.

Sandhill cranes are spring and summer residents of Oregon. They roost, nest, and rear young in wet meadows, including wild, irrigated hay meadows and shallow marshes. The cranes may use agricultural crop lands for feeding during nonnesting season. Sandhill cranes have been observed nesting near Howard Prairie and Hyatt Lake on or near lands administered by the Ashland Resource Area.

Olive-sided flycatcher ***Contopus borealis*** **BT** **(Present)**

Olive-sided flycatchers are commonly observed throughout BFRA. They are seen and heard calling from tall trees at the edges of clear-cuts and openings. They have been documented during bird survey routes. No surveys are planned.

Olive-sided flycatchers are fairly common in coniferous forests, burns, and clearings. They often perch high on tall conifers or snags at edge of clear-cuts. They feed on insects and other invertebrates, including caterpillars.

Pileated woodpecker **Dryocopus pileatus** **BT** **(Present)**

Pileated woodpeckers are present throughout BFRA-administered lands. They have been observed from Evans Creek to the eastern boundary near Rogue River NF lands on the east. Pileated woodpeckers have been observed flying over meadows and in mixed hardwood-conifer stands as well as in mature forests. Pileated woodpeckers have been observed foraging in madrone tree. They also will forage on down logs in clear-cuts. Pileated woodpecker sign (nest holes, excavation sites, etc.) are often observed. No surveys are planned.

Pileated woodpeckers play a significant influence on the ecosystem where it is present. They are capable of creating large cavities in hard snags and decadent live trees. They also use cavities in decadent trees or excavated cavities for night roosts (Bul,l et al. 1992).Their abandoned nests are used by a wide variety of species (Aubry and Raley 2002b).

Pileated woodpeckers are found mostly in old growth and mature forests, but can feed in younger forests and clear-cuts. Their home range was found to be between 550 acres in Eastern Oregon to 1,000 acres in the Coast Range. They need large hard snags for nesting. They mainly use dead trees that have the strength to handle a nest cavity that averages 8 inches wide and 22 inches deep (≥20″ DBH). Pileated woodpeckers excavate a new nest each year.

Western bluebird ***Sialia mexicana*** **BT** **(Present)**

Western bluebirds are present in BFRA-administered lands. They are often seen in the open oak woodlands in the lower elevations of the resource area, but are also seen in open forests and clear-cuts. No surveys are planned.

In western Oregon, western bluebirds nest in open areas near farms and in clear-cuts in standing snags. They nest in natural cavities, old woodpecker holes, and in nest boxes.

Reptiles

California mountain kingsnake ***Lampropeltis zonata*** **BT** **(Present)**

There is no documented report of the California mountain kingsnake on BFRA-administered lands. However a specimen was observed dead on Antioch Road approximately ½ mile from BLM land (Hale, personal observation). A second report was an observation of an adult California kingsnake seen on Flat Creek Road in the Elk Creek Watershed on private land. BFRA-administered lands were within 0.5 to .75 miles. No surveys for snakes are planned.

Habitat used by California mountain kingsnakes includes moist habitats of oak and pine forests and chaparral. They are found under or inside rotting logs and in talus areas and may also be found under rocks (Brown, et al. 1995).

Northern sagebrush lizard ***Sceloporus graciosus graciosus*** **BT** **(Absent)**

Although sagebrush lizards are present in southwestern Oregon, the Northern sagebrush lizard subspecies is not believed to be present. According to one source (Brown, et al 1.995), there are three or four subspecies of *Sceloporus graciosus* recognized. One of these subspecies, the Southern sagebrush lizard (*Sceloporus graciosus gracilis*) occupies extreme southwestern Oregon, to the exclusion of the Northern sagebrush lizard.

Amphibians

Clouded salamander ***Aneides ferreus*** **BT** **(Present)**

There are anecdotal reports of presence in BFRA lands. They have been reported under mounds of bark and under talus, but no confirmed reports are on file. No surveys are planned.

Habitat requirements are forest and forest edges from sea level to 4,900 feet. There is a correlation between clouded salamander abundance and large conifers as well as down woody material. They occur mainly under loose bark in decayed, standing and fallen snags and stumps, and in holes in snags. They have been found as high as 20 feet in trees. They may also be found in cracks in cliff rocks and under moss and leaf litter.

Western toad ***Bufo boreas*** **BT** **(Present)**

There are no records of presence of western toad in the BFRA. Western toads or their eggs have not been observed during pond surveys. Although they are not documented, the area is within the range and they are likely present in BFRA-administered lands. It is likely people observe them and do not report the sighting.

Western toads are largely terrestrial amphibians found from sea level to high mountains. They often use rodent burrows. They are nocturnal during dry weather, and may forage in daytime on rainy or overcast days. Optimal habitat is humid areas with dense undergrowth. They have been found beneath bark and within decayed wood in large Douglas-fir logs, especially those partially submerged in water. Toads breed in ponds, pools, and slow-moving water in streams. In the Oregon Cascades, they may prefer mud bottomed shallows of lakes and ponds.

Sharptail snake ***Contia tenuis*** **BT** **(Suspected)**

There are no records of sharptail snakes in lands administered by the BFRA. Populations are usually restricted to lower elevations in the west side of the Cascades. They range in elevation from near sea level up to 2,000 feet (Brown, et al. 1995). They could be present in the BFRA in the low elevation oak woodlands and hardwood-mixed conifer forests. There are no surveys planned.

Habitat where sharptail snakes are found is conifer forests and oak grassland edges. They are found in rotting logs, moist talus, under rocks, boards, or other objects, mostly in interior valleys.

Invertebrates

Denning's agapetus caddisfly ***Agapetus denningi*** **BT** **(Unknown)**

There is little information about this species. It has not been found in Medford District BLM.

The habitat is larger, more open streams and rivers at low to mid-elevations in western Oregon. Most likely they are associated with rubble and boulder substrates in areas of moderate current. There are no pictures or identification available and no surveys are planned.

Green Springs Mountain farulan caddisfly ***Farula davisi*** **BT** **(Unknown)**

Two specimens were collected from Green Springs Mountain, 10 miles east of Ashland in a pear scylla trap near a large stream. No larvae have been found. There are no pictures or identification available and no surveys are planned.

No specific life history is available. Species of *Farula* inhabit cool, highly humid areas. This species is known from only two specimens, both adult males. They were collected near a small stream with a marshy area nearby. One of these is probably the habitat.

Franklin's bumblebee ***Bombus franklini*** **BT** **(Unknown)**

There are no records of Franklin's bumblebee in the BFRA. They are a grassland species and they could be present in the lower elevation grasslands and oak woodlands. No surveys are planned.

Franklin's bumblebee has been found in herbaceous grasslands between 1,400 and 4,000 foot elevations. Activity spans the entire blooming season, so they do not appear restricted to a particular host or flower. Adults are probably present and in active flight from May (on warm sunny days) through early September. Their range is restricted to southwestern Jackson County, Oregon, perhaps southeastern corner of Josephine County, and perhaps part of northern California.

Oregon megomphix (snail) ***Megomphix hemphilli*** **BT** **(Absent)**

Oregon megomphix were Survey and Manage snails. They are found in the Glendale Resource Area, but were not determined to be present in BFRA-administered lands. Subsequent analysis of survey data has determined that the BFRA is outside their range and no surveys are required.

Megomphix are expected to occur in moist conifer/hardwood forests up to 3,000 feet. Found in hardwood leaf litter and decaying nonconiferous plant matter under bigleaf maple trees, especially if there are any rotten logs or stumps nearby. A bigleaf maple component in the tree canopy and an abundance of sword fern on forested slopes and terraces seems characteristic of the sites.

Sagehen creek goeracean caddisfly ***Goeracea oregona*** **BT** **(Unknown)**

No information is available.

Schuh's homoplectran caddisfly ***Homoplectra schuhi*** **BT** **(Unknown)**

There are no reports of these Schuh's homoplectran caddisfly in the BFRA. They appear to have a limited distribution from the Cascade and Coast range mountains of southwestern Oregon and northern California, where suitable habitat is found. There are no pictures or identification available and no surveys are planned.

The habitat for these caddisfly larvae are spring-seepage habitats in forested montaine areas. *Homoplectra* sp. are found in streams with moderate to closed shading from a forest canopy with moist sites having a mixed deciduous conifer canopy.

Siskiyou chloealtis grasshopper ***Chloealtis aspasma*** **BT** **(Unknown)**

There are no reports of Siskiyou chloealtis grasshopper in the BFRA. There are no pictures or identification available and no surveys are planned.

The type locality was located near a railroad station near Siskiyou summit (Applegarth 1995). Habitat where it was originally found was in an open stand of hemlock and in a grassy area near the summit of a ridge, along the lower edge of an extensive brush field.

Siskiyou gazelle beetle ***Nebria gebleri siskiyouensis*** **BT** **(Unknown)**

No information is available.

▲▲▲▲▲▲

USFWS Species of Concern

Band-tailed pigeon ***Columba fasciata*** **SOC** **(Present)**

There are reported sightings of band-tailed pigeons in Evans and Trail creeks and in A&B road area. They are likely present throughout the BFRA where elderberries are found. No surveys are planned.

Habitat for band-tailed pigeon is coniferous forests along the northwestern Pacific Coast. It is present in oak woodlands or oak-pine forests in summer.

Flammulated owl ***Otus flammeolus*** **NBC** **(Present)**

There are no known flammulated owl nests on BFRA-administered lands. They have been reported by field surveyors during other owl surveys, but no nests have ever been found. There are reports of their presence in Elk Creek from surveys on private timberlands. They are Bureau Sensitive for the Eastern Cascade, Blue Mountain, and Basin Range physiographic provinces, but not sensitive in southern Oregon. Surveys have been done sporadically in the past in the BFRA, with negative results. No surveys are currently planned.

Habitat is habitat is coniferous woodlands and forest edges, especially oak and pine ecosystems. They nest in abandoned woodpecker holes, especially those of flickers (Erlich, et al.).

Rufous hummingbird ***Selasphorus rufus*** **NBC** **(Present)**

Rufous hummingbirds are commonly seen in the summer months in the BFRA. They are presumed to nest in the forests and thickets, although no nests have been reported. They are not Bureau Sensitive for the BLM. No surveys are planned.

Rufous hummingbirds are found in forest edges, thickets in conifer or deciduous forests, woodlands, mountain chaparral, and alpine meadows. They breed in lowlands and mountains and migrate out of the area in the winter months.

Siskiyou caddisfly ***Tinodes siskiyou*** **SOC** **(Unknown)**

There are no reports of Siskiyou caddisfly in the BFRA. There are no pictures or identification available and no surveys are planned.

Adult collection records indicate the larvae area associated with mid-sized streams, with moderate to dense shading from a mixed hardwood-conifer overstory. Adults have been collected adjacent to both cool, spring-fed streams and streams with a high annual temperature range. It has been found in northern California and from two disjunct populations in Oregon: one from the west side of the Cascade Mountains near Beaver Sulphur Campground in the Rogue River National Forest and one from the Wallowa Mountains. No other information is available.

Yellow-breasted chat ***Icteria virens*** **SOC** **(Present)**

Yellow-breasted chats are present near larger streams in the BFRA. Habitat is brushy briars and stream thickets. There are no documented reports of presence on BFRA-administered lands, although they are likely present in riparian areas along the larger streams. Most of these areas are on private lands along the Rogue River, but some larger creeks may also provide habitat. Blackberries are commonly encountered in the lower elevation stream banks.

Yellow-breasted chats are not sensitive for Medford BLM. They are listed as Bureau Sensitive in the Willamette Valley. No surveys are planned.

Wildlife Species Descriptions for the Slick Sand Project Area

This section will provide more site-specific background for the 6th field Upper West Evans subwatershed than the generalized species descriptions for the Medford District listed above.

Mollusk surveys were performed to interagency protocol standards, as described in Duncan, et al. 2003.

Northern Goshawk surveys were performed to interagency protocol standards, as defined in USDA and USFS 2000.

Federally Listed Species

Bald Eagle (Federally Threatened)

In southwest Oregon, the majority of bald eagles nest in large trees near lakes, rivers, and ponds. No lake/pond habitat is nearby and the nearest river, the Rogue River, is over 12 miles from the south end of the subwatershed. Vagrant eagles are sporadically sighted in the project area, but are believed to be migrants or wandering. Fish as preferred prey are not readily accessible to eagles due to tree canopies overhanging most fish-bearing streams. Eagles are also known to eat carrion or rabbits. Most of the habitat here is too forested or brushy for eagle hunting. There are no known nest sites in the 5th field Evans Creek watershed, but eagles may winter along the main Evans Creek. The probability of bald eagles nesting within the next decade within the 6th field subwatershed is very low.

Vernal Pool Fairy Shrimp (Federally Threatened)

Their habitat is vernal pools. The northern range extension of fairy shrimp is the Table Rocks and Agate Desert areas near Medford, over 12 miles from the project area. No vernal pool habitat exists in the 6th field subwatershed or in the 5th field watershed.

Bureau Sensitive Species

The Survey and Manage category of wildlife implemented in the 1994 Northwest Forest Plan was eliminated via the Record of Decision "To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines" (USDA and USDI 2004). Some former Survey and Manage species became Bureau Sensitive or Bureau Tracking.

Bureau Sensitive Species are species the Bureau of Land Management considers to be of concern and which may have the potential in the future to become federally listed.

Northwestern Pond Turtle

Northwestern pond turtle habitat includes streams, large rivers, and slow-moving water. They are most common in areas with large rocks and boulders, where they go to bask in the sun. Turtles are present in the Upper West Fork Evans Creek subwatershed. There have been no formal surveys, but turtles have been observed crossing the main West Evans roads, and in upland areas away from major streams.

Northern Goshawk

The northern goshawk is found in a variety of forest types. Nesting occurs in mature forest with high canopy closure and an open understory. Survey techniques and population status are discussed in Woodbridge et al, 2005. There is one historic site (White Rock) in the subwatershed, but there is sufficient potential habitat to support several additional undiscovered pairs. There are no known additional sites within the 5th field watershed.

Suitable spotted owl habitat could also be considered as suitable for goshawk nesting, although goshawks will utilize some younger, more open, or smaller blocks of habitat. Goshawks are not dependant upon large blocks of older seral forest. On the east side of the Butte Falls Resource Area, goshawks returned to utilize stands that had been recently thinned. Goshawks are capable of shifting their nest tree up to ½ mile each year between several alternate core areas. Surveys for goshawk were completed in July 2004 in 10 proposed project units totaling 840 acres that featured the most likely habitat. No goshawks were detected. The one known site (which is also a spotted owl core) nested in 2001, but there were no detections in 2002, 2003, 2004 or 2005. That area will be resurveyed in June 2006.

Peregrine Falcon

The primary nesting habitat is tall cliffs. There is no suitable cliff substrate within the 6th field subwatershed. The nearest known nest cliff is seven miles from the subwatershed. The nearest potential cliff structure is 2½ miles away, and was vacant in 2005. Nesting falcons could forage within the project area, and migrating birds or vagrants could pass through. Due to the lack of suitable cliff habitat, the probability of peregrine nesting within the subwatershed in the next decade is negligible.

Woodpeckers

Four species of woodpecker are on the Bureau Sensitive list: Black-backed, Lewis', Three-toed, and White-headed. No specific surveys have been done for sensitive woodpecker species in the watershed. The black-backed woodpecker has not been documented in the project area or the Butte Falls Resource Area. Their habitat is located in higher elevations. Lewis' woodpeckers prefer hardwood oak stands with scattered pine near grassland shrub communities. Lewis' woodpeckers occur in the Sams Valley area but are unlikely in the project area. No nests have been located. Three-toed woodpeckers are generally found in higher elevation forests above 4,000 feet. White-headed woodpeckers occur in ponderosa pine and mixed ponderosa forests. There are no records of three-toed woodpecker or white-headed woodpecker in the Butte Falls Resource Area.

Fisher (Federal Candidate)

Fisher habitat includes snags, overhead canopy, stick and mistletoe structures in trees for dens, and riparian cover. This wide-ranging species has been confirmed northeast of the Elk Creek drainage (20 miles east of the project area). A radiotracking study near Prospect documented males with a mean home range of 24 square miles (Aubrey and Raley 2002, 7) and one male dispersed 34 miles. Although there have been no surveys in the Evans Creek country, this wide ranging species could be expected to occur in sparse numbers in the project vicinity.

Maternal dens can be found in cavities and mistletoe brooms in live and dead trees. Downed logs will also be used as natal dens to hide the kits (ibid, 8). Prey in SW Oregon recovered from den and rest sites included rabbit, ground squirrel, flying squirrel, woodrat, opossum, skunk, porcupine, bobcat, deer, elk, jay, woodpecker, grouse, berries, and yellow jacket (ibid, 4).

Fishers are found in forests with a coniferous component, large snags or decadent live trees, and logs for denning and resting, and complex physical structure near the forest floor to support adequate prey populations (Aubry and Lewis, 2002). They are not limited to older seral habitat.

Townsend's big-eared bat

This species is commonly considered to be a cave dweller. No mine adits, caves, or cliffs have been documented in the project area. This bat could be using tree cavities in the project area, but they have not been documented in the watershed. There have been no bat mist-netting surveys in the subwatershed.

Mollusks

Three species of mollusk are present on the Bureau Sensitive list: Chace sideband (Monadenia chaceana), Crater Lake tightcoil (Pristiloma arcticum crateris), and Oregon shoulderband (Helminthoglypta hertleini). Two mollusk species that use late-successional habitat, the Chace sideband and Crater Lake tightcoil, are known or suspected to occur in the Butte Falls Resource Area. A third species, Oregon shoulderband, is not late-successional, old growth habitat dependent. Two protocol surveys covering proposed project units were completed in spring 2004, with no detections of the three species.

Bureau Tracking

Bureau Tracking species are species which may become threatened or endangered in the future and are not Federally listed, State listed, Bureau Sensitive, or Bureau Assessment and are on List 3, the Review or Watch lists of the Oregon Natural Heritage Data Base. Tracking species are not necessarily considered as special status species for management purposes.

Great Gray Owl

Great gray owls (GGO) forage in open areas such as meadows and oak woodlands. Most of the watershed is low quality GGO habitat – steep, brushy, and dense, with no meadows adjacent to the federal parcels. The nearest confirmed great gray owl location is seven miles south of the project area. No surveys have been completed in the subwatershed; however no great gray owls have been detected during 15 years of spotted owl surveys. Vagrant great grays could occur here. The great gray owl is no longer on the Medford District Sensitive Species list. It moved from Survey and Manage to Bureau Tracking, where surveys are not required. The probability of undetected nesting GGO in the subwatershed is low.

Game Species

Data for the Evans Creek Hunting Unit (which contains the project area) were provided by Oregon Department of Fish and Wildlife (ODFW) (Vargas, pers.com., 2004). The following species are common in the watershed.

Roosevelt Elk

The 2004 population ratios were 15 bulls per 100 cows, with a target of at least 10 bulls, and 28 calves per 100 cows, with a target of 30 calves. Long-term trends are more important than survey numbers for individual years, which fluctuate annually depending on weather conditions during hunting season or during the census period. The 10-year trend is stable.

Blacktail Deer

Fall herd composition routes showed 31 bucks per 100 does, and 49 fawns per 100 does. Spring 2004 surveys showed 30 fawns per 100 adults. Buck ratios are steady. Fawn ratios fluctuate annually. The population level is less than desired by ODFW.

Black Bear and Cougar

No census routes have been established, but ODFW believes the number of animals is increasing throughout Jackson County based on damage complaints from the public.

Upland Game Birds

Mountain Quail - ODFW does not specifically monitor mountain quail by hunting unit.
Band-tailed pigeons - Statewide, band-tailed pigeons are in a long-term decline.
Turkey - There are no census routes, but damage complaints are increasing countywide, indicating that the population is increasing.

Special Habitats

A Special Habitat is "a forested or nonforested habitat which contributes to overall biological diversity within the District. Special habitats may include: ponds, bogs, springs, sumps, marshes, swamps, dunes, meadows, cliffs, salt licks, and mineral springs" (USDI 1995, 14).

No cliffs or talus slopes are located in the subwatershed, except for a large quarry in Section 1 (T33S, R3W). Four man-made pump chances provide potential salamander or turtle habitat. There are no meadows on BLM-administered land within the project area. Some meadows located on private land along Evans Creek are beginning to fill in with seedling trees.

Currently, 24 percent of the Federal land in the Evans Creek 5th field watershed is in the 80-180 year age class, with another 13 percent in the 200 year plus age class. The watershed exceeds the minimum requirements of 15 percent for late-successional forest, as outlined in the NWFP. In the 16,006 acre 6th field subwatershed, BLM manages 9,600 acres. 9,113 of that is forested, with 3,873 (42% of the forest capable acres) in stands of at least 80 years age. 2,487 acres are over 150 years age (27% of the forest capable acres).

Bald Eagle. Due to the distance of the project area from typical foraging or nesting habitat such as the main Evans Creek, each of the three action alternatives would be a No Affect under the Endangered Species Act. No mitigation measures would be necessary for bald eagles.

Northwestern Pond Turtle. Riparian areas will have negligible habitat disturbance. The man-made pump chances will be cleaned out (deepened), which could disturb turtles in the short term (1 year) until vegetation returned to the small pond. But the ponds are adjacent to riparian areas that will provide alternate habitat.

Northern Goshawk. The action alternatives will result in a short-term (2-5 year) reduction in suitable nesting habitat. Goshawks can construct a new nest each year, and will return to nest in thinned stands. If a potential nest stand is logged, the birds can shift to an adjacent stand. Their prey is diverse (birds and mammals) and the adult can range out to a mile from the nest to forage. They forage in a variety of stand conditions, including regeneration units. 16 to 25 trees per acre (tpa) would be maintained in the 125 acres of SGFMA, and the 65 acres of NGFMA in Alternative 2 would maintain 6 to 8 tpa. Thus ample nesting and foraging opportunities will remain following the proposed project. The proposed alternatives would not reduce the ability of goshawks to nest and produce young. There are no units proposed within ¾ mile of the historic site.

Peregrine Falcon. There are no potential nesting cliffs in the subwatershed or within two miles of any proposed treatment units. Peregrines prey on a diverse array of bird species. None of the proposed alternatives would impact peregrine foraging or nesting opportunities.

Woodpeckers. The action alternatives will maintain at least two snags per acre in regeneration harvest units. Snags will not be removed in other units unless they present a safety hazard. None of the four sensitive woodpecker species (Black backed, Lewis', Three-toed, White headed) have been documented in the subwatershed. Ample standing snags will be maintained for the more common primary excavator species (Pileated, Downy, Hairy woodpecker, Common Flicker)

Fisher. Preliminary results from a SW Oregon research study conducted near Prospect showed that fishers will hunt in clearcuts, and showed no preference for riparian areas. Key habitat features are snags and decadent trees with natural cavities (Raley 2004). No guidelines have been established for how much of these habitat features are needed for this wide-ranging species. The proposed action alternatives would maintain all large coarse down wood and snags (except those that present a safety hazard). Areas of closed canopy would remain in each section.

The highly mobile fishers would be expected to use the existing connectivity network of riparian management zones and 100-acre owl cores that will be maintained across the watershed. Impacts to fisher from the Action Alternatives are predicted to be minimal. Theoretically fisher could be occupying a stand scheduled for treatment. As the human disturbance (chainsaw noise) approached, the animals would be expected to move out of the stand.

Townsend's big-eared bat. There is no cave habitat available for maternity colonies. Ample snag habitat with cavities and loose bark for roosts would be maintained in each section under each alternative, so impacts to the Townsends and to other bat species would be minimal. There is potential that bats could be roosting in a snag that was felled as a safety hazard. If the bats survived the felling of the tree, they could shift their roost to a neighboring stand.

Mollusks. None of the sensitive species of snails were found in sampling surveys of proposed units, so impacts would be negligible.

Great Gray Owl. There is low likelihood of GGO occurance in treatment units. They could occur within the subwatershed adjacent to private meadows. But there are no sale units adjacent to those meadows. GGO will forage in partial-cut open stands. If they are present, the owls would be expected to persist regardless of which action alternative was selected.

Terrestrial Habitat in General. Goal 9 from the Aquatic Conservation Strategy states, "Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species." Since none of the alternatives would remove any appreciable amount of timber from riparian areas, this goal would be maintained for terrestrial species.

Special Habitats. None of the three action alternatives would reduce the amount of late-successional forest to below 15 percent in the subwatershed, or in the watershed, as recommended to be maintained in the NWFP.

There are no other special habitats (cliff, talus, wet meadows) that occur in or adjacent to proposed treatment units.

Appendix E

Botany

Summary

- The Slick Sand project area is outside the ranges and does not contain suitable habitat for the Federal Endangered plants *Fritillaria gentneri, Limnanthes floccosa* ssp *grandiflora* and *Lomatium cookii*. The proposed activities would have "no effect" on these Endangered plants.
- Surveys for Special Status vascular and nonvascular plants have been completed in all proposed treatment units. The proposed activities would not trend toward listing Special Status vascular or nonvascular plants because sites would be protected from direct and indirect effects.
- Because of their rarity, it is unlikely Sensitive fungi are present in the treatment units. The risk of impacting them is low.

Introduction

Special Status plants include vascular plants, lichens, bryophytes, and fungi in the following four categories: (1) Federal Threatened and Endangered (T&E), (2) State Threatened and Endangered, (3) Sensitive, and (4) Assessment. The Bureau of Land Management's policy is to: (1) manage, protect, and conserve T&E species and the ecosystems on which they depend and (2) ensure that actions authorized on BLM-administered lands do not contribute to the need to list Bureau Special Status species under the provisions of the Endangered Species Act. Bureau Tracking species are species that are apparently secure or for which more information is needed to determine their rarity. Protection of Tracking species is discretionary and project evaluations are not required for them (USDI 2001; USDI 2003). Tracking plant species found in the Slick Sand project area are included in this report for information purposes.

Survey and Manage (S&M) was formerly a designation for rare and uncommon vascular and nonvascular plants and fungi. The *Record of Decision for the Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines*, signed March 22, 2004 and effective April 21, 2004, removed Survey and Manage as a management category for plants and animals. Former S&M species that were determined to still need management or protection were reassigned to the Special Status species program. They are considered for analysis in this EA under their new status. Former S&M species that do not have Special Status are not analyzed or managed.

Methodology

Approximately 5,000 acres, or 53 percent, of BLM-managed lands in the Upper West Fork Evans Creek 6th field subwatershed were surveyed for Special Status vascular plants and noxious weeds between 1988 and 2004. Surveys were conducted as clearances for timber sales, silvicultural treatments, and restoration projects. In 2004 and 200,5 surveys for Special Status vascular and nonvascular plants were completed on 1,276 acres containing the proposed Slick Sand treatment units. Surveys are conducted by qualified botanists at the time of year when Special Status plants can be detected. Surveyors use an intuitively controlled methodology where a representative cross section of all major habitats and topographic features are covered. Efforts are concentrated in areas of probable habitat of Special Status species. Survey reports, species lists, and Special Status plant site reports are on file in the Butte Falls Resource Area.

Predisturbance field surveys are not required for Special Status fungi. The assumption was made in the *FEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* that "If project surveys for a species were not practical under the Survey and Manage standards and guidelines… then surveys will not be practical or expected to occur under the Special Status/Sensitive Species policies either. Instead, the other components of pre-project clearances, such as habitat examinations; habitat evaluation; evaluation of species-habitat associations and presence of suitable or potential habitat; review of existing survey records, inventories, and spatial data; or utilization of professional research, literature, and other technology transfer sources are most likely to be used" (USDA and USDI 2004, 122). All Sensitive fungi in the

Medford District (Table E-3) were formerly S&M species for which surveys were not considered practical. Surveys are considered impractical because the fungi produce ephemeral sporocarps (fruiting bodies) on an irregular basis. "Richardson (1970) estimated that sampling every 2 weeks would fail to detect about 50 percent of macrofungi species fruiting in a season. On the average, less than 10 percent of species were detected in each of 2 consecutive years at any 1 of 8 sites (O'Dell, et al. 1999). The reasons for annual and seasonal variation are not fully understood, and predicting when, or under what conditions, a species would fruit is not possible at present." (USDA and USDI 2004, 148)

Assumptions

- It is unknown if Sensitive fungi are present in the Slick Sand harvest units or if present, what consequences would occur to the species if a population was impacted. The 2004 FEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines addresses incomplete or unavailable information. "While additional information would add precision to estimates, the basic data and central relationships are sufficiently well established that any new information would be unlikely to reverse or nullify understood relationships. Though new information would be welcome, no missing information was evaluated to be essential to a reasoned choice among the alternatives….Any discussion of risk based on rarity and likelihood of disturbance must recognize that, for many species, only a small percentage of potential habitats have been surveyed. In situations where limited species-specific information is available, more reliance, by necessity, must be placed on information regarding the condition and management of the overall landscape in formulating conclusions regarding environmental consequences" (USDA and USDI 2004, 108-109). In the absence of complete information about the presence of Sensitive fungi in the Slick Sand treatment units or the consequences of the proposed activities on species viability, the best available information about the fungi, their habitats, distance from known sites to the project area, and the effects of similar activities on related species groups was used to evaluate the effects of the action alternatives.
- Data are not available for the abundance or extent of rare plants in the Upper West Fork Evans Creek 6th field subwatershed prior to BLM botanical surveys conducted over the last 17 years. It is unknown if rare plants or fungi have been impacted in the project area as a result of human activities or natural ecosystem processes during the last 150 years. Only observations about current environmental conditions in relation to the known habitat requirements of Special Status species can be made. Environmental changes that have occurred in the project area during the last 150 years may have caused some native plants to become rarer.
- Private timber lands are in early to mid-seral stages and do not provide habitat for late-successional associated plants and fungi. Special Status species do not receive protection on private lands, but are protected on BLM-managed lands by the Endangered Species Act and Bureau policies.

Affected Environment

The Slick Sand project area is in the Upper West Fork Evans Creek 6th field subwatershed, located in the Klamath Mountains eco-region. BLM-managed lands (9,515 acres) represent 59 percent of the total acres in the subwatershed. The treatment units range in elevation from approximately 1,850 feet to 4,100 feet. Timber sale units contain late, mature and old growth conifer stands, while fuels treatment units contain a mix of mid-, late, and mature seral stands. Plant associations represented in the units are Douglas fir-canyon live oak/dwarf Oregon grape, Douglas-fir/salal-dwarf Oregon grape, Douglas-fir-canyon live oak/poison oak, Douglas-fir/dry shrub, and Douglas-fir/white fir. The overstory is dominated by Douglas fir, with smaller percentages of white fir, ponderosa pine, sugar pine, knobcone pine, and incense cedar. Moister sites contain western hemlock, while drier areas that have experienced frequent high intensity fire contain patches of knobcone pine. Dominant hardwood trees are madrone and California black oak, but chinquapin, big-leaf maple, and canyon live oak are also present. The understory layer contains oceanspray, hazel, deerbrush, Oregon grape, poison oak, and vine maple. Rhododendron and salal occur in some moister sites, while patches of manzanita occupy drier sites. Vegetation along seasonal streams is similar to the surrounding upland vegetation. Vegetation along perennial streams consists of the riparian species red alder, big-leaf maple, western hemlock, ninebark, vine maple, salal, and sedges.

Data are not available for the presence or extent of rare plants in the subwatershed prior to surveys conducted on BLM-managed lands during the last 17 years. Activities since settlement of Euro-Americans may have impacted native plants and caused some to become rarer by reducing or altering suitable habitat. Natural plant community patterns that normally follow topographical or soil type features have been artificially altered due to the checkerboard ownership of public and private lands. Treatments have followed property boundaries, fragmenting natural plant communities and sometimes isolating rarer

or uncommon plant species. Isolated plant populations lose genetic exchange with other populations, which can reduce population vigor.

Logging activities in the watershed may also have impacted rare plants associated with forest habitats. Populations may have been destroyed during timber harvest activities, including road and landing construction. Forest stands in the subwatershed that formerly had structural complexity and species diversity have been converted to single-age early seral stands. Stands are currently a mosaic of early, mid- and late seral forests (see Section 3.3, Forest Conditions). Approximately 17 percent (2,700 acres) of BLM-managed forest in the subwatershed are currently mature conifer stands between 80 and 200 years old and 9 percent (1,501 acres) are old growth conifer stands over 200 years old. Old growth associated species currently have less habitat available for occupation while early and mid-seral associated species have more habitat.

Wildfire suppression, initiated in the early 1900's, has altered fire regimes from their natural intervals and resulted in an increase in heavy fuel loads across all plant communities and seral stages. Under normal fire regimes, fires burn unequally over a landscape, creating structural complexity that supports biodiversity. As fuels build up, the risk increases of high severity fires, which could result in mortality or damage to rare plants. Special Status plants that require disturbance openings or earlier seral stages, or depend on heat or chemicals that fire generates for seed germination, may have declined or suffered reduced population vigor as a result of fire exclusion. The combination of heavy fuels and early seral stands in the 6th field watershed leaves forest stands vulnerable to high severity wildfire which causes greater damage to vegetation and soils. Although rare plants in southwestern Oregon evolved with frequent fire regimes and are adapted to some level of wildfire, they may receive more damage in the event of a wildfire because several fire intervals have been missed and fires would burn at greater intensities than under natural conditions.

Road and trail construction, recreational and off-road vehicle use in the project area have reduced habitat for some rare plants and created avenues for the spread of noxious weeds. Most noxious weed populations are spread by vehicles and occur along road and trail systems. Noxious weeds impact rare plants by competing with them for water, nutrients, space, and light.

Special Status Plants in the Slick Sand Project Area

Threatened and Endangered (T&E) Plants

Three Federal Endangered vascular plants have their ranges within the Butte Falls Resource Area - *Fritillaria gentneri* (Gentner's fritillary), *Limnanthes floccosa* ssp *grandiflora* (large-flowered meadowfoam) and *Lomatium cookii* (Cook's lomatium). The Slick Sand Project Area is outside the ranges of these three species and does not contain suitable habitat or known sites for them. *Fritillaria gentneri* grows in oak woodlands, chaparral, or mixed hardwood-conifer woodlands. *Limnanthes floccosa* ssp *grandiflora* and *Lomatium cookii* grow in vernal pools or vernally wet areas. Large-flowered meadowfoam and Cook's lomatium sites in Jackson County are located in the Agate Desert.

Special Status Vascular Plants

The Slick Sand project area does not contain highly diverse plant communities or special habitats that many rare plants are associated with. Over 6,000 acres of BLM-administered land in the Slick Sand project area have been surveyed and only 7 sites of 1 Special Status vascular plants have been discovered. Two Tracking species, *Cypripedium californicum* (1 site) and *Cypripedium montanum* (2 sites) were also discovered during surveys. Tracking species do not receive protection under Bureau policy.

Table E-1. Special Status Vascular Plants Documented in the Slick Sand Project Area

Scientific Name	Status	Location	# of Sites	Proposed Treatment	Protection Measures
Cypripedium fasciculatum	Sensitive	T33S-R4W-S20	2	slash, hand pile, and burn	50 foot no-treatment buffer
		T33S-R3W-S21	1	outside units	N/A
		T33S-R3W-S29	3	outside units	N/A
		T33S-R3W-S29	1	slash, hand pile and burn	50 foot no-treatment buffer

Cypripedium fasciculatum (clustered lady slipper orchid) is a perennial orchid with shallow, rhizomatous roots and mycorrhizal associations. It occurs in a variety of forested habitats with a great diversity of soils, elevation, aspect, and plant communities. Populations are found in areas with 60 to 100 percent canopy cover (USDA and USDI 1998). Approximately 530 sites have been documented in the Medford District, with 69 in the Butte Falls Resource Area. Although its distribution extends throughout the western United States, populations are widely scattered and disjunct, with generally few plants per population. The Medford District BLM has the most sites within the Northwest Forest Plan area (Washington, Oregon, northern California).

Three *Cypripedium fasciculatum* sites are located in Slick Sand units proposed for fuels reduction in Alternatives 2, 3, and 4. One of the sites is in a mid-seral, dry Douglas-fir stand with 85 percent canopy cover. The site is dominated by stump-sprouted madrone with low shrub and forb cover, high leaf litter, and no moss cover. The two other sites are in late seral Douglas-fir stands with high cover of madrone and canyon live oak in the understory and light shrub and forb layers. Canopy cover at the 2 sites is 75-85 percent. Population vigor at all three sites was described as poor.

Special Status Nonvascular Plants

No Special Status nonvascular species were discovered in the Slick Sand units. One site of the Tracking species, *Leptogium teretiusculum* was documented in the project area, but Tracking species do not receive protection under Bureau policy.

Special Status Fungi

No fungi surveys have been conducted in the Upper West Fork Evans Creek 6th field subwatershed. Ten fungi that were formerly Survey and Manage species, for which surveys were not considered practical, are now Bureau Sensitive (Table E-2). Four have been documented in the District and the other six are only suspected here, based on what is known about their habitats and ranges. None of the ten Sensitive fungi have been found to date in the Butte Falls Resource Area, although various levels of fungi surveys have been conducted on roughly 7,700 acres over the last seven years. Information about the habitat requirements for these 10 fungi is limited, although all are known to be ectomycorrhizal and to depend on wind or animals for spore dispersal. Few sites have been documented for these fungi in the Pacific Northwest. Species descriptions follow the Environmental Consequences sections.

Table E-2. Special Status Fungi Documented or Suspected in the Medford District BLM

Scientific Name	Status	Documented/ Suspected	Proximity of Known Sites to Slick Sand	#Sites Medford	#Sites NWFP[1]
Boletus pulcherrimus	Sensitive	Documented	43 miles (SE Jackson County)	4	36
Dermocybe humboldtensis	Sensitive	Suspected	Arcata and Roseburg BLM	0	4
Gastroboletus vividus	Sensitive	Suspected	Rogue River National Forest (S. Central Jackson County)	0	4
Phaeocollybia californica	Sensitive	Documented	Grants Pass Resource Area, Josephine County	1	34
Phaeocollybia olivacea	Sensitive	Documented	10 miles (E. Josephine County)	4	99
Phaeocollybia oregonensis	Sensitive	Suspected	Eugene and Coos Bay BLM	0	11
Ramaria spinulosa var. *diminutiva*	Sensitive	Suspected	Roseburg BLM	0	1
Rhizopogon chamalelotinus	Sensitive	Suspected	N. Central Josephine County	0	1
Rhizopogon ellipsosporus	Sensitive	Documented	26 miles (W. Jackson County)	1	3
Rhizopogon exiguous	Sensitive	Suspected	N. Central Josephine Co.	0	3

[1] Number of sites in the Northwest Forest Plan area from GeoBob database

Environmental Consequences

Effects on Botany Common to All Alternatives

The Slick Sand project area is outside the ranges and does not contain suitable habitat for the T&E plants *Fritillaria gentneri, Limnanthes floccosa* ssp *grandiflora* and *Lomatium cookii*. The proposed activities would be "no effect" to them because no populations occur in the treatment units, no plants would be impacted, and habitat changes resulting from the proposed treatments would not reduce suitable habitat for them.

Effects of Alternative 1 on Botany

- Special Status vascular and non-vascular plants and fungi would not trend toward listing under Alternative 1.

Direct and Indirect Effects

Special Status Vascular Plants

There would be no direct effects to Special Status vascular plants under Alternative 1 because no physical disturbance would occur that could impact them.

The only potential indirect effect to Special Status vascular plants under the No Action Alternative would be that the risk of damage from high severity wildfire would not be reduced. Three *Cypripedium fasciculatum* sites were discovered in units proposed for fuels reduction. Under the No Action Alternative, these stands would remain overstocked, resulting in deterioration of stand health and reduced resiliency to disturbance events (section 4.4.1.1). *Cypripedium fasciculatum* is typically found in stands with 60-80 percent canopy cover. Stands with 80-100 canopy cover may inhibit growth or vigor of some Special Status vascular plants, including *Cypripedium fasciculatum*. In the event of a wildfire, stands with high canopy cover and fuel ladders burn at higher intensity, potentially resulting in stand-replacement and greater damage to plants and soil. The risk of damage to Special Status vascular plants from intense wildfire would remain unchanged from current conditions.

Special Status Nonvascular Plants

No direct or indirect impacts would occur to Special Status nonvascular species under the No Action Alternative because no sites were documented in the treatment units.

Special Status Fungi

There would be no direct or indirect effects to Special Status fungi under the No Action alternative because no physical disturbance would occur that could impact them and there would be no loss of old growth forest which provides habitat for fungi.

Cumulative Effects

Although information is not available for logging plans on private industrial forest lands, it is assumed that commercial harvest will occur in the future on private lands and that privately-owned forests are in early to mid-seral stages. Special Status species do not receive protection on privately-owned lands, but will continue to be protected and conserved on federal lands, according to BLM policies and federal regulations. Reevaluation of the cumulative effects from past management activities in three deferred 7th field watersheds within the Upper West Fork Evans Creek watershed may occur within the next five years. Depending on the findings of this analysis, management activities may or may not be proposed. Approximately 12,000 acres in the rest of the 5th field watershed will be considered for treatment during that time, although actual acres treated would be about half that amount.

It is expected that recreation and off-road vehicle use will continue on private and public lands and that noxious weeds will continue to spread along roads and trails in the subwatershed. However, noxious weeds will be treated on BLM-managed lands in the project area under the Medford District *Integrated Weed Management Plan and Environmental Assessment OR-110-98-14*.

Alternative 1 would not contribute additional cumulative effects to Special Status plants or fungi. The amount of late-successional forest on BLM-managed lands would remain unchanged in the absence of wildfire and would continue to provide habitat for late-successional associated plants and fungi. Mid-seral stands would continue to develop towards a late seral stage, although at a slower rate than if thinned. Current trends as a result of fire exclusion would also continue in the units proposed for fuels reduction treatment and there would be more potential for intense, stand-replacing fires in those

stands. The risk of direct mortality or damage to Special Status plants or fungi or a loss of suitable habitat from high severity wildfire would remain unchanged from current conditions.

Effects on Botany Common to All Action Alternatives

- The effects on Special Status plants and fungi under Alternatives 2, 3, and 4 are similar in nature and differ only in the magnitude of effects, based on the number of acres and methods of treatment proposed.
- The proposed activities in Alternatives 2, 3, and 4 would not trend toward listing Special Status vascular or nonvascular plants because sites would be protected from direct and indirect effects.
- Because of their rarity, it is unlikely that Sensitive fungi are present in the treatment units. The risk of impacting them is low.

Direct and Indirect Effects

Special Status Vascular Plants

The only Special Status vascular plant sites discovered in the proposed Slick Sand treatment units are three *Cypripedium fasciculatum* populations located in two fuels reduction units. The treatment in these units would be the same under all three action alternatives. One of the sites is in a mid-seral stand dominated by stump-sprouted madrone, indicating past disturbance from wildfire. The other two sites are in late-successional stands that are also dominated by madrone and canyon live oak in the understory. All three sites have 75-85 percent canopy cover directly over the plants and shrub and forb cover is low, indicating the sites may not receive enough light to support a diverse understory. The strategy for managing the sites is to protect plants from direct impacts by establishing 50 foot no treatment buffers. Small diameter hardwoods and shrubs outside the buffers would be thinned in order to release nutrients, light, and water for the remaining conifers. The fuels reduction treatment would not reduce the overstory canopy cover, but would open up the understory somewhat. There may be some short-term indirect effects to the plants as a result of reduced humidity levels and increased temperatures, but these effects would not necessarily be negative. The plants may benefit in the short-term from receiving increased light and would benefit over the long-term from accelerating development of the mid-seral stand's late-successional characteristics and improving the health and resiliency of the stand.

Special Status vascular plants in the subwatershed could potentially be indirectly affected if noxious weeds were introduced or increased during implementation of the Slick Sand forest management and restoration projects. Noxious weeds could be introduced or spread during soil disturbance or movement of equipment in and out of the project area or between treatment units. Noxious weeds compete with native plants for space, water, light, and nutrients. Their presence can result in decreased native plant diversity and abundance. Noxious weed populations in the Slick Sand project area were treated in 2005, which would reduce the risk of spreading weeds during project implementation. Requiring vehicles to be washed and weed-free before going off roads would reduce the chance of spreading weed seeds.

Although all forest management units were surveyed and no Special Status vascular plants were discovered in the harvest units, the loss of old growth forest habitat during regeneration harvest could indirectly affect Special Status vascular plants associated with late-successional forests by reducing the amount of available habitat for expansion of existing populations. *Cypripedium fasciculatum* is a late-successional forest associate. Alternative 2 proposes the most regeneration harvest (190 acres), Alternative 3 proposes 35 acres for regeneration harvest, and no regeneration harvest would occur under Alternative 4.

Forest management treatments could also indirectly benefit Special Status vascular plants. Thinning dense, overstocked mid-seral stands would accelerate development of late-successional characteristics and improve stand health, making them more resilient to catastrophic damage from wildfire, insects or pathogens. Thinning progeny test sites would facilitate returning them to their natural plant community composition and structure, which would improve their suitability as habitat for rare plants over their current condition.

Special Status Nonvascular Plants

No direct or indirect effects would occur to Special Status nonvascular plants because no sites are present in the treatment areas.

Special Status Fungi

No surveys have been conducted for the 10 Medford District Sensitive fungi (Table G-3) in the Slick Sand forest management units or in the Upper West Fork Evans Creek 6th field subwatershed. Although habitat requirements for these ten fungi are not well known, they are all associated with forest habitats, generally but not always in late-successional stands. If present in the Slick Sand units, they would be most likely to occur in timber harvest or fuels reduction units. The progeny test

site renovation, culvert replacement, pump chance renovation, roadside stabilization, and road project areas do not contain suitable habitat for Sensitive fungi. No direct or indirect effects would occur to Sensitive fungi as a result of implementing restoration projects.

Because of their rarity throughout the Northwest Forest Plan Area and the distance of known sites to the Slick Sand project area (Table G-3), it is unlikely that Sensitive fungi are present in the harvest units. If present, they could be directly or indirectly adversely impacted by harvest activities. Harvest can have varying degrees of adverse impacts to rare fungi, depending on the level of tree removal and ground disturbance.

The main and most extensive parts of fungi consist of below-ground mycelial networks which reside in the top few inches of mineral soil. They are often connected to multiple trees through their root systems. Activities which remove, disturb, or compact the top layer of organic material and mineral soil could negatively impact fungi that occur there. In one study, fungal mycelia networks ranged in size from 1.5-27 square meters (Dahlberg and Stenlid, 1995). Mycelia networks could be disrupted by equipment during timber harvest, construction or ripping of roads or landings, or by removal of host trees that sustain the ectomycorrhizae. These impacts could result in a loss of fungal species diversity and abundance (Amaranthus et al. 1996). Among the three action alternatives, Alternative 2 presents the greatest potential risk of disturbance to Sensitive fungi with 1.2 miles of temporary spur roads and 7 new landings; Alternative 3 would present less risk with 1 mile of temporary spur roads and 6 new landings; and Alternative 4 presents the least potential risk with .6 miles of temporary spur roads and 5 new landings.

Tractor logging presents more potential risk of ground disturbance and compaction which could negatively impact fungi than cable, helicopter, or skyline logging. The difference in impacts from tractor harvest by alternative would be in the number of acres affected. Alternative 2 proposes 60 acres of tractor harvest, Alternative 3 proposes 35 acres of tractor harvest, and Alternative 4 proposes 20 acres of tractor harvest. Under all action alternatives, potential impacts would be localized and minimized by using existing skid roads and requiring them to be a minimum of 150 feet apart (PDFs-Timber Harvest). This spacing impacts only 12 percent of an area. Fungal mycelia could survive if they were missed or only partially damaged during harvesting, if their host trees remained, and if environmental conditions were favorable for their persistence.

Sensitive fungi could also be directly impacted from radiant heat during burning of post-harvest slash piles. Effects from pile burning include damage or death of mineral soil fungi including the mycelia and spores; loss of litter, organic matter and large wood, resulting in reduced moisture retention capability; loss of nutrient sources; and changes in fungal species diversity and abundance. Under all three action alternatives, 615-635 acres would have fuels reduction treatments with burn piles. In harvest units, logging slash would also be hand or excavator piled and burned. Under Alternative 2, 392 acres could potentially have burn piles, in Alternative 3, 292 acres could have burn piles, and under Alternative 4, 187 acres could have burn piles.

Fungi may also be indirectly affected by changes in environmental conditions after timber harvest. Reducing canopy cover results in lower humidity, increased light, and higher air temperatures. Hotter, drier conditions inhibit sporocarp production and fungal persistence. Luoma, et al. (2004) looked at the effects of different levels and patterns of green-tree retention (retention of existing basal area) on ectomycorrhizal sporocarp production. The results of the study suggest that leaving a combination of dispersed and aggregated (grouped) green-trees is desired when sporocarp production is the goal. This mix of retention patterns reduces the effects of a distinct edge between forest stands and harvested areas, particularly for temperature and moisture. In the study, total fall mushroom biomass decreased significantly in the stands where basal area retention patterns were 40 percent aggregate, 15 percent dispersed, and 15 percent aggregate compared to the 75 percent aggregate and 40 percent dispersed treatments and the control. Sporocarp production was nearly eliminated from the stands where only 15 percent of basal area was retained in an aggregate pattern. In the Slick Sand project, regeneration harvest would generally leave less than 40 percent of the existing basal area and NGFMA could leave less than 15 percent of the existing basal area. Density management and selection harvest would retain between 37 and 71 percent of the existing basal area. If rare fungi are present in the Slick Sand harvest units, they might persist in the altered environmental conditions in the density management and selective cut units, but would be less likely to persist in regeneration units.

Converting late-successional conifer stands to an early seral stage as a result of regeneration harvest could also potentially affect Sensitive fungi by reducing the amount of suitable habitat across the landscape for these species. The potential risk to Sensitive fungi from reducing suitable habitat would be greater under Alternative 2 because it proposes regeneration harvest of 190 acres or 4.5 percent of mature and old growth forest on BLM-managed lands in the 6th field watershed versus 35 acres or less than 1 percent of old growth forest in the 6th field watershed under Alternative 3. There would be no risk to Special Status fungi from regeneration harvest under Alternative 4.

While timber harvest activities present potential direct and indirect threats to Sensitive fungi if present, the proposed density management and selective harvest, fuels reduction, and progeny site renovation treatments could also potentially benefit them, by reducing the potential of stand-replacing wildfires and improving stand resiliency against drought, insects, and disease. Reducing stand densities would provide more water, nutrients, light, and growing space to the remaining trees and improve individual tree vigor and resiliency against natural disturbances. Thinning progeny test sites would facilitate returning them to their natural plant community composition and structure and accelerate development of late-successional characteristics. There could be short-term negative impacts to fungi from increased temperatures and reduced humidity as a result of opening the understory, but in the long-term (40+ years), the resulting conditions in these stands would be more favorable to Special Status fungi than their current conditions.

Cumulative Effects

It is anticipated that timber harvest, road building, recreation and other activities that could impact rare plants will continue in the future on both private and BLM-managed lands in the 6th field watershed. While Special Status plants that occur on BLM-administered lands are managed under BLM policy, there are no policies that protect them on private lands. No timber sales are planned on BLM-administered land over the next five years in the 6th field watershed where the Slick Sand project is planned. Reevaluation of the cumulative effects from past management activities in three deferred 7th field watersheds within the Upper West Fork Evans Creek watershed may occur within the next five years. Dependant upon the findings of this analysis, management activities may or may not be proposed. However, approximately 12,000 acres in the rest of the 5th field watershed will be considered for treatment during that time, although actual acres treated would be about half that amount.

The activities proposed in Alternatives 2, 3, and 4 would add no additional cumulative effects to Special Status vascular and nonvascular plant populations in the project area because the areas have been surveyed and Sensitive plant sites would be protected. Project design features would reduce the risk of noxious weeds being introduced or spread during project implementation and potentially impacting Special Status vascular plants.

The only potential indirect cumulative effect to Special Status vascular and nonvascular plants that could occur as a result of the proposed activities in Alternatives 2 and 3 would be a reduction of suitable habitat for expansion of existing late-successional forest associated species. Approximately 26 percent of BLM-managed conifer stands in the 6th field watershed are currently in mature and old growth stages. They would drop to 21.5 percent under Alternative 2 and to 25 percent under Alternative 3. Under Alternative 4 there would be no change in mature or old growth conifer stands. The proposed Slick Sand projects under all three action alternatives would not trend toward listing Special Status vascular or nonvascular plants.

Fuels reduction and forest thinning treatments proposed in the action alternatives would improve stand health and resiliency and reduce the risk of stand-replacing wildfires in those units. Creating conditions for lower intensity wildfires would reduce the risk of damage to rare plants and fungi in the 6th field watershed.

The potential cumulative effect of the proposed projects on Sensitive fungi would be the risk of impacting rare populations and the loss of suitable habitat. Alternative 2 presents greater risks of impacts to Sensitive fungi than Alternative 3 or 4. However, the proposed harvest and fuels reduction would occur on matrix lands, which are designated for timber production and harvest. Approximately 14 percent of the 8 million acres of late-successional forest in the Northwest Forest Plan Area are in matrix and available for harvest and 86 percent are reserved in late-successional reserves, congressionally reserved and administratively withdrawn areas, and riparian reserves. It is estimated that over the next 50 years late-successional forest would develop at 2.5 times the rate of loss through stand replacement fires and harvest (USDA, USDI 2004, pp. 109-111). This reserve system spread across the landscape is intended to provide protection and development of late seral habitat for the protection and expansion of rare plants that are associated with late-successional habitat. Under the Northwest Forest Plan, at least 15 percent late seral conifer forest must be maintained in each 5th field watershed (USDA, USDI 1994, p. C-44). The Evans Creek 5th field watershed has 42 percent late seral conifer forests. Under all 3 action alternatives, the percent of late-successional forest in the Upper West Fork Evans Creek 6th field subwatershed would remain at least 25 percent.

For 8 of the 10 former Survey & Manage fungi for which surveys are not practical (*Boletus pulcherrimus, Gastroboletus vividus, Dermocybe humboldtensis, Ramaria spinulosa* var. *diminutiva, Phaeocollybia californica, Rhizopogon chamaleontinus, Rhizopogon ellipsosporus,* and *Rhizopogon exiguus*) (see Table E-3), the 2004 FSEIS determined that habitat, including known sites, is insufficient to support stable populations in the Northwest Forest Plan area. For 7 of the 8 species, "this outcome is not due to federal actions but other factors such as: (1) limited potential habitat and few populations on federally managed lands; (2) potential for stochastic events; (3) low number of individuals; (4) limited distribution; and (5) narrow ecological amplitude." (USDA and USDI 2004, p. 124) Because habitat is insufficient to support stable populations

and is not due to federal actions, the Slick Sand proposed treatments would not change the species condition (based on habitat) for 7 of the 10 species.

For 1 of the 8 species (*Phaeocollybia californica*) (see Table E-3), the outcome of insufficient habitat is due to land management activities, such as soil disturbance and loss of host trees. Known sites of *Phaeocollybia californica* are not substantially protected by reserves and loss of even a few known sites could adversely impact persistence within the Northwest Forest Plan Area (USDA and USDI 2004, p. 154). However, because the species is rare across the Pacific Northwest Forest Plan area and few populations are known, it is unlikely that it is present in the proposed harvest units. The risk of impacting populations is low.

Two of the 10 former Survey & Manage fungi for which surveys are not practical (*Phaeocollybia olivacea* and *Phaeocollybia oregonensis*) (see Table E-3) were determined to have habitat, including known sites, sufficient to support stable populations in the Northwest Forest Plan area. These species would stabilize in a pattern similar to or different from their reference distribution because a substantial number of known sites are located in reserves or are managed under the Agencies' Special Status Species Programs (USDA and USDI, 2004, p. 152). Because habitat is sufficient to support stable populations, the Slick Sand treatments would not change the species' condition for these two species.

Table E-3. Former Survey & Manage Fungi Species (Surveys Not Practical) in Reserves

Scientific Name	Number of Sites in NWFP	Number of Sites in Reserves	Percent in Reserves
Habitat Not Sufficient – Not Due to Federal Action			
Boletus pulcherrimus	36	5	13.9
Dermocybe humboldtensis	4	1	25.0
Gastroboletus vividus	4	2	50.0
Ramaria spinulosa var. diminutiva	1	0	0
Rhizopogon chamaleontinus	1	0	0
Rhizopogon ellipsosporus	3	0	0
Rhizopogon exiguus	5	3	60.0
Habitat Not Sufficient – Due to Management			
Phaeocollybia californica	30	5	16.7
Habitat Sufficient			
Phaeocollybia olivacea	93	19	20.4
Phaeocollybia oregonensis	11	5	45.5

SOURCE: ISMS database November 20, 2004
Reserves are the following land use allocations: Late-Successional Reserves, Owl Cores, Riparian Reserves, and Congressionally Reserved Areas

Because of their rarity across the Pacific NWFP area, it is unlikely that Sensitive fungi are present in the Slick Sand timber harvest or fuels reduction units and the risk is low that they would be impacted. The assumption is made that protecting known sites (current and future found) for these Sensitive fungi species, in addition to conducting large-scale fungi inventories throughout the Pacific Northwest will be adequate in ensuring that this project and future projects would not contribute to the need to list these fungi (USDI 2004, 5-2).

Sensitive Fungi Documented or Suspected in the Medford District BLM

Information about the ranges, habitat associations, and number of sites of Special Status fungi are from the Geographic Biotic Observation database (GeoBob), *Management Recommendations for Survey and Manage Fungi* (Castellano and O'Dell 1997), *Handbook to Strategy I Fungal Species in the Northwest Forest Plan* (Castellano, et al. 1999), *Handbook to Additional Fungal Species of Special Concern in the Northwest Forest Plan* (Castellano, et al. 2003), and Oregon Natural Heritage Program [Online]http://oregonstate.edu/ornhic/survey_manage_ranks.html.

Boletus pulcherrimus is a red-pored mushroom that grows solitary in humus in association with the roots of mixed conifers (grand fir and Douglas fir) and hardwoods. It is endemic to the Pacific Northwest and fruits from July through December, although it does not fruit every year.

Dermocybe humboldtensis is a gilled mushroom that fruits in November and December in association with conifer roots. It has been documented only in Humboldt County on stable dunes and in Roseburg in a late-successional Douglas-fir forest in a riparian reserve at 1,720 feet elevation. No sites have been documented in the Medford District BLM, but it is suspected here because it is mid-way between the known sites and contains similar habitat to the Roseburg site.

Gastroboletus vividus is a semi-underground boletoid mushroom. It forms below ground in association with the roots of various conifers and is known only within the range of the Northern Spotted Owl. It was documented in southern Oregon in Star Ranger District/Rogue-Siskiyou National Forest in a low elevation Douglas-fir forest, although other sites across its range are at higher elevations and are associated with Shasta red fir and mountain hemlock.

Phaeocollybia californica is a gilled mushroom that may fruit in March, May, October or November. It is associated with the roots of silver fir, Sitka spruce, Douglas fir, western hemlock, oak, or tanoak in later successional mixed evergreen forests. Endemic to the Pacific Northwest, it has been found in the Arcata, Coos Bay, Eugene, and Roseburg BLM Districts.

Phaeocollybia olivacea is a fall-fruiting gilled mushroom that is found scattered or in arcs in later successional mixed evergreen forests in association with oak or tanoak roots.

Phaeocollybia oregonensis is a fall-fruiting gilled mushroom that is associated with the roots of silver fir, Douglas fir, or western hemlock in moist late-successional forests. Sites have been documented in the Coast Range in the Coos Bay BLM and in the Cascade Mountains in northern Oregon.

Ramaria spinulosa var. *diminutiva* is a coral fungi that fruits in the fall on humus or soil in association with conifers. It is known from Europe and the Pacific Northwest. The closest known site to the Flounce Around area is in Roseburg in a late-successional Douglas-fir stand at 1,200 feet elevation.

Rhizopogon chamalelotinus is a truffle that grows in the duff in association with roots of Douglas fir and sugar pine at around 3,600 feet elevation. It fruits in June and September and has been documented in Josephine County and in Idaho.

Rhizopogon ellipsosporus is a truffle that grows in the duff in association with the roots of Douglas fir and sugar pine at around 2,800 feet elevation. It fruits in October and is endemic to the Pacific Northwest. Sites have been documented on the Medford BLM in a Douglas fir forest in the Applegate and in Josephine County on the Rogue-Siskiyou National Forest. All three documented sites in the Pacific Northwest Forest Plan area are in Josephine and Jackson County.

Rhizopogon exiguous is a truffle that grows in the duff in association with Douglas-fir and western hemlock at around 3,100 feet elevation. It fruits in March, August, September, and November and is known within the range of the Northern Spotted Owl. One site was documented in Josephine County in a low elevation Douglas fir forest.

Botany References

Amaranthus, M.P., D. Page-Dumroese, A. Harvey, E. Cazares, and L.F. Bednar. 1996. "Soil compaction and organic matter affect conifer seedling momnycorrhizal and ectomycorrhizal root tip abundance and diversity." Research Paper, PNW-RP-494. USDA Forest Service, Pacific Northwest Research Station. Portland, OR.

Castellano, M.A., and T. O'Dell. 1997. *Management Recommendations for Survey and Manage Fungi.* V. 2.0. BLM-IM No. OR-98-003.

Castellano, M.A., J.E. Smith, T. O'Dell, E. Cazares, and S. Nugent. 1999. *Handbook to Strategy 1 Fungal Species in the Northwest Forest Plan*. General Technical Report PNW-GTR-476.

Castellano, M.A., E. Cazares, B. Fondrick., T. Dreisbach. 2003. *Handbook to Additional Fungal Species of Special Concern in the Northwest Forest Plan*. General Technical Report PNW-GTR-572.

Dahlberg, A. and J. Stenlid. 1995. "Spatiotemporal patterns in ectomychorrhizal populations." *Canadian Journal of Botany* 73 (Supplement): S1222-S1230.

Luoma, D.L., J.L. Eberhart, R. Molina, and M.P. Amaranthus. 2004. "Response of ectomycorrhizal fungus sporocarp production to varying levels and patterns of green-tree retention." *Forest Ecology and Management* 202 (2004):337-354.

USDA Forest Service and USDI Bureau of Land Management. 1998. *Management Recommendations for Vascular Plants*. BLM 1630/1736-PFP (BLM-OR931)P.

USDA Forest Service and USDI Bureau of Land Management. 2002. BLM-Instruction Memorandum No. OR-2002-080. *Amendments to Survey and Management Recommendations Designed to Facilitate Certain National Fire Plan Activities – Vascular Plants, Lichens, Bryophytes, and Fungi.*

USDA Forest Service and USDI Bureau of Land Management. 2004. *Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards.*

USDI Bureau of Land Management. Rel. 6-121 January 19, 2001. BLM Manual 6840 Regulations – Special Status Species Management.

USDI Bureau of Land Management. July 16, 2004. Project Evaluations for Former S&M Species in Which Surveys are Not Feasible, Attachment 5. In Information Bulletin OR-2004-145. *Implementation of Special Status Species Policies for the Former Survey and Manage Species.* On file at Oregon State Office-Bureau of Land Management, Portland, Oregon.

Appendix F

Noxious Weeds

Introduction

Noxious weeds are those plant species designated by Federal or state law as generally possessing one or more of the characteristics of being aggressive and difficult to manage, parasitic, a carrier or host of serious insects or disease, a serious threat to biodiversity and other resource values, and a nonnative (new to or not native to the United States). Noxious weeds degrade native ecosystems by displacing native plants, decreasing native plant diversity and abundance, altering natural ecosystem processes, and competing with rare plants.

The authority for treating noxious weeds on Federal lands lies with several documents:

- Federal Land Policy and Management Act (FLPMA)
- Public Rangelands Improvement Act (PRIA)
- Carlson-Foley Act
- Federal Noxious Weed Act of 1974, consistent with the *Northwest Area Noxious Weed Control Record of Decision (ROD) for the Final Environmental Impact Statement (EIS) and Supplemental EIS (FSEIS)* dated April 7, 1986 and May 5, 1987 respectively.

General direction in the management of noxious weeds is provided in the Medford District Integrated Weed Management Plan and Environmental Assessment OR-100-98-14. In general, the BLM is directed to implement an effective weed management program with the objectives of preventing the introduction and establishment of noxious weeds; containing and suppressing existing noxious weed infestations; and cooperating with local, state, and other Federal agencies in the management of noxious weeds.

Affected Environment

Past human activities on private and public lands within the Slick Sand project area have resulted in the establishment of noxious weed populations. Activities that have disturbed the soil or opened up the canopy, such as road construction, logging, vehicular traffic, and off-highway vehicle trails, have brought in and spread noxious weed seeds. The majority of noxious weeds are introduced by vehicle tires during road construction and passage. Roadsides provide ideal conditions for establishment of noxious weeds which inhabit open areas where sunlight is abundant and competition is minimal. While vehicles are the major vector for the spread of weeds, other factors, such as shade, soil types, and the amount of disturbance, can either inhibit or aid noxious weed establishment.

Because these plant species are well established within the Rogue Valley, are predominantly transported via vehicle tires, and are able to quickly colonize newly disturbed areas, they will continue to increase in numbers within the project area unless aggressively treated. The checkerboard ownership pattern in the Slick Sand project area makes control of noxious weeds difficult. Varying levels of disturbance and noxious weed treatment occur on private lands. Because the BLM generally only treats weed populations on public land, they remain vulnerable to infestations from surrounding lands.

On BLM-administered land in the Slick Sand project area, 16 sites of 5 species of noxious weeds (see Table F-1) have been documented during surveys over the last 17 years, including the surveys conducted during summer 2004 in the proposed Slick Sand treatment units. Most populations are along roads; two are inside proposed regeneration units and several are adjacent to fuels treatment units.

Table F-1. Noxious Weed Populations in the Slick Sand Project Area				
Section	**Location**	**Unit Treatment**	**Noxious Weed**	**# and Size of Sites**
T32S, R4W, Sec. 35	Riparian Reserve	None	*Cirsium arvense* (Canada thistle)	1 site; 2^2 meters
T33S, R3W, Sec. 7	Roadside	Adjacent to density management unit	*Centaurea pratensis* (meadow knapweed)	1 site; 2^2 meters
T33S, R3W, Sec. 7	Roadside	Outside	*Centaurea maculosa* (spotted knapweed)	1 site; 499^2 meters
T33S, R3W, Sec. 17	Units 17-5, 17-6	SGFMA	*Cytisus scoparius* (scotch broom)	2 sites; 3^2 and 25^2 meters
T33S, R3W, Sec. 18	Roadside	Adjacent to slash, handpile, and burn units	*Centaurea solstitialis* (yellow star-thistle)	2 sites; 186^2 and 14^2 meters
T33S, R3W, Sec. 19	Roadside	Adjacent to slash, handpile, burn units	*Centaurea solstitialis* (yellow star-thistle)	1 site; 28^2 meters
T33S, R3W, Sec. 19	Roadside	3 outside units; 1 near Progeny Test Site thin unit	*Centaurea pratensis* (meadow knapweed)	4 sites; 28^2, 28^2, 55^2, and 138^2 meters
T33S, R3W, Sec. 33	Roadside	Adjacent to slash, handpile, burn unit	*Centaurea solstitialis* (yellow star thistle)	2 sites; 46^2 and 92^2 meters
T33S, R3W, Sec. 33	Roadside	Adjacent to slash, handpile, burn unit	*Centaurea pratensis* (meadow knapweed)	1 site; 93^2 meters
T33S, R4W, Sec. 13	Roadside	Unit dropped	*Cytisus scoparius* (scotch broom)	1 site; 92^2 meters

Environmental Consequences

Effects of Alternative 1 (No Action) on Noxious Weeds

Direct and Indirect Effects

Under Alternative 1, there would be no direct or indirect effects on noxious weeds from forest management or restoration project activities. Current management of noxious weeds on BLM-administered land in the Slick Sand project area would continue under the Medford District Integrated Weed Management Plan. Some populations in the area may be treated, but there would not be a focused effort to eradicate the known populations in and adjacent to the treatment units.

Cumulative Effects

Past activities in the project area have contributed to the introduction and spread of noxious weeds on both private and BLM-administered lands. Noxious weeds will likely continue to increase as a result of the following current and future practices: soil disturbance and vehicular traffic in association with timber harvest on private lands, recreation, and off-highway vehicle use. Alternative 1 would not contribute additional risks of introducing or spreading noxious weeds in the Slick Sand project area.

Effects on Noxious Weeds Common to all Action Alternatives

Direct and Indirect Effects

All action alternatives present some potential for introducing and spreading noxious weeds in the Slick Sand project area. Activities that result in soil disturbance or removal of vegetation create an environment that favors establishment of noxious weeds. Because weed seeds are readily spread by vehicle tires, movement of equipment during road work and timber harvest activities, particularly from roads with existing weed populations, to newly disturbed soil creates a risk of increasing noxious weed populations. Burning handpiles, and to a lesser extent underburning, would temporarily remove ground cover and may also pose some opportunities for weeds to invade the newly cleared areas. Regeneration harvest would open up areas to potential weed invasion.

The alternatives that propose the most acres of tractor harvest, regeneration harvest, handpile and underburning, and miles of new temporary road construction and road decommissioning (see Table 2-1) create the greatest potential for introducing or spreading noxious weeds. Table F-2 ranks the alternatives based on their potential risk of increasing noxious weeds in the Slick Sand project area.

Table F-2. Potential of Alternatives to Increase Noxious Weeds in the Slick Sand Project Area

Activity	Least To Most Impacting			
Regeneration harvest	Alt. 1	Alt. 4	Alt. 3	Alt. 2
New temporary road and landing construction	Alt. 1	Alt. 4	Alt. 3	Alt. 2
Road decommissioning	Alt. 1	same	same	same
Tractor harvest	Alt. 1	Alt. 4	Alt. 3	Alt. 2
Handpiles burned and underburning	Alt. 1	same	same	same

It should be noted that the difference in proposed treatment acres between alternatives is relatively small. With mitigation measures, there would be little difference in potential impacts among the three action alternatives.

The strategies for treating noxious weeds in the Slick Sand project area would be twofold:

1) Treat known sites in units, on landings, and along roads adjacent to units prior to project implementation.
2) Implement PDFs to reduce the likelihood of introducing or spreading noxious weeds during project activities. PDFs include cleaning equipment before entering the project area and mulching and seeding landings and ripped roads after project completion.

Cumulative Effects

Past activities in the project area have contributed to the introduction and spread of noxious weeds on both private and BLM-administered lands. Noxious weeds will likely continue to increase as a result of the following current and future practices: soil disturbance and vehicular traffic in association with timber harvest on private and public lands, recreation, and off-highway vehicle use. While the action alternatives create a potential for increasing noxious weeds in the Slick Sand project area, mitigation measures would reduce those potential impacts. Alternatives 2, 3, or 4 would not contribute substantial additional risks of introducing or spreading noxious weeds in the Slick Sand project area.

Appendix G

Cultural Resources

The State Historic Preservation Organization standards stipulate that 100 percent of the high probability lands, 20 percent of the medium probability lands, and 5 percent of the low probability lands within the project area must be surveyed. Also, a minimum of 20 percent of the total project area is required to be surveyed. These standards were met or exceeded for this project through three different surveys.

In accordance with the National Historic Preservation Act of 1966 Section 106, an archaeologic reconnaissance was conducted for the Slick Sand project area. No sites were found and there are no previously recorded sites in the project area.

The following write-up is taken from the Slick Sand Cultural Resource Survey, number OR 110-04-09 (2003):

Prior to Euro-American settlement in the 19th century, the upper Rogue River drainage was likely a boundary area between the Takelma people of the Rogue River Valley and the Molala who inhabited parts of the Cascade Mountains from Mt. Hood to the upper Rogue River.

The project vicinity was probably first utilized by Paleo-Indians around 13,000 to 11,000 years ago, even though there is no archeological evidence to support their existence within the project area itself. Archaeologists have found evidence of the existence of Paleo-Indians elsewhere in the upper Rogue River drainage. By late prehistoric times, the area would have seen use by the Takelma and possibly the Umpqua or Southern Molala.

From 1,000 years ago to contact (Formative and Protohistoric period), the Takelma had a settlement pattern closely related to their subsistence regime. Permanent winter villages were located in the low elevation river valleys of the region in close proximity to predictable and significant food resources. During the warmer months, the Takelma would temporarily move to their seasonal base camps in the surrounding uplands to hunt, gather crops, and procure other resources not available near their winter villages.

The staple vegetal foods of the Takelma were acorns and camas. A variety of root crops, manzanita berries, pine nuts, tarweed seeds, wild plums, and sunflowers augmented their diet. Anadromous fish (especially salmon), deer, and elk, as well as a variety of small mammals and certain insects provided protein in the Takelma diet.

The ethnographic record for the interior southwestern Oregon is limited due to the rapid destruction of the Native American cultures in the region as a result of the Rogue Indian Wars of the 1850s. With the discovery of gold in northeastern Oregon, prospectors from the Rogue Valley created a route over the Cascades to the gold fields of the John Day River. As more and more Euro-Americans came into the region, conflict with the Takelma and the neighboring groups increased. The discovery of gold in 1850 near Grants Pass, and again in 1851-1852 near Jacksonville, encouraged even more Euro-Americans to settle in the area. Conflict escalated to the point of the Rogue Indian Wars of 1852-1856. Evans Creek played a prominent role during the Rogue Indian Wars as the site of several skirmishes and acted as the boundary for the Table Rock Reservation (Beckman 1996). By 1856, those who were not killed during the Rogue Indian Wars were forcibly relocated to reservations in northern Oregon.

Appendix H

Economics

Economic Assessment of Timber Harvest in the Slick Sand Analysis Area

Alternative 1

Since no harvesting would occur under this Alternative, there would be no return to the Federal Treasury. No forestry-related jobs would be created.

Alternative 2

Under Alternative 2, 3.7 million board feet would be harvested, with a return to the Federal Treasury of $770,000. Direct employment resulting from timber harvest and processing of a commodity would provide for approximately 35 jobs.

Alternative 3

Under Alternative 3, 1.9 million board feet would be harvested, with a return to the Federal Treasury of $270,000. Direct employment resulting from timber harvest and processing of a commodity would provide for approximately 18 jobs.

Alternative 4

Under Alternative 4, 1.0 million board feet would be harvested, with a return to the Federal Treasury of $100,000. Direct employment resulting from timber harvest and processing of a commodity would be approximately 9 jobs.

NOTE: Direct employment figures based on Table 3&4-49 of USDA and USDI 1994a , *FSEIS on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*.