Evans Creek Forest Management Project Environmental Assessment

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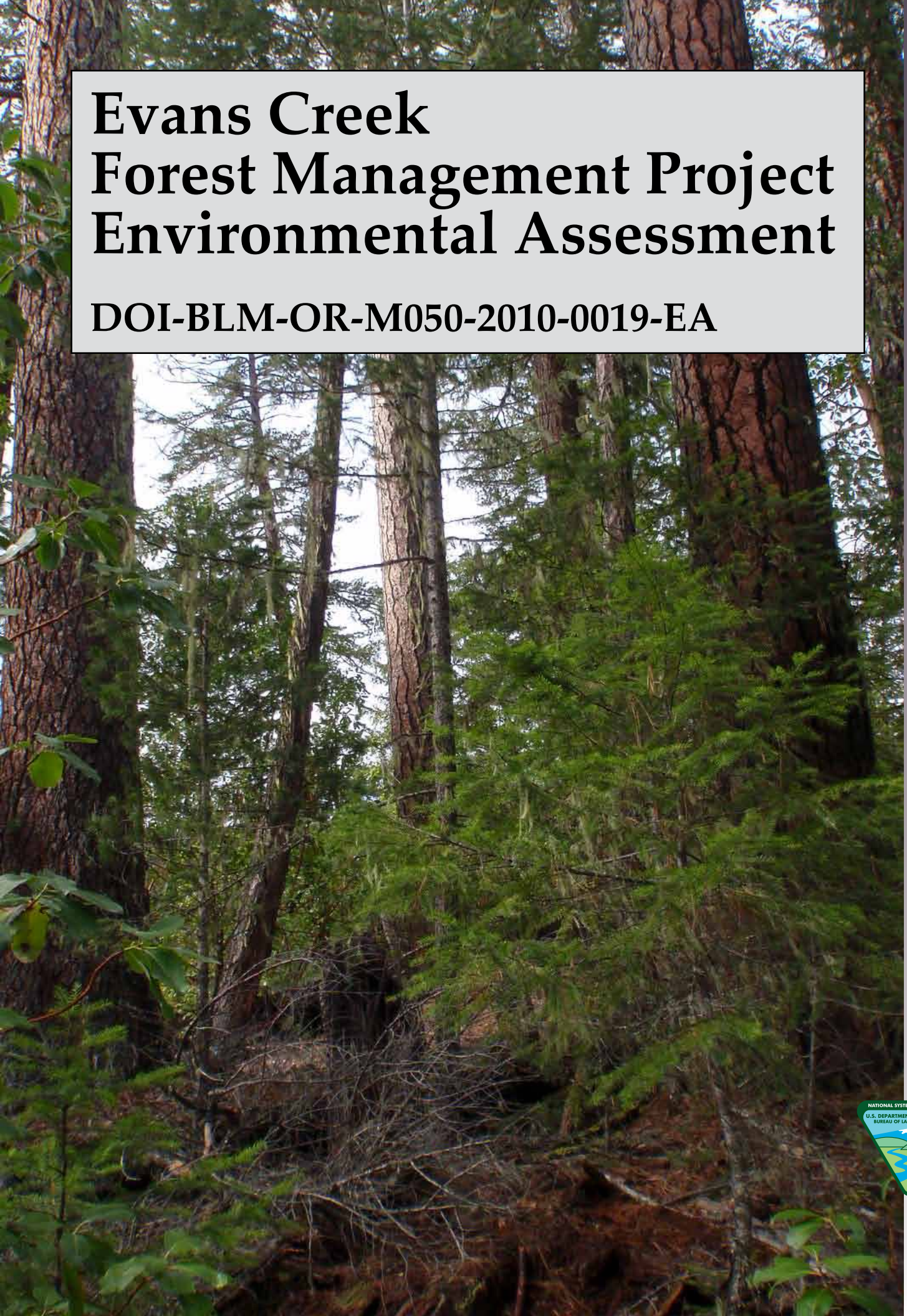

BLM

Butte Falls Resource Area

June 2011

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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BLM/OR/WA/AE-11/052+1792

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1.0 Purpose and Need

This section describes why the BLM (Bureau of Land Management) is proposing this action. It also identifies the factors that will be used for making a decision and lists the legal requirements the BLM must consider.

The following definitions are for terms used in this section:

allowable sale quantity. The gross amount of timber volume, including salvage, that may be sold annually from a specified area over a stated period of time in accordance with the approved land use plan.

authorized officer. The Federal employee who has the delegated authority to make a specific decision.

RA32 habitat. Older and more structurally complex, multilayered conifer forests identified in recovery action 32 from the draft 2010 northern spotted owl recovery plan.

slash. The branches, bark, tops, cull logs, and broken or uprooted trees left on the ground after logging.

special forest products. Some of the vegetative material found on public lands that can be harvested for recreation, personal use, or as a source of income. Includes plants, seeds, cones, trees and tree parts, boughs, fruits, roots, flowers and stems, edible plants, edible mushrooms, medicinal plants, decorative woods, ornamental plants, poles, posts, burls, and firewood.

1.1 Introduction

The BLM's Butte Falls Resource Area is proposing a forest management project that includes timber harvest and the associated road work and activity slash fuels reduction, dispersed campsite and off-highway vehicle trail rehabilitation, water source restoration, special forest products harvest, and scattered salvage harvest. This EA (environmental assessment) documents the environmental analysis the BLM conducted to estimate the site-specific effects on the human environment that may result from implementation of this project. The EA will provide the BLM Authorized Officer (Butte Falls Field Manager) with current information to aid in the decisionmaking process. It will also determine if there are significant impacts not already analyzed in the Environmental Impact Statement for the Medford District's Resource Management Plan and whether a supplement to that Environmental Impact Statement is needed or if a Finding of No Significant Impact is appropriate.

1.1.1 Proposed Action

The BLM is proposing forest management activities on up to 3,000 acres of matrix lands and 315 acres of riparian reserves. Forest management activities could include sample tree falling, regeneration harvest, selection harvest, density management, commercial thinning, dry forest management, small diameter thinning, tree planting, and slash disposal activities such as piling and burning, underburning, and biomass utilization. Road projects proposed to

support forest management activities are road renovation, road decommissioning, permanent road construction, and temporary spur road construction and decommissioning. Road decommissioning is also proposed in areas located outside of forest management activities.

The BLM is evaluating dispersed campsites along 14 miles of West Evans Creek to determine if sites should be closed and rehabilitated, restricted in size, or blocked to prevent vehicles from entering West Fork Evans Creek.

The BLM proposes restoration activities on 22 water sources that are used by fire engines, water tenders, and helicopters as water sources during wildfire suppression, and by wildlife for drinking water, habitat, and foraging opportunities. Maintenance would restore water-holding capacity in and access to existing water sources.

The BLM plans to evaluate the harvest of special forest products and small quantities of scattered salvage timber throughout the Evans Creek watershed.

1.1.2 Project Area

The Evans Creek Project Area is located within 3 miles of the town of Rogue River, Oregon in the south and extends north to the Rogue-Umpqua Divide. Proposed projects would occur in the Evans Creek, Upper Cow Creek, and Trail Creek fifth field watersheds (Table 1-1). Timber would also be hauled out through the Jumpoff Joe Creek fifth field and the Gold Hill/Rogue River watershed. The majority of the proposed projects are focused in the Evans Creek fifth field watershed.

Table 1-1. Land Ownership in the Fifth Field Watersheds containing the Project Area

Land Owner/ Jurisdiction	Fifth Field Watershed			Total	
	Evans Creek	Upper Cow Creek	Trail Creek	Acres	Percent
Bureau of Land Management	59,259	586	663	60,508	39
US Forest Service	1,092	6,315	38	7,445	5
Private Industrial Timber Land	49,358	397	290	50,045	33
Private Land	33,427	219	870	34516	22
State	142	653		795	1
Total	**143,278**	**8,170**	**1,861**	**153,309**	**100**

The Project Area is located on BLM-administered lands in

- Township 32 South, Range 2 West, section 33;
- Township 32 South, Range 3 West, sections 30, 31, 34, 35;
- Township 33 South, Range 2 West, sections 5, 7, 9, 17, 19, 21, 27, 29;
- Township 33 South, Range 3 West, sections 1, 3-5, 7-9, 11, 13, 17-21, 23, 25, 27, 29, 31, 33;
- Township 33 South, Range 4 West, sections 23, 25, 35;
- Township 34 South, Range 2 West, sections 5, 9, 15-17, 19, 21, 33;
- Township 34 South, Range 3 West, sections 1, 3, 5, 7, 9, 11, 13 15, 17, 23;
- Township 34 South, Range 4 West, sections 1, 3, 7, 10, 11, 13, 17, 19, 23, 25, 31, 32;

- Township 34 South, Range 5 West, section 24;
- Township 35 South, Range 3 West, sections 1, 3-5, 7, 9, 10, 17;
- Township 35 South, Range 4 West, section 19;
- Township 35 South, Range 5 West, section 1, 13;
- Township 36 South, Range 4 West, sections 4, 5;
- Township 36 South, Range 5 West, section 1;
- Willamette Meridian; Jackson County, Oregon.

The nearest main transportation routes are Interstate 5, East Evans Creek Road, and West Evans Creek Road (Map 1).

1.2 Purpose

To be given serious consideration as a reasonable alternative, any action alternative must meet the objectives provided in the Medford District ROD/RMP (Record of Decision and Resource Management Plan) for projects to be implemented in the Project Area.

1.2.1 Timber Harvest

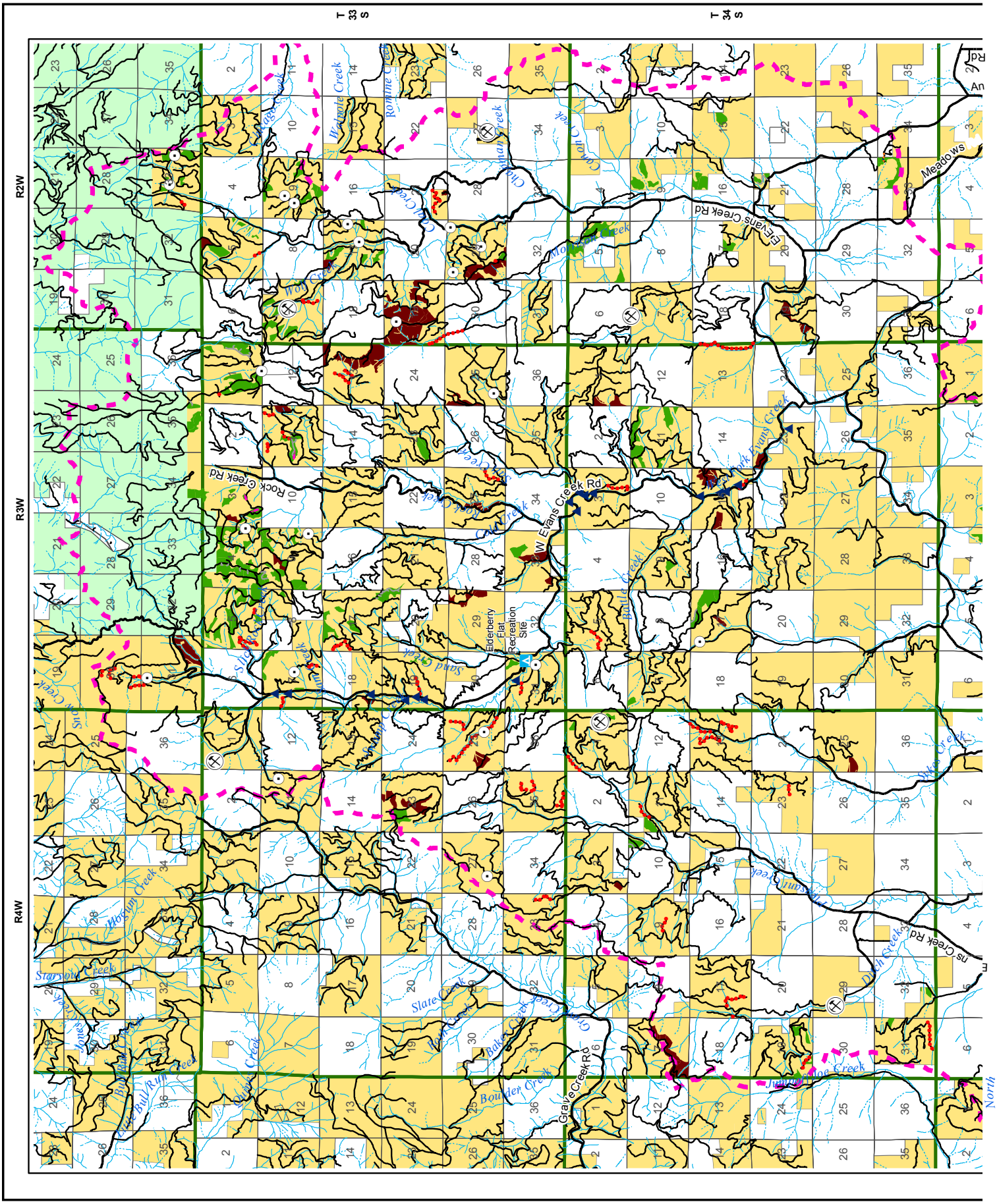
Design economical commercial timber sales on matrix lands in the Evans Creek, Upper Cow Creek, and Trail Creek fifth field watersheds.

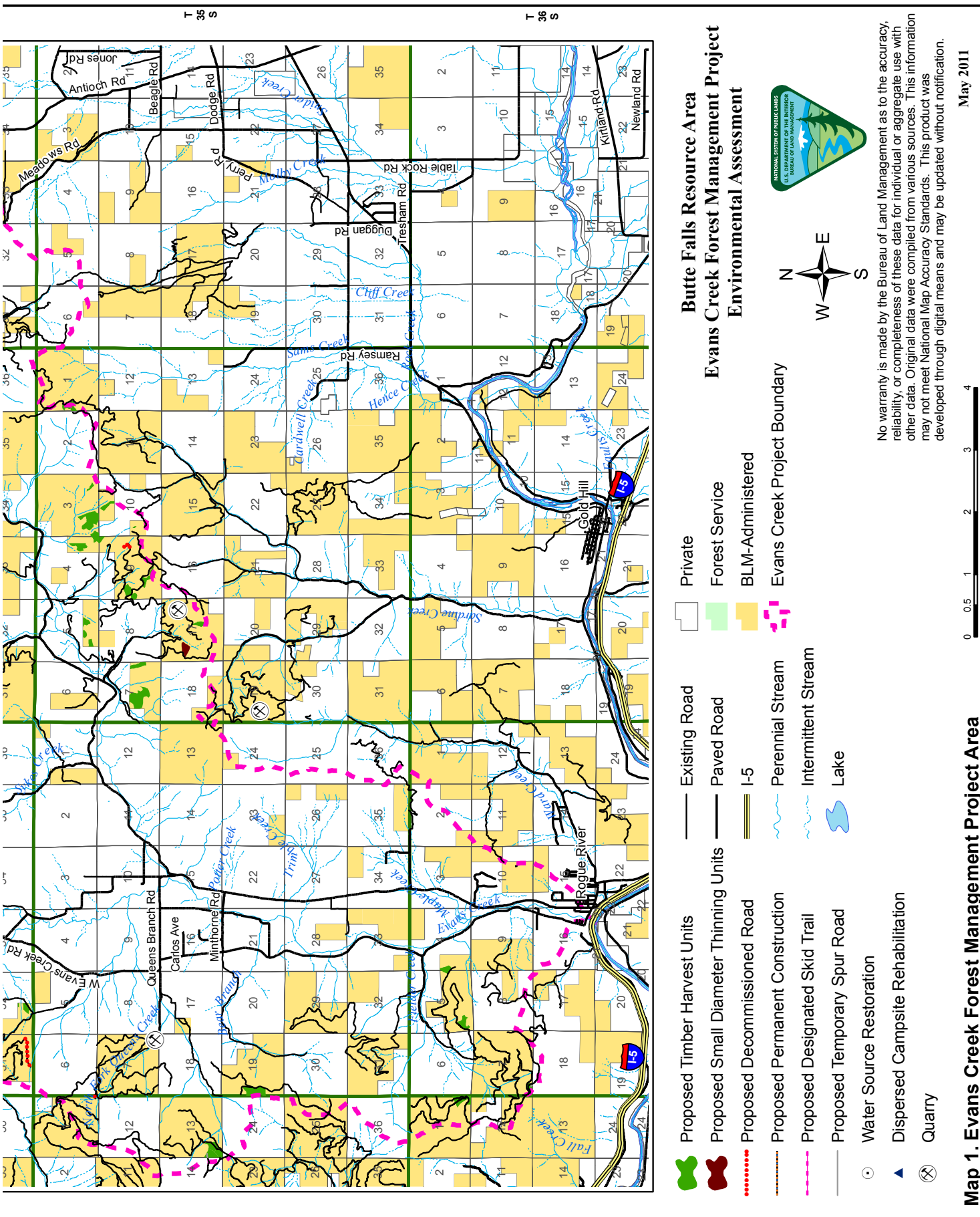
The proposed timber sales and stewardship contracts would produce revenue for the Federal government and could contribute between 15.5-18.5 million board feet of timber toward the Medford District's annual Allowable Sale Quantity during fiscal years 2011-2013. The BLM would use sample tree falling to provide an accurate estimation of the quality and volume of wood to be offered in the timber sales and to assure the BLM recovers a fair value for the harvested timber. The ROD/RMP (p. 81) directs the BLM to design and implement forest management activities to produce a sustained yield of products to support local and regional economic activity.

Timber on matrix lands in the Project Area allocated to northern GFMA exceeds the minimum harvest age of 100 years established in the Medford District ROD/RMP (p. 181). Timber on matrix lands allocated to southern GFMA exceeds the minimum harvest age of 150 years (ROD/RMP, p. 194). The ROD/RMP assumed stands on matrix lands that exceed the minimum harvest age would be regeneration harvested.

Reduce stand densities in stands less than 120 years old in order to make site resources available for remaining trees.

Stands which are older and developmentally more complex (exhibit a multiple layer stand structure) would be selection harvested. Selection harvest would create a multiple canopy, multiple ages stand (ROD/RMP, p. 182). For this project, selection harvest would be used to avoid removal of northern spotted owl habitat or to maintain northern spotted owl habitat.


T 33 S
T 34 S
R4W
R3W
R2W
Rock Creek Rd
W Evans Creek Rd
E Evans Creek Rd
Meadows
Elderberry Flat Recreation Site
Grave Creek Rd
Starvout Creek
Slate Creek
Boulder Creek
Bull Run Creek
Jones Creek
Hogum Creek
Sand Creek
Bear Creek
Wildcat Creek
Rowline Creek
Cow Creek
Mosquito Creek
Dry Creek
Bear Creek
Jumbo Creek
Dry Creek
Bike Creek
North


Butte Falls Resource Area
Evans Creek Forest Management Project
Environmental Assessment
Proposed Timber Harvest Units
Proposed Small Diameter Thinning Units
Proposed Decommissioned Road
Proposed Permanent Construction
Proposed Designated Skid Trail
Proposed Temporary Spur Road
Water Source Restoration
Dispersed Campsite Rehabilitation
Quarry
Existing Road
Paved Road
I-5
Perennial Stream
Intermittent Stream
Lake
Private
Forest Service
BLM-Administered
Evans Creek Project Boundary
N
E
S
W
0 0.5 1 2 3 4
Miles
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.
May 2011
Map 1. Evans Creek Forest Management Project Area
T 35 S
T 36 S
Jones Rd
Antioch Rd
Meadows Rd
Beagle Rd
Dodge Rd
Perry Rd
Table Rock Rd
Treshan Rd
Duggan Rd
Ramsey Rd
Kirtland Rd
Newland Rd
Queens Branch Rd
Carlos Ave
Minthorne Rd
W Evans Creek Rd
Gold Hill
Rogue River
I-5
Molby Creek
Cliff Creek
Sams Creek
Hardwell Creek
Henice Creek
Solstice Creek
Trimble Creek
Porter Creek
Evans Creek
Fall Creek
Fowlers Creek

Reduce tree densities in stands less than 120 years old that have a more simplified stand structure with limited layers present in order to control stocking levels and to redistribute the growth potential to fewer, but larger, trees.

Commercial thinning is programmed in the ROD/RMP on matrix lands for stands less than 120 years old that have reached a combination of stem diameter and surplus volume to allow an economical entry. Commercial thinning would be designed to assure high levels of volume productivity (ROD/RMP, p. 185).

Maintain or enhance forest health, stand structure, and function in commercial thinning stands identified as northern spotted owl habitat.

The ROD/RMP allows density management to occur in stands programmed for commercial thinning in order to retain patches of denser habitat where desired to meet criteria for wildlife habitat (ROD/RMP, p. 189).

Reduce tree densities to increase landscape resiliency to environmental disturbances.

Forest stands with densities that exceed historic conditions and natural carrying capacities would be harvested using dry forest management techniques. Dry forest management would be implemented to reduce tree mortality and restore stand vigor, resiliency, and stability (ROD/RMP, p. 186).

Aid in the reforestation of the areas proposed for regeneration harvest.

A combination of existing regeneration, natural seeding, and tree planting would be used, when applicable, to meet regeneration targets and timeframes for the stands. ROD/RMP direction is to apply silvicultural systems that are planned to produce over time forests that have desired species composition, structural characteristics, and distribution of seral or age classes (ROD/RMP, p. 72-73).

1.2.2 Road Work

Reduce the potential for sediment production on up to 130 miles of roads that would be used to haul harvested timber.

Roads in the Project Area are potential sources of sediment to streams. Before timber is hauled on these roads, the timber sale purchaser must implement measures to minimize sediment production from timber hauling and sediment delivery to streams. ROD/RMP direction is to restore or improve roads to a desired standard in a manner that minimizes sediment production and water quality degradation (ROD/RMP, p. 163).

Decrease the possibility of sediment entering streams by decommissioning approximately 16 miles of road that are no longer needed for access.

The ROD/RMP recommends “closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to Aquatic Conservation Strategy and riparian reserve objectives and considering short-term and long-term transportation needs” (ROD/RMP, p. 28).

Provide vehicular access to proposed harvest units on BLM-administered lands in the Project Area that are not accessible by existing roads.

The ROD/RMP directs roads to be located to minimize soil erosion, water quality degradation, and disturbance to riparian vegetation by minimizing road locations in riparian reserves and locating roads on stable positions, such as ridges (ROD/RMP, p. 28 and 157).

1.2.3 Fuels Treatment associated with Timber Harvest

Reduce the potential risk of wildfire that may result from the slash produced during harvest activities.

Forest management activities produce fuels that could remain a fire hazard for 10 to 20 years, if left untreated, until natural decomposition occurs. ROD/RMP direction is to reduce activity-based fuel hazards (ROD/RMP, p. 91).

1.2.4 Dispersed Campsite and Off-highway Vehicle Trail Rehabilitation

Reduce the impacts from unrestricted dispersed camping along West Fork Evans Creek and eliminate vehicular access to the creek from those campsites.

Seventeen dispersed campsites on BLM-administered land within the riparian area of West Fork Evans Creek are creating adverse effects to riparian and aquatic habitat. User-created off-highway vehicle trails connect several of the campsites and enter or cross West Fork Evans Creek. Dispersed camping and vehicular access to West Fork Evans Creek is altering riparian vegetation and contributing sediment to West Fork Evans Creek. ROD/RMP direction is to adjust dispersed recreation practices that retard or prevent attainment of Aquatic Conservation Strategy and riparian reserve objectives (ROD/RMP, p. 68).

1.2.5 Water Source Restoration

Improve water resources available for wildfire suppression and wildlife in the Evans Creek watershed.

Water sources at 21 sites in the Evans Creek watershed are in poor to fair condition and are currently not usable by firefighting equipment. ROD/RMP direction is to supply water for various resource programs while protecting water quality and riparian vegetation (ROD/RMP, p. 165).

1.2.6 Special Forest Product and Scattered Salvage Harvest

Provide opportunities for the sale and harvest of special forest products and recover some economic value from the salvage of scattered dead trees, and scattered dead and green hazard trees in the Evans Creek watershed.

ROD/RMP direction is to allow harvest of special forest products throughout the District, with area and plant species/group restrictions listed in the RMP (p. 76). On lands not available for planned forest management, ROD/RMP direction is to salvage killed or substantially damaged timber using special silvicultural prescriptions designed to meet the needs of nontimber allocations made on those lands and provide for the safety of forest users (ROD/RMP, p. 72).

1.3 Need

BLM employees, through data analysis and field examinations, have identified overstocked stands in the Project Area that need immediate forest management activities because the stands contain more trees than the sites have water, nutrients, and growing space to sustain. Fire suppression, wildfires, and forest management activities have altered the historic vegetative patterns in the Evans Creek fifth field watershed. Management practices, such as selective cutting, overstory removal, and mortality salvage, along with fire suppression have contributed to overstocked stands and high densities. Overstocked stands have a greater potential for severe stand-replacing wildfires. Clearcutting, shelterwood harvest, and large stand-replacing fires have shifted many contiguous stands of late-successional forest to a patchy mosaic of young stands. Older forest stands in the area have declining growth rates or are deteriorating due to insects, disease, or other factors. Declining growth rates have resulted in reduced volume yield from these matrix lands. The proposed forest management activities are needed in the Project Area to reduce the number of trees and reverse these trends so the stands would persist and contribute to future forest production and other RMP objectives.

Local economies and governments depend on the contributions the BLM-administered lands make to employment and income. In stands identified for harvest, the BLM needs to design economically viable timber sales that accurately predict the volume of timber that would be offered for sale.

In September 2010, the US Fish and Wildlife Service (USFWS) released the *Draft Revised Recovery Plan for the Northern Spotted Owl*, which contains 34 Recovery Actions. Recovery Actions are recommendations to guide activities needed to accomplish the recovery objectives and ultimately lead to delisting of the species. Specifically, Recovery Action 32 (RA32) in the Recovery Plan recommends maintaining "all of the older and more structurally complex multi-layered conifer forests on Federal and non-Federal lands across the range of the spotted owl . . ." (U.S. Fish and Wildlife Service 2010, 69). The intent of RA32 is to not further exacerbate the competitive interactions between spotted owls and barred owls. The BLM needs to maintain existing habitat within the provincial home range (1.3-mile radius) of known active northern spotted owl sites and all or substantially all of the older and more structurally complex, multilayered conifer forests.

Road construction and the use of existing and new haul roads and skid trails associated with forest management activities are considered sources for sediment in streams (PRMP/EIS, p. 4-19, 4-20). Sediment levels can adversely affect water quality and could impair fish production. When high, fine sediment levels occur in spawning gravels, less spawning occurs, eggs may be suffocated, and emerging fry become trapped, resulting in reduced fish production. Before roads are used for hauling timber, they need to be renovated to reduce the probability of sediment entering streams from these roads. Proposed timber harvest units that are currently inaccessible by vehicle need roads constructed to allow short- or long-term access. Roads need to meet the road standards set forth in BLM 9100 series manuals, the Medford District ROD/RMP, and the BMPs (best management practices) contained in the ROD/RMP. Roads no longer needed for access need to be decommissioned.

Unrestricted dispersed camping in riparian areas and unauthorized off-highway vehicle use in streams have removed riparian vegetation, compacted stream bank soils, and caused sediment

to enter West Fork Evans Creek. Limiting the size of the dispersed campsites and eliminating off-highway vehicle access is necessary to reduce sediment delivery into West Fork Evans Creek from those activities.

Water sources constructed primarily for fire suppression also provide a supply of drinking water and habitat for wildlife. Existing water sources are overgrown or have been breached and no longer hold water. These water sources require maintenance to restore them to a functional condition that provides access for firefighting equipment.

The Bureau receives requests for recreational, personal, and commercial collection of special forest products. The BLM needs to provide the public with the opportunity to harvest these products to satisfy demand and to manage the harvest to protect the forest resources and reduce environmental impacts.

On occasion, the BLM falls individual or small groups of dead, diseased, or injured trees, or trees that are a safety hazard. The economic value of these trees needs to be recovered in areas where coarse woody debris levels meet RMP recommendations for matrix lands.

1.4 Issues

1.4.1 Scoping

Scoping is the process used to identify the range of issues, management concerns, preliminary alternatives, and other components of a NEPA (National Environmental Policy Act) document. It involves internal and public viewpoints. The Butte Falls Resource Area first began outreach for this project in fall 2007 when a letter initiating the scoping period was mailed October 15, 2007 to 600 individuals, businesses, organizations, tribes, and government agencies. A legal notice requesting comments was published in 4 local newspapers (*Medford Mail Tribune*, Grants Pass *Daily Courier*, Eagle Point *Upper Rogue Independent*, and *Rogue River Press*). The BLM received a total of 14 comment letters in response.

The BLM hosted a public meeting in Wimer, Oregon on February 28, 2008 to present preliminary project proposals to the public. Invitations were mailed to 91 people. The meeting was attended by 27 people and generated 2 comment letters.

On April 24, 2008, the BLM decided to temporarily delay the Evans Creek project in order to concentrate on the salvage of trees blown down during winter storms. The Evans Creek project was resumed when the BLM mailed a second letter to reinitiate scoping for the Evans Creek Forest Management Project. This letter was mailed on July 1, 2010 to 151 individuals, businesses, organizations, tribes, and government agencies. The BLM received a total of 11 comment letters in response to this mailing. In addition, the BLM received 244 nearly identical e-mail comments.

In February 2011, the BLM posted a Web site for the Evans Creek project to provide the public with current and background information. The Web site contained links to a project summary, time line, and maps. It supplied the scoping letter and scoping comments, photographs, and links to recommended reading.

1.4.2 Issues Identified for Analysis

Issues provide a basis for comparing the environmental effects of the alternatives and aid in the decision-making process. The major issues brought forward were used to identify appropriate project design features or analyze environmental effects. Based on input from the public and the ID (Interdisciplinary) Team plus information contained in the ROD/RMP, the following issues were identified.

1.4.2.1 Sediment

Can the BLM harvest timber on Federal lands while maintaining or reducing the amount of sediment reaching streams?

High road density, unauthorized off-highway vehicle trails, and highly erodible fragile soils combine to contribute sediment to the streams in the Project Area. Sediment in fish-bearing streams can suffocate eggs and fill in pools that are important to fish rearing.

1.4.2.2 Northern Spotted Owl Habitat

Can the BLM provide silviculture treatments in northern spotted owl habitat without harm to an individual owl?

Forest stands on matrix lands in the Project Area contain northern spotted owl habitat (nesting, roosting, foraging, or dispersal). These stands are programmed for silviculture treatments. To treat these stands, the BLM must design management actions that would maintain or improve northern spotted owl habitat in order to prevent harm to known northern spotted owls.

1.4.2.3 Economics

How can the BLM provide an economical timber sale while maintaining healthy, diverse, and productive ecosystems?

Many factors influence the cost of removing timber from Federal lands: harvest prescription, yarding system, volume, road needs, activity slash treatment, hauling distances, and seasonal operating restrictions. The BLM must carefully balance these economic factors with ecosystem needs to design an economically viable timber sale.

1.4.2.4 Forest Condition

How can the BLM promote the growth and vigor of overstocked forest stands in the Project Area?

Forest stands in the Project Area are overstocked with more trees than the sites have moisture, nutrients, and growing space to sustain. The supply of essential site resources has decreased while the demand has increased. Without adequate resources, tree growth and vigor declines, increasing the probability of tree mortality from insects or disease.

1.5 Decision Factors

In choosing the alternative that best meets the purpose and need, the BLM will consider the extent to which each alternative would:

- reduce competition-related mortality and wildfire risk, and increase tree vigor and growth;
- provide for the establishment and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris;
- promote the development of healthy, late-successional characteristics;
- provide timber resources and provide revenue to the government from the sale of those resources;
- reduce erosion and subsequent sedimentation from roads and reduce road densities;
- reduce the short-term and long-term costs of managing the lands in the Project Area;
- maintain or improve long-term soil productivity on all treatment units; and
- maintain or improve existing highly suitable northern spotted owl habitat within the provincial radius (1.3 miles) of known active northern spotted owl sites and all or substantially all of the older and more structurally complex, multilayered conifer forests.

1.6 Legal Requirements

This proposed forest management project is in conformance with the objectives, land use allocations, and management direction in the 1995 ROD/RMP and any plan amendments in effect at the time this document is published.

The project also conforms with:

- Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan)
- Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (2001 Survey and Manage)

The analysis in the Evans Creek Forest Management Project EA is site-specific and supplements the broader analyses found in the *Medford District Proposed Resource Management Plan/Final Environmental Impact Statement* (PRMP/FEIS). The PRMP/FEIS includes the analysis from the *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* (Northwest Forest Plan FSEIS).

The BLM developed this project to be in compliance with the following laws, regulations, and policies: Oregon and California Railroad and Coos Bay Wagon Road Grant Land Act (O&C Act), Federal Land Policy and Management Act (FLPMA), Endangered Species Act (ESA), National Environmental Policy Act (NEPA), Archaeological Resources Protection Act (ARPA), Clean Air Act (CAA), and Clean Water Act (CWA).

1.7 Decisions to be Made

The following decisions will be made through this analysis:

- To determine if an SEIS (Supplemental Environmental Impact Statement) should be prepared based on whether the proposed action would result in significant impacts to the human environment not already analyzed in the EIS prepared for the Medford District ROD/RMP and its amendments. If there are any such additional impacts that are significant, we will determine whether the project proposals could be modified to mitigate the impacts so an SEIS would not be necessary. If we determine there is no need to prepare an SEIS, we will document this determination in a Finding of No Significant Impacts.
- To determine at what level, where, and how to harvest trees on BLM-administered lands allocated to the programmed timber harvest base within the Project Area.
- To implement or not implement proposed restoration projects (road decommissioning, dispersed campsite and off-highway vehicle rehabilitation, water source restoration) on BLM-administered lands within the Project Area and, if so, which projects, at what level, and where.
- To allow or not allow the harvest of special forest products and scattered salvage on BLM-administered lands in the Project Area and, if so, which products, at what level, and where.

2.0 Alternatives

Chapter 2 provides a description of the proposed project. The alternative ways for meeting the need for this project and the objectives identified in Chapter 1 are presented. Project design features that serve as the basis for resource protection during project implementation are included.

The following definitions are for terms used in this section:

biomass. Unmerchantable and waste plant materials used as a source of renewable combustible fuel. Also includes non-sawlog material ground up into fiber and used in secondary wood products.

canopy cover (canopy closure). The ground area covered by the crowns of trees or woody vegetation as determined by the vertical boundary of the crown perimeter.

core area. An area that contains habitat essential in the breeding, nesting, and rearing of young, up to the point of dispersal of the young. It is the area within the home range that receives a disproportionate amount of use. For northern spotted owls, it is a 0.5-mile radius circle (about 500 acres) from the nest or center of activity that delineates the area most heavily used by northern spotted owls during the nesting season.

cruise (cruising). Collecting data in a forest and accurately measuring and assessing the volume and quality of timber in that forest.

end haul. Excavated material moved, other than by dozer, to an embankment or waste area to prevent sidecasting material outside of the road prism.

grapple. Large, pincherlike mechanism on a skidding machine used to pick up prebunched logs.

home range. The area an animal traverses in the scope of normal activities. For northern spotted owls, the provincial home range is a circle around an activity center that represents the area the owls are assumed to use for nesting and foraging in any given year. The size of the circle depends on the province in which the project is located. For the Evans Creek project, the provincial home range is 1.3 miles (about 3,400 acres).

landing. A place where logs are assembled, processed, and loaded on trucks for further transport.

nest patch. The 300-meter radius area (about 72 acres) around a known or likely northern spotted owl nest site. It is included in the core area.

relative density. A means of describing the level of competition among trees or site occupancy in a stand, relative to a theoretical maximum that is based on tree size and species composition. Relative density is determined by dividing the stand basal area by the square root of the quadratic mean diameter (the average dbh of the tree that is of average basal area in a stand).

skid trail. A route along which logs are transported to a landing.

skidding. Pulling logs with equipment or horses from the stump to the landing.

stocking. Related to the number and spacing of trees in a stand.

2.1 Introduction

The ID Team for the Evans Creek Forest Management Project developed three action alternatives for meeting the objectives of the project. These alternatives vary in the response to the issues identified in Chapter 1. In addition, we have included a No Action Alternative (Alternative 1) to provide a baseline for comparison. The action alternatives explore a range of options for forest management in the Project Area.

2.2 Proposed Projects

2.2.1 Forest Management

2.2.1.1 Timber Harvest

Regeneration harvest would occur in older forest stands with declining growth rates or experiencing deterioration from insects, disease, or other factors. Retained trees would be the most vigorous trees and would be selected based on tree crown ratio and form. Northern GFMA (General Forest Management Area) regeneration harvest would retain 6 to 8 trees per acre greater than 20 inches dbh (diameter at breast height). A canopy closure of 10 to 15% would remain after harvest. Southern GFMA regeneration harvest would retain 16 to 25 green

trees per acre greater than 20 inches dbh. A canopy closure of 25 to 40% would remain after harvest. Regeneration harvest units would be replanted after harvest.

Selection harvest 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 stand structure would have multiple layers with multiple-aged trees. Canopy cover would range from 40 to 60% following harvest.

Sample tree falling would fall, buck, and scale trees within proposed timber sale units to ensure the accuracy of the timber cruises for the timber sales resulting from this project. Sample tree falling is essential in determining wood quality and level of defect so timber sale volume can be more accurately predicted. Only trees selected for harvest in the timber sales would be felled; these trees would be randomly selected and would be bucked to standard, merchantable lengths for evaluation of condition and value and direct measurement of volume. Sample tree falling would be limited to an average of no more than one tree per acre or less. Trees available for sample falling would range from 6 to 32 inches dbh from all conifer species and would reflect the percentages of each conifer species on the landscape.

Sample tree falling would be one of the last activities completed during the preparation of a timber sale. Sample tree felling would occur as part of the timber cruising process, before a timber sale decision is issued, but after completion of planning and environmental analysis by an ID team, all site inventories (e.g., wildlife, botany, and cultural resources), and sale layout and preparation. Trees felled for sample trees would be yarded during the timber sale harvest operations.

Commercial thinning is used to control stocking and to redistribute the growth potential to fewer but larger trees. Removal of smaller trees and trees in direct competition with healthy dominant and codominant trees would redirect the site resources toward the development and maintenance of large healthy trees. A minimum of 40% canopy cover would remain after harvest.

Density management would thin trees from below to maintain or enhance forest health, stand structure, and function for northern spotted owl habitat. The residual canopy cover would be a minimum of 40 or 60%, depending on the current owl habitat designation (dispersal or nesting, roosting, and foraging), with multiple layers present.

Dry forest management would reduce stand densities to increase landscape resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change). Smaller trees and vegetation that compete with the dominant and codominant trees for nutrients and water would be removed. All trees 150 years or older and all of the largest hardwoods would be retained. Structural diversity within stands would be achieved by leaving small, unthinned patches and creating small openings. Unthinned patches and small openings would range from 0.1 to 0.25 acre and occupy 10 to 15% of the stand acreage. A minimum of 40% canopy cover would remain after harvest.

Small diameter thinning would thin stands to promote stand health, create structural diversity within the stands, and increase landscape resiliency to environmental disturbances. Riparian areas located adjacent to upland thinning units would be thinned using a similar prescription

with an emphasis on retaining riparian species (e.g., maple, willow). In mixed conifer stands, conifer trees 8 inches and greater would be thinned to a 25% relative density on sites where average rainfall is less than 35 inches per year, and a 35% relative density on sites where average rainfall is more than 35 inches per year. Pine stands would be thinned to a 25% relative density. Approximately 10 to 15% of the stands would be left in unthinned patches and small openings ranging in size from 0.1 to 0.25 acre. In conifer stands containing hardwoods, 3 to 5 of the largest hardwood trees per acre would be retained. In stands where the relative density of trees larger than 8 inches is less than 35%, trees less than 8 inches would be thinned and spaced 20 feet from existing conifer trees. In stands more than 80 years old, all trees (hardwoods and conifers) 16 inches and more in diameter would be retained.

Hardwood management would thin hardwood trees 8 inches and over to a 30% relative density. Black oak would be the favored leave species. Trees would be thinned in a clumpy pattern instead of strictly on spacing. Healthy conifers would be retained. In stands where the relative density of trees larger than 8 inches is less than 30%, trees less than 8 inches would be thinned and spaced 15 feet from existing conifers. All hardwoods 16 inches in diameter and larger would be retained in thinning stands over 80 years old. One 35-acre hardwood stand more than 80 years old that contains a high component of larger hardwoods would be treated using group selection to create 1-acre openings that would promote stand diversity and release conifers. Between the openings, all trees 16 inches and larger would be left and hardwoods 8 to 16 inches in diameter would be thinned to a relative density of 30%. Riparian areas within this stand would not be harvested.

2.2.1.2 Timber Yarding

Yarding, or skidding, the felled timber from the stump to the landing would be accomplished using ground-based, skyline-cable, and helicopter yarding systems.

Ground-based yarding uses a skidder (rubber-tired or tracked) or tractor that moves from the landing into the harvest unit on designated skid trails. Skidders or tractors are equipped with a cable (winch) line drum, grapples, or both. The winch drum holds 75 to 150 feet of cable called the bull or winch line. Depending on their proximity, trees would be bull lined or grappled to the skid trail. The bull line can run directly to the logs or, more commonly, through an integral arch mounted on the machine. When the trees are on the skid trail, the skidder or tractor skids the trees to the landing. An integral arch or grapple lifts the front end of the logs off the ground during the skidding process. This lift reduces friction between the logs and the ground, reduces soil disturbance, and improves traction by transferring part of the log weight to the skidder. The skidder would travel on skid trails that are designated and approved by the BLM. Ground-based yarding is generally limited to slopes of 35% or less. Skid trails and landings no longer needed for future management activities would be ripped after harvest is completed.

Cut-to-length or feller-buncher tree harvesting systems could be used within the small diameter thinning units that meet ground-based yarding criteria. The cut-to-length harvester cuts and processes the tree out in the harvest unit. The harvester moves through the trees felling, delimbing, bucking, and bunching trees. The harvester fells a tree and as it delimbs the tree, it places the limbs on the ground in front of the harvester to walk over as it moves through the woods. Walking the equipment over the limbs reduces amount of soil the equipment may compact, decreases fire-related problems with slash, and helps decompose the

slash more quickly. This system requires another piece of equipment, a forwarder, to move the logs out to the road or landing. The forwarder is equipped with a boom with grapples to pick up the logs and a bunk where logs are stacked. The loader loads the processed logs onto the bunk and then carries the logs to the road or landing.

The feller-buncher falls and bunches trees mechanically with hydraulically driven chain saws, circular saw, or shears. Feller-bunchers can be a tree-to-tree machine, where the machine walks up to each tree to cut, or an excavator with saws attached to a boom. In the latter case, the excavator maneuvers the boom and reaches out to cut the tree, avoiding the need to walk up to each individual tree. A feller-buncher bundles the whole, felled trees for a skidder to pick up and skid to a landing. Unlike the cut-to-length system, the feller-buncher system limbs the trees and cuts into log lengths at the landing.

Skyline-cable yarding uses a stationary machine, or yarder, that sits on the road and pulls the logs to the landing using stationary steel cables with a moveable carriage. They are generally used on ground too steep for ground-based yarding. The skyline cable is the major load-bearing line; it provides most of the lift to the logs. A mainline cable runs to or through the carriage and pulls the carriage and logs along the skyline to the landing. One end of the log is suspended unless a topographic condition (convex slopes, benched ground) reduces the ability to lift the end of the log off the ground.

Helicopter yarding can be used on most any terrain and is not dependent on road location or harvest treatment. Helicopters use a tag line (cable), generally 150 feet or greater, to lift the logs above the standing timber and fly them to a landing.

2.2.1.3 Reforestation

Regeneration harvest units would be replanted after harvest with the following mix of native conifers: 70% Douglas-fir, 20% ponderosa or sugar pine, and 10% incense cedar. Approximately 300 to 500 trees per acre would be planted. Vegetation would be scalped for a 6-inch radius around the planting hole prior to planting.

Target stands would contain 229 well-spaced trees per acre with a minimum stocking level of 60% of the target (140 well-spaced trees per acre). At 1, 3, and 5 years after planting, the BLM would conduct surveys to determine seedling survival, stocking levels, and maintenance (e.g., tubing, mulching, shading, scalping) needs. Replanting would occur if needed to meet the target number of trees per acre. If necessary, radius hand-scalping would remove competing vegetation for a 3-foot radius around planted seedlings.

2.2.2 Road Work

2.2.2.1 Road Renovation

Before roads are used for forest management activities, road surfaces would be bladed and ditch lines cleaned, where needed; catch basins would be cleaned or enlarged; brush growing near culvert inlets or outlets would be removed; culvert 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. Crushed aggregate material would be placed on sections of inadequately surfaced roads that would be used for hauling logs.

2.2.2.2 Road Decommissioning

BLM roads no longer needed for access would be ripped, seeded with native grasses, mulched, and planted to reestablish vegetation. Cross-drain culverts, road fills in stream channels, and potentially unstable fill areas would be removed to restore the natural hydrologic flow. Roads would be closed with a device similar to an earthen barrier or equivalent and would not be maintained in the future.

2.2.2.3 Permanent Road Construction

Roads would be constructed where permanent access to proposed and future harvest units is needed. Roads may be temporarily blocked after use but would remain in the BLM road record inventory for future use.

2.2.2.4 Temporary Spur Road Construction

Spur roads would be constructed to allow operators temporary access to harvest units. All temporary spur roads would be located on stable areas. After harvest is complete, the roads would be decommissioned in the same season as used. Temporary spur roads would be ripped, seeded with native grasses, mulched, and blocked.

2.2.3 Fuels Treatment Associated with Forest Management

2.2.3.1 Lop and Scatter

When the slash (live and dead material 9 inches or less) remaining in the units after harvest is less than 11 tons per acre, all stems and branches would be cut from the tree trunk and scattered. Trunks 7 inches in diameter and less would be cut to 3-foot lengths and left on the ground. The depth of the slash would not exceed 18 inches.

2.2.3.2 Hand Piling and Hand Pile Burning

When the slash remaining in the units after harvest is greater than 11 tons per acre, material between 1 and 7 inches in diameter and longer than 2 feet would be piled by hand. The piles would be a minimum of 4 feet high and 6 feet in diameter. Piles would be burned in the fall, winter, or spring.

2.2.3.3 Maintenance Underburning

Fire would be used when the slash remaining in the units after harvest is less than 5 tons per acre. Maintenance underburning would use prescribed fire to remove at least 60% of the harvest slash less than 3 inches in diameter and a lesser amount of the larger size slash.

2.2.3.4 Biomass Removal

Whole trees or tree tops would be yarded to log landings, the tree tops and limbs removed and piled at the landings, and the resulting piles of slash hauled away from the landings. Whole tree yarding and tree top yarding would not be required but are options for treating slash in the small diameter thinning project.

2.2.4 Dispersed Campsite and Off-highway Vehicle Trail Rehabilitation

User-created campsites located along 14 miles of West Fork Evans Creek Road, from Evans Creek to Cedar Creek, would have boulders or barricades placed to define the limits of each campsite and to prevent off-highway vehicles from accessing West Fork Evans Creek. Boulders would be at least 3 feet in diameter and would be partially buried to deter moving. Other barrier methods could be used if they are relatively maintenance-free and easy to repair or replace. Where vehicles are crossing the creek, boulders or barricades would be placed on both sides of the creek to prevent vehicle entry. Trails blocked from access would be ripped and planted with native stock shrubs and trees.

2.2.5 Water Source Restoration

Existing water sources would be maintained to allow use by fire engines, water tenders, and helicopters for fire suppression and by wildlife for drinking water, habitat, and foraging opportunities. Maintenance activities would include clearing brush and trees; removing accumulated sediment from developed spring sites; installing, repairing, or replacing spring boxes and culverts; repairing or replacing pipelines; installing, repairing, or replacing devices such as bentonite or pond liners that impede water seepage; installing safety devices such as fences and exit ramps; and completing minor road work such as grading and adding rock.

2.2.6 Special Forest Product and Scattered Salvage Harvest

A variety of special forest products and small quantities of scattered salvage timber would be authorized for harvest. All nonwood products would be harvested manually. Wood products would be harvested using mechanical equipment such as chainsaws, skidders, cable yarding equipment, helicopters, loaders, and log trucks. Existing skid trails would be used; no new skid trails would be constructed.

Appendix K contains a more comprehensive description of the special forest product and scattered salvage harvest project.

2.3 Alternative 1 (No Action Alternative)

The No Action Alternative describes a baseline against which the effects of the action alternatives can be compared. This alternative describes the existing condition and the continuing trends in the Project Area. Under the No Action Alternative, the proposed forest management and restoration activities would not be implemented at this time and current management would continue. Future activities in this area could be proposed and analyzed in a subsequent NEPA document.

2.4 Proposed Projects Common to All Action Alternatives

The following projects would be the same in Alternatives 2, 3, and 4: rehabilitating 17 dispersed campsites and off-highway vehicle trails, restoring 21 water sources, and authorizing special forest product harvest and scattered salvage tree harvest.

2.5 Alternative 2 (Map 2 and Table 2-1)

Alternative 2 implements management direction from the Medford District ROD/RMP for general forest management areas and riparian reserves. RMP-prescribed treatments would be applied to matrix units outside of known active owl sites. Management actions would not occur within RA32 habitat or the 70 acres (nest patch) around known and generated northern spotted owl nest sites. Riparian reserves would not be included in timber sale units.

2.5.1 Forest Management

In Alternative 2, forest management actions are proposed on 3,250 acres: 267 acres of regeneration harvest (9 acres northern GFMA and 258 acres southern GFMA), 883 acres of selection harvest, 228 acres of commercial thinning, 757 acres of density management, 792 acres of small diameter thinning, and 323 acres of hardwood management. Trees would be removed using ground-based, skyline-cable, or helicopter yarding systems. Skid trails and landings in regeneration harvest units would be ripped following completion of harvest. Regeneration harvest units would be replanted after harvest with a mix of native conifers.

2.5.2 Road Work

Road renovation would occur on 129 miles of road within the Project Area. Decommissioning would occur on 16 miles of BLM roads. Road construction would include 0.2 mile of permanent roads and 5.5 miles of temporary spur roads. The temporary spur roads and their associated landings would be decommissioned after use.

2.5.3 Fuels Treatment Associated with Forest Management

Preliminary fuels treatments were recommended for post forest management acres by alternative (Appendix F-Fuels). The BLM would conduct a fuels assessment within each unit following harvest activity. This assessment would determine the fuel hazard and fire risk based on surface fuel loading, aspect, slope, access, and location of each unit. Fuels treatments could include lop and scatter, hand pile and burn, maintenance underburn, and biomass removal. Most fuels treatments would begin within 30 days after completion of harvest activities.

2.6 Alternative 3 (Map 3 and Table 2-1)

Alternative 3 emphasizes dry forest management treatments as described in the *Restoration of Federal Forests in the Pacific Northwest: Strategies and Management Implications* (Johnson and Franklin). Alternative 3 would maintain all highly suitable habitat, as determined by the Relative Habitat Suitability modeling described in the *2010 Draft Revised Recovery Plan for the Northern Spotted Owl*. Proposed forest management actions would not downgrade or remove

the existing highly suitable habitat. Treatments would maintain all owl habitat within the 500-acre owl core area and where existing nesting, roosting and foraging habitat currently occupies less than 40% of the area within the home range of historic northern spotted owl sites. Management actions would not occur within RA32 habitat or the 70 acres (nest patch) around known and generated northern spotted owl nest sites. Riparian reserves would not be included in timber sale units.

2.6.1 Forest Management

In Alternative 3, forest management actions are proposed on 3,282 acres: 2,167 acres of dry forest management, 792 acres of small diameter thinning, and 323 acres of hardwood management. Trees would be removed using ground-based, skyline-cable, or helicopter yarding systems.

2.6.2 Road Work

Road renovation would occur on 130 miles of road within the Project Area. Decommissioning would occur on 16 miles of BLM roads. Road construction would include 0.2 mile of permanent roads and 5.5 miles of temporary spur roads. The temporary spur roads and their associated landings would be decommissioned after use.

2.6.3 Fuels Treatment Associated with Forest Management

Preliminary fuels treatments were recommended for post forest management acres by alternative (Appendix F-Fuels). The BLM would conduct a fuels assessment within each unit following harvest activity. This assessment would determine the fuel hazard and fire risk based on surface fuel loading, aspect, slope, access, and location of each unit. Fuels treatments could include lop and scatter, hand pile and burn, maintenance underburn, and biomass removal. Most fuels treatments would begin within 30 days after completion of harvest activities.

2.7 Alternative 4 (Map 4 and Table 2-1)

Alternative 4 applies silviculture management treatments that would be neutral or beneficial to northern spotted owl habitat. Owl habitat currently defined as dispersal or nesting, roosting, and foraging would not be altered to the extent that the habitat designation would be downgraded. Management actions would not occur within RA32 habitat or the 70 acres (nest patch) around known and generated northern spotted owl nest sites. Riparian reserves would not be included in timber sale units.

2.7.1 Forest Management

In Alternative 4, forest management actions are proposed on 3,191 acres: 985 acres of density management, 1,091 acres of selection harvest, 792 acres of small diameter thinning, and 323 acres of hardwood management. Trees would be tractor, skyline-cable, or helicopter yarded.

2.7.2 Road Work

Road renovation would occur on 117 miles of road within the Project Area. Decommissioning would occur on 16 miles of BLM roads. Road construction would include 0.2 mile of permanent roads and 5.5 miles of temporary spur roads. The temporary spur roads and their associated landings would be decommissioned after use.

2.7.3 Fuels Treatment Associated with Forest Management

Preliminary fuels treatments were recommended for post forest management acres by alternative (Appendix F-Fuels). The BLM would conduct a fuels assessment within each unit following harvest activity. This assessment would determine the fuel hazard and fire risk based on surface fuel loading, aspect, slope, access, and location of each unit. Fuels treatments could include lop and scatter, hand pile and burn, maintenance underburn, and biomass removal. Most fuels treatments would begin within 30 days after completion of harvest activities.

2.8 Project Design Features

2.8.1 Common to All Projects

- Protect raptor species, if any are located, with the appropriate buffers and seasonal restrictions based on species, proposed treatment, site-specific environmental conditions, and protection recommendations.
- Store all hazardous materials and petroleum products in durable containers placed outside of riparian reserves. Locate so an accidental spill will be contained and will not drain into the stream system.
- Refuel equipment in locations outside riparian reserves. Equipment may be refueled at existing helicopter landings located within riparian reserves if absorbent pads are used when refueling.
- Construct new landings outside of riparian reserves.
- Stop work immediately and report by telephone to the authorized BLM officer if any human remains/grave sites, cultural resources, or paleontological resources (i.e, prehistoric/historic sites or objects or vertebrate fossils) 50 years of age or older are discovered during any project. All actions in the immediate area of the discovery will be suspended until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer in consultation with a qualified cultural resources specialist to determine appropriate actions required to comply with Federal, State, or local laws.
- Protect known Special Status and Survey and Manage vascular plant, lichen, bryophyte, and fungi sites. Buffers will be determined based on species, proposed treatment, site-specific environmental conditions, and available management recommendations (Special Status Species Conservation Assessments and Survey and Manage Management Recommendations).
- Ensure straw and mulch are free of weed reproductive plant parts, per 63 FR 124:51102. Straw or hay must be obtained from the BLM or purchased from growers certified by

Oregon Department of Agriculture's Weed Free Forage Program. If hay is used, it must be from native grasses only.

- Wash equipment that will travel off system roads prior to entry onto BLM-administered lands.

2.8.2 Timber Harvest and Small Diameter Thinning

2.8.2.1 Common to Timber Harvest and Small Diameter Thinning

- Seasonally restrict harvest activities from March 1 to September 30 within 0.25 mile of known northern spotted owl sites (within 0.5 mile for helicopter operations and blasting). The seasonal restriction will be waived if nonnesting is determined. If any new owls are discovered in harvest units following the sale date, activities will be halted until mitigation options are determined.
- Seasonally restrict harvest activities from March 1 through June 30 within 0.25 mile of known great gray owl nest sites and provide a 300-foot no-harvest buffer around meadows and natural openings.
- Locate skid trails to minimize disturbance to coarse woody debris. Where skid trails encounter large coarse woody debris, a section will be bucked out for equipment access. The remainder will be left in place and not disturbed.
- When constructing new temporary spur roads, use ridge tops and existing footprints of jeep roads and skid trails wherever possible.
- Restrict all tractor yarding and soil ripping operations from October 15 to May 15, or when soil moisture exceeds 25 percent.
- Restrict all cable yarding in fragile soils from October 15 to May 15, or when soil moisture exceeds 25 percent.
- Construct hand waterbars in cable yarding corridors on FM soils where gouging occurs immediately after use according to ROD/RMP guidelines (p.167).
- Restrict tractor and mechanical operations to slopes generally less than 20 percent on fragile soils and 35 percent on nonfragile soil types. In areas where it is necessary to exceed these gradients to access more tractor area, use ridge tops where possible.
- Apply native seed and mulch for 100 feet above or below all landings and portions of skid trails that intersect logging roads on fragile soils.
- Rip all temporary spur roads and associated landings to a depth of 18 inches using a subsoiler or winged-toothed ripper, apply native seed and weed-free mulch, and block upon completion of use. If hauling on a temporary spur road is not completed in the same year the road is constructed, the road will be blocked by October 15.
- Do not rip temporary spur roads within 10 feet of a stream channel.
- To minimize soil disturbance, mechanized cut-to-length systems 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.
- Place woody debris or other appropriate barriers (e.g., rocks, logs, and slash) on the first

100 feet of skid trails leading off system roads in all tractor units upon completion of yarding.

- Apply native seed and certified weed-free straw mulch to skyline-cable yarding corridors where yarding logs to the roads results in extended soil surface exposure.
- 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.
- Restrict all timber hauling and landing operations on native surface or 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. Allow road or landing use on adequately rocked roads between those dates only during periods of dry weather.
- Restrict all log hauling during the winter season (October 15 to May 15) to roads with at least 10 inches of durable rock surfacing or if evidence of road damage (i.e., yielding of the subgrade or visual evidence of sediment-laden runoff) is occurring.
- Rip, seed, mulch, and block all BLM-identified predesignated skid trails in same season after use.
- Rip, seed, mulch, and block all tractor landings in Sprignett Creek, West Fork Evans Headwaters, West Skeleton, Ash Flat, and Cold Creek seventh field drainage areas.
- Block skid trails leading off system roads upon completion of yarding by scattering large and small debris, such as rocks, logs, and slash, on the first 100 feet of the skid trails.
- Conduct all mechanical harvester (includes felling and bunching) operations using low ground-pressure (maximum 6 pounds per square inch) equipment.
- Waterbar skid trails based on gradient and erosion class guidelines in the ROD/RMP (p.167).
- Walk mechanized harvest equipment over slash on skid trails to the extent possible.
- Use erosion control techniques on temporary roads located inside riparian reserves. Techniques may include applying native grass seed and weed-free mulch, scattering chipped material, or scattering limbs and other fine material.
- Apply native seed and mulch to all disturbed or exposed soils during stream culvert removal, replacement, and installation in the same operational season the work is completed.
- Remove all possible excess sediment from stream channels during culvert removal, replacement, and installation activities in the same operational season of work.
- Install culvert crossings where temporary roads cross intermittent streams. Remove culverts after use and before fall rains begin.
- Use cut-to-length harvester equipment with a ground pressure less than or equal to 6.0 pounds per square inch, instead of designated skid trails, where stand conditions allow for adequate amounts of logging slash (typically 12 inches or more in depth) to support the equipment.

- Require the heavier forwarder equipment (used to retrieve the logs) to operate perpendicular to the slope when slopes exceed 20 percent (no sidehilling).
- Maintain 150-foot spacing on all forwarder trails and stay on sideslopes less than 35 percent (20 percent for fragile [FM] soils unless logging slash depth requirements are met).
- Use full or partial suspension when cable yarding.
- Avoid downhill yarding (Bureau of Land Management, 1995, p. 166)
- Use full or partial suspension when yarding on FG, FM, and FW soils (Bureau of Land Management, 1995, p. 156).

2.8.2.2 Timber Harvest

- Rip all newly constructed helicopter landings, apply grass seed, and mulch with native plant materials in the same season after use.
- Rip skid trails in all tractor-yarded regeneration harvest units.
- To minimize soil disturbance, limit Feller-Bunchers and harvesters to existing skid trails in previously harvested areas and designated skid trails with an average of 150-foot spacing.
- Designate skid trails at an average of 150-foot spacing. In order to minimize ground disturbance, avoid creating new skid trails and use existing trails, where feasible.
- Where available, use existing helicopter landings and areas with level ground and open canopies (e.g., road intersections and turnouts). Limit helicopter landings to 1.0 acre or less in size.
- Limit sample tree falling to trees proposed for harvest.
- Do not fall sample trees within riparian reserves.
- Do not fall a sample tree if felling the tree is contingent on falling snags greater than or equal to 20 inches in diameter at breast height.

2.8.2.3 Small Diameter Thinning

- Operate ground-based equipment outside riparian reserves unless used for yarding from existing roads and landings.
- Do not treat vegetation within 60 feet of fish-bearing, perennial streams and within 35 feet of non-fish-bearing, intermittent streams.
- Use existing skid trails in harvest units, where feasible. Designate all other skid trails prior to falling timber at an average 100-foot spacing.
- Limit landings to 0.5 acre or less in size.
- To minimize soil disturbance, limit Feller-Bunchers and harvesters to existing skid trails in previously harvested areas and designated skid trails with an average of 100-foot spacing.
- Place logging slash or chips on existing landings after use.

2.8.3 Road and Quarry Work

- Seasonally restrict blasting activities from March 1 to September 30 within 0.5 mile of known northern spotted owl sites. The seasonal restriction will be waived if nonnesting is determined. If any new owls are discovered in harvest units following the timber sale date, activities will be halted until mitigation options are determined.
- Seasonally restrict mechanical roadside brushing activities within 0.25 mile of known northern spotted owl or raptor sites. The seasonal restriction will be waived if nonnesting is determined.
- Restrict all road construction, renovation, closure, culvert removal, culvert replacement, and decommissioning work from October 15 to May 15, or when soil moisture exceeds 25 percent.
- Avoid unstable areas (i.e. headwalls, slumps and steep side slopes) to reduce potential for mass movement.
- Block or barricade identified roads after use and before beginning of rainy season (generally by October 15).
- Offset the amount of new road construction on fragile soil with an equal amount of road decommissioning on fragile soil.
- Rip roads identified for decommissioning to a depth of 18 inches using a subsoiler or winged-toothed ripper, apply native seed and weed-free mulch, and block.
- Apply native seed and mulch to fill slopes and areas disturbed during permanent road construction and road decommissioning. Seeding and mulching will occur in the same operational season that construction activities occur.
- Restrict the application of dust abatement materials, such as lignin, Mag-Chloride, during or just before wet weather, and at stream crossings or other locations that could result in direct delivery to a water body (typically 25 feet from 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 (175 feet) from a stream.
- When removing culverts, pull slopes back to the natural slope, or at least 1:1, to minimize sloughing and erosion, and to minimize the potential for the stream to undercut streambanks during periods of high streamflows. Mulch, plant and seed with native plant species on all sideslopes of the stream where the culvert was removed in the same season the culvert was removed.
- Construct silt fences 25 and 50 feet below culvert placement and replacement sites located on fragile soil to trap sediment and prevent it from entering nearby stream channels.
- Dewater streams during culvert placement and replacement to maintain optimum bedding material moisture content and to minimize the movement of sediment downstream.
- Restrict 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 (generally October 15 to May 15).

- Leave on-site all trees cut for temporary road construction in T34S, R2W, section 21 within 35 feet of the intermittent, non-fish-bearing stream.
- If explosives are necessary in quarry development, require a detailed blasting plan to minimize the amount of rock material outside the designated quarry perimeter.
- 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. Install silt fences above and below the road crossing in Chapman Creek when quarry access is needed.
- Use approved rip rap, aggregate, and borrow material for road construction, renovation, and surfacing. BLM material sources will be surveyed prior to use and will be free of noxious weeds. If noxious weed are found, they will be treated prior to material extraction and use.
- Plant grass seed, native vegetation, or both within the same operating season to stabilize exposed soil in overburden areas from quarry operations.

2.8.4 Fuels Treatments Associated with Timber Harvest

- Seasonally restrict prescribed burning and site preparation from March 1 to July 15 within 0.25 mile of known active northern spotted owl nests. The seasonal restriction will be waived if nonnesting is determined.
- In small diameter thinning units:
  - Stack hand piles more than 60 feet from fish-bearing, perennial streams and more than 35 feet from non-fish-bearing, intermittent streams.
  - Allow low intensity underburns ignited outside the 35- or 60-foot stream buffers to back into the buffer, as long as mid- and upper level canopies are not at risk. No direct ignition will occur within the 35- or 60-foot stream buffers.
  - Prohibit the use of foam agents within 60 feet of fish-bearing, perennial streams and within 35 feet of non-fish-bearing, intermittent streams during prescribed burning and mop-up activities.

1. In all other timber harvest units:
   - Stack hand piles more than 350 feet from fish-bearing, perennial streams and more than 175 feet from non-fish-bearing, intermittent streams. Piles will not be placed in channel bottoms.
   - Allow low intensity underburns ignited outside the 175- or 350-foot stream buffers to back into the buffer, as long as mid- and upper level canopies are not at risk. No direct ignition will occur within the 175- or 350-foot stream buffers.
   - Prohibit the use of foam agents within 350 feet of fish-bearing, perennial streams and within 175 feet of non-fish-bearing, intermittent streams during prescribed burning and mop-up activities.

- Within riparian reserves, build firelines less than 2 feet wide, construct in the same season as burn operations, and rehabilitate immediately following final mop-up. Handline rehabilitation will consist of waterbar construction and vegetation placement within the handline in order to minimize sediment flow into water bodies. All firelines

will be located in a stable area and where topography breaks occur and will be constructed manually using hand tools and chainsaws. Waterbars will be installed based on slope and soil type.

- 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, schedule burning to 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.
- Implement low-intensity burns only in the spring on fragile granitic or schist soils in underburn units.

2.8.5 Dispersed Campsite and OHV Trail Rehabilitation

- Restrict all trail decommissioning work from October 15 to May 15, or when soil moisture exceeds 25 percent.
- Waterbar trails based on gradient and erosion class guidelines in the ROD/RMP (p.167).
- Apply native seed and certified weed-free mulch to all decommissioned trails and areas that are disturbed due to operational procedures.
- While in riparian areas, carefully plan access needs for individual work sites within a project area to minimize exposure of bare soil, soil compaction, and damage to tree roots. Use existing trails when possible.
- Inspect all mechanized equipment daily to help ensure toxic materials such as fuel and hydraulic fluid do not enter the stream.
- Do not rip areas within 10 feet of a stream channel.
- Refuel equipment at least 175 feet from streams, ponds, or other wet areas. Equipment will not be stored in a stream channel overnight. Hydraulic fluid and fuel lines will be in proper working condition in order to minimize leakage into streams.
- Prepare a spill plan. If a spill does occur, waste diesel, oil, hydraulic fluid, and other hazardous materials will be removed from the site and disposed of at an approved location in accordance with Federal regulations.
- Seasonally restrict chainsaw and heavy equipment use from March 1 through June 30 within 200 feet of known northern spotted owl or raptor nests. This may be extended up to September 30 if nesting activity is occurring at that time. Seasonal restriction will be waived if nonnesting is determined.

2.8.6 Water Source Restoration

- Seasonally restrict chainsaw and heavy equipment use from March 1 through June 30 within 200 feet of known northern spotted owl or raptor nests. This may be extended up to September 30 if nesting activity is occurring at that time. Seasonal restriction will be waived if nonnesting is determined.
- Lop and scatter, handpile, chip, or remove from the site slash resulting from brushing and clearing activities in order to prevent creating a fire hazard.
- Refuel equipment at least 175 feet from streams, ponds, or other wet areas. Equipment will not be stored in a stream channel overnight. Hydraulic fluid and fuel lines will be in proper working condition in order to minimize leakage into streams.
- Dispose of end-haul material in stable sites outside of floodplains, as identified by the BLM Authorized Officer. Apply erosion control measures at disposal sites to minimize sediment delivery to water bodies.
- Meet Federal land management plan and ODFW standards for replacement culvert design and installation.
- Minimize disturbance to existing riparian vegetation in order to maintain slope stability.
- Use sediment-control measures such as straw bales, filter cloth, or sediment fences.
- Limit instream work to the period from June 15 to September 15.
- Maximize maintenance activities during late summer and early fall to best avoid wet conditions.
- Temporarily suspend work if monitoring indicates rain storms have saturated soils to the extent there is potential for causing excessive stream sedimentation.
- Apply mulch as soon as possible after excavation or ripping to reduce erosion.
- Prepare a spill plan. If a spill does occur, waste diesel, oil, hydraulic fluid, and other hazardous materials will be removed from the site and disposed of at an approved location in accordance with Federal regulations.
- Install, operate, and maintain fish screens on water withdrawal equipment in accordance with NOAA Fisheries.

2.8.7 Special Forest Products and Scattered Salvage Harvest

- Seasonally restrict chainsaw and heavy equipment use from March 1 through June 30 within 200 feet of known northern spotted owl or raptor nests. This may be extended up to September 30 if nesting activity is occurring at that time. Seasonal restriction will be waived if nonnesting is determined.
- Retain snags, adequate coarse woody material, and canopy cover within previously harvested timber sale units identified as “NRF Maintained” (northern spotted owl nesting, roosting, and foraging habitat).
- Use existing, well-defined trails that need little clearing for access. No new skid trails will be constructed.
- Place woody debris or other barricade materials (e.g., rocks, logs, and slash) on the first 100 feet of skid trails leading off system roads upon project completion.

- Construct waterbars on skid trails prior to fall rains using ROD/RMP (p. 167) waterbar spacing guidelines.
- Reconstruct barricades on skid trails/roads after use.
- Cover newly exposed soils with on-site materials or native seed and weed-free mulch.
- Do not allow harvest of special forest products within Special Status plant buffers.
- Do not allow harvest of special forest products from trees with yellow "PLANT SITE" signs attached.

2.9 Alternatives Considered but Eliminated

2.9.1 "Citizen's" Alternative

Klamath-Siskiyou Wildlands Center, Cascadia Wildlands, Oregon Wild, and Siskiyou Project submitted a proposed action alternative titled the "Citizen's Alternative." The groups proposed an alternative in which (1) existing plantations are commercially thinned to increase vigor, create stand diversity, and provide wood fiber; (2) fire-suppressed, unnaturally dense forest stands are thinned from below; (3) remaining late-successional forests are retained; (4) existing northern spotted owl nesting, roosting, and foraging habitat is not removed or downgraded; (5) no new permanent or temporary roads are constructed; (6) existing roads are upgraded; and (7) road density is reduced.

The project's ID Team reviewed the proposed citizen's alternative and concluded the actions proposed in the Evans Creek project addressed nearly all elements of the group's proposal. Therefore, a separate "Citizen's Alternative" was not developed. The ID Team used the following rationale for not developing an additional alternative.

1. Existing plantations are commercially thinned to increase vigor, create stand diversity, and provide wood fiber.

The Evans Creek project proposes small diameter thinning on about 800 acres in all action alternatives; 225 acres are in existing plantations. In assessing units to consider for the small diameter thinning project, the BLM reviewed all plantations within the Evans Creek watershed. Selected units were the size, density, and condition that would benefit from the proposed treatments. Small diameter thinning would be a combination of commercial and precommercial thinning. It would reduce tree densities and promote stand diversity by varying the harvest prescription based on tree species, rainfall amount, stand age, and tree size.

2. Fire-suppressed, unnaturally dense forest stands are thinned from below.

Density management, proposed in Alternatives 2 and 4, would thin dense stands from below. Density management is proposed on 750 to 1,000 acres in the Evans Creek project.

Dry forest management, proposed in Alternative 3, would also reduce stand densities to increase landscape resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change). Smaller trees and vegetation that compete with the dominant and codominant trees for nutrients and water would be removed.

3. Remaining late-successional forests are retained.

Alternative 1 (No Action) would retain all late-successional forests. Alternatives 3 and 4 propose treatments within late-successional forest that would retain late-successional forest conditions.

4. Existing northern spotted owl nesting, roosting, and foraging habitat is not removed or downgraded.

Proposed alternatives looked at different management actions within nesting, roosting, and foraging habitat. Under all alternatives, no 100-acre known northern spotted owl activity center, RA32 habitat, or 70-acre nest patches would be harvested. On matrix lands within the 1.3-mile home range of known spotted owl sites, the current habitat status would be maintained in all alternatives. Nesting, roosting, and foraging habitat could be removed or downgraded in Alternatives 2 and 3. In Alternative 4, no nesting, roosting, or foraging habitat would be removed or downgraded.

5. No new permanent or temporary roads are constructed.

BLM project layout specialists and engineers investigated various means for meeting the project's purpose and need with minimal road construction. They found some level of permanent and temporary road construction was needed in order to provide an economically viable timber harvest project. Therefore, this would not meet the Purpose and Need for the project.

6. Existing roads are upgraded.

Road renovation, proposed in all action alternatives (Alternatives 2, 3, and 4) would upgrade 123 to 130 miles of roads. Depending on the current condition of the road, renovation could include blading roads, cleaning ditches, cleaning culvert inlets and outlets, brushing, and applying crushed aggregate. This road work would occur before these roads are used by trucks to haul trees.

7. Road density is reduced.

For the Evans Creek project, an interdisciplinary team reviewed the transportation management objectives for about 500 road segments in the Evans Creek watershed. The team identified the needs and objective for each segment, including access needs for future management, private land access, fire suppression, road stability, erosion potential, recreational needs, and specific resource concerns. The transportation management objectives recommend one or several management actions for each Bureau-controlled road and identify current and future use and constraints, maintenance level, improvement and maintenance needs, roads that may be closed, and continuity with overall transportation network. As a result of this process, the team identified the 16 miles of road decommissioning proposed in this project that would result in reduced road density.

Table 2-1. Comparison of the Action Alternatives

	Alternative 2	Alternative 3	Alternative 4
Forest Management (acres)			
NGFMA Regeneration	9	0	0
SGFMA Regeneration	258	0	0
Selection Harvest–40% Canopy	679	0	880
Selection Harvest–60% Canopy	204	0	211
Commercial Thinning	228	0	0
Density Management–40% Canopy	514	0	704
Density Management–60% Canopy	243	0	281
Dry Forest Management–40% Canopy	0	1,726	0
Dry Forest Management–60% Canopy	0	441	0
Small Diameter Thinning (<80 years old)	441	441	441
Small Diameter Thinning (≥80 years old)	351	351	351
Hardwood Management	323	323	323
Total Harvest	**3,250**	**3,282**	**3,191**
Yarding Systems (acres)			
Helicopter	891	913	865
Skyline-cable	1,085	1,095	1,057
Ground-based	159	159	154
Reforestation (acres)	267	0	0
Road Work (miles)			
Renovation	129	130	123
Decommissioning	16	16	16
Temporary Spur Road Construction and Decommissioning	5.5	5.5	5.5
Permanent Road Construction	0.2	0.2	0.2
Dispersed Campsite and OHV Trail Rehabilitation	17 sites		
Water Source Restoration	21 sites		
Special Forest Product and Scattered Salvage Harvest	Boughs, burls, cedar rails, cones, firewood, fungi, manzanita, ornamental wood, poles, transplant stock, whips, and scattered salvage.		

3.0 Affected Environment and Environmental Consequences

This section provides the environmental analyses of the biological, physical, social, and economic elements relative to the proposed project. For each resource topic, the setting (affected environment) is presented first, followed by the impact analysis (environmental consequences). The setting describes the existing environmental conditions that serve as the baseline for determining project impacts.

3.1 Introduction

Chapter 3 describes the current condition of the environment within the Evans Creek Project Area. Past activities have contributed to the conditions currently existing in the Project Area and are reflected in the description of current conditions. Terms used in this section are defined as follows:

physiographic province. A region of the landscape with distinctive geographical and biological features.

site-potential tree. A tree that has attained the average maximum height possible given the site conditions where it occurs.

3.1.1 Physical Setting

The Evans Creek Project Area includes the public lands and resources administered by the Butte Falls Resource Area of the Medford District BLM. The Project Area contains the entire 143,280-acre Evans Creek fifth field watershed and portions of the Upper Cow Creek (8,170 acres) and Trail Creek (1,860 acres) fifth field watersheds. It contains approximately 153,310 acres with around 60,510 acres (39%) administered by the BLM. The Project Area is located north of the city of Rogue River in southwest Oregon.

The Evans Creek Project Area lies within the Klamath Mountains physiographic province. Physiographic provinces vary by the type and structure of vegetation and the differences in hydrology, geology, and other processes such as fire-return intervals. The Klamath Mountains province includes a complex of mountain ranges in southwest Oregon and northwest California and contains diverse local climates that range from the cool, wet coastal areas to the hot, dry interior valleys.

Elevations range from 990 feet in the south, at the confluence of Evans Creek with the Rogue River, to 5,090 feet in the north on Cedar Springs Mountain. The topography is made up of low foothills and broad valleys along the major streams, and V-shaped valleys and sharp ridges in the uplands. Annual precipitation ranges from 35 to 50 inches with a mean average of 24 inches; most of the precipitation falls as rain from November through March. Summers are hot and dry and winters are mild and damp. Summer temperatures range from the 80s to high 90s with occasional highs of 100° plus. Winter temperatures may drop below freezing and snow is common in the higher elevations (Atwood 1995, 2).

Important perennial streams in the Project Area that drain into Evans Creek are West Fork Evans Creek, East Fork Evans Creek, and Pleasant Creek. Main transportation routes are West Evans Creek Road and East Evans Creek Road; both roads are paved.

Vegetation is composed of areas of open grasslands, Oregon white oak-ponderosa pine savannas, and mixed conifer forests. The primary plant groupings are mixed conifer/madrone-deciduous brush/salal, white oak-ponderosa pine/manzanita-wedgeleaf/grass, and mixed conifer/interior valley/grass. Forest stands are a mixture of conifer species: Douglas-fir, ponderosa pine, sugar pine, and incense cedar.

The landscape pattern in the Project Area is largely determined by the checkerboard ownership (see Table 1-1). The Federal government and industrial forest companies are the two major landowners in the watershed. On industrial timberlands, 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.

3.1.2 Land-Use Allocations and Additional Considerations

BLM lands proposed for management activities within the Evans Creek Project Area were designated as matrix (including connectivity/diversity block), riparian reserve, and late-successional reserve (known northern spotted owl activity centers) in the Medford District ROD/RMP. Also included are areas the RMP identified as needing special management directions. Following is a summary of pertinent management direction contained in the ROD/RMP as it applies to the Project Area.

3.1.2.1 Matrix

The Medford District ROD/RMP objectives on matrix lands are to "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 forests; 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; and provide early-successional habitat" (Bureau of Land Management 1995, 39). The Northwest Forest Plan described matrix lands as those areas where most scheduled timber harvest would occur. Matrix lands are divided into the northern and southern General Forest Management Areas (GFMA).

Connectivity/Diversity Blocks are spaced throughout matrix lands in the northern GFMA allocation. The ROD/RMP directs that each block is to be maintained in at least 25 to 30% late-successional forest condition. Riparian reserves and other allocations with late-successional forest count toward this percentage. The Project Area contains all or portions of seven connectivity/diversity blocks: T33S, R2W, section 29; T33S, R3W, sections 3, 5, and 27; T33S, R4W, section 27; T34S, R3W, section 17; and T34S, R4W, section17.

3.1.2.2 Riparian Reserves

Riparian reserves are "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" (Forest Service and Bureau of Land Management 1994, 7). 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. Riparian reserve widths are set during watershed analysis and the boundaries may vary based on site-specific elements and characteristics including the size of a site-potential tree. The riparian reserve width for the Evans Creek fifth field watershed is 175 feet.

3.1.2.3 100-acre Known Northern Spotted Owl Activity Centers

Known northern spotted owl activity centers are one of five components of the late-successional reserve system. Known spotted owl activity centers are defined as "one hundred acres of the best northern spotted owl habitat as close as possible to a nest site or owl activity center for all known (as of January 1, 1994) northern spotted owl activity centers" (Bureau of Land Management 1995, 32). The Evans Creek Project Area contains 24, 100-acre known northern spotted owl activity centers within the 1.3-mile provincial radius.

3.1.2.4 Deferred Watersheds

The 1995 RMP identified areas with "high watershed cumulative effects" as deferred watersheds. These areas will be deferred from management activities for 10 years starting from 1993. Within the Project Area, West Fork Evans (Headwaters), West Skeleton Mountain, Cold Creek, Ash Flat, and Sprignett Creek are deferred watersheds. Their deferral status will be reevaluated in this project (see Appendix G-Evans Creek Watershed Deferral Status Report).

3.1.2.5 Big Game Winter Range and Elk Management Area

Lands in the eastern part of the Project Area (primarily the east half of T34S, R2W) contain winter range for deer and elk, and elk management areas. These lands are managed to enhance and maintain biological diversity and ecosystem health in order to contribute to healthy wildlife populations (RMP, 44).

3.1.3 Other Actions in the Watershed containing the Project Area

3.1.3.1 Brief History of the Project Area

The history of the Evans Creek watershed provides the foundation for understanding the conditions that exist in the watershed today. Natural processes and human activities influence and shape the vegetation and landscape found within the watershed. They may cause slow and subtle changes only visible through the passage of time, or sudden, devastating changes that occur in an instant.

Natural forces such as wildfires and floods have altered vegetation and stream conditions. Fires influence vegetation patterns, stand ages, and species composition. Floods can cause streams to change channels, wash away soils and streamside vegetation, deposit gravels and sediment, and form pools.

Human occupation and use of the lands and resources have a continual and wide-ranging effect on the watershed environment. The native Takelma successfully managed the resources in the Evans Creek area in order to survive. They used fire as a tool to improve access to food supplies and provide better protection from attacking enemies by removing cover. (Atwood and Lang 1995, 9-15).

In the early to mid-1800s, fur trappers moved into the area and focused mainly on harvesting the beaver populations (Atwood and Lang 1995, 20-25). The discovery of gold in nearby Jacksonville, Oregon in 1851 brought prospectors into area streams, including Evans Creek and Pleasant Creek. The earliest miners initially used picks, shovels, and pans to extract gold. Eventually large-scale hydraulic mining was introduced and extensive mining ditch systems were constructed to supply water for the hydraulic mining process (Atwood and Lang 1995, 28). Miners used the water to blast away gravel and soil that was run through a sluice to extract the gold. The sediment-laden water was then returned to streams.

The Homestead Act of 1862 made public lands available for settlement and the population of the Evans Creek area grew. Early Euro-American settlement in the Evans Creek watershed was concentrated along the creek bottomlands, benches, and nearby foothills primarily in the ". . . southerly environs of the watershed" (Atwood and Lang 1995, 46). Homesteaders cleared and burned forests and brush to provide area for planting crops and provide range for livestock. They dammed creeks and constructed irrigation ditches to deliver water to their farms.

The late 1800s saw logging concentrated in the lower elevations closer to settlements and transportation (Atwood and Lang 1995, 49). Steep, rugged terrain in the higher elevations of Evans Creek discouraged commercial timber cutting in this area. In the 1920s through 1940s, the use of more mechanized logging methods replaced horse logging teams and provided access to the previously unentered areas. The increase in mechanized logging also brought an increase in road building along with the associated impacts such as soil erosion and siltation from these activities (Atwood and Lang 1995, 98-99)

In 1937, the O&C Act provided direction for Federal lands managed by the BLM in this area. The O&C Act was intended to provide forest management that would contribute to the local economy by providing for permanent forest production on a sustained yield basis. The O&C Act required O&C lands to be managed "for providing a permanent timber supply, protecting watershed, regulating stream flow, and providing recreational facilities" (43 U.S.C. §1181a).

World War II brought increased demand for lumber and increased logging in southern Oregon on private lands. In the years between 1950 and 1970, most of the private lands in Upper Pleasant, West Evans, and East Evans creeks were tractor logged. Clearcutting and shelterwood cutting were the predominant harvest treatments on private lands. Salvage logging occurred following the 1962 Columbus Day Storm that brought extensive blowdown throughout the watershed (Atwood and Lang 1995, 118-121).

Since the end of World War II, "the greatest human impact on the Evans Creek landscape has occurred through development, increased roads, extensive logging, and fire" (Atwood 1995, p. 139). As the population of the Evans Creek area increased, the area has shifted from a rural agricultural community to an urban interface area. Larger parcels of land were divided into smaller acreages for home construction, frequently within forested areas. More people moving into the area meant more road construction and a resulting increase in soil erosion and the spread of noxious weeds.

Increasing public concerns over declining populations of plant and animal species, water quality, and the quality of the human environment resulted in the passage of the Endangered Species Act in 1973, Clean Water Act in 1987, and National Environmental Policy Act in 1969. These laws applied additional considerations to how the BLM manages the Federal lands under the O&C Act.

Wildfires and fire suppression have altered the landscape in the Evans Creek watershed. Several large fires (Grave Creek in 1978; Angel and Sykes in 1987; Pleasant Creek in 1988; and Sprignett Butte, Hull Mountain, and East Evans in 1994) have contributed to the high level of early to mid-seral stand conditions in the Project Area. Fire suppression has contributed to an accumulation of fuels that may lead to more high intensity fires instead of the low intensity burns that historically occurred.

3.1.3.2. Past Timber Harvest in the Project Area

Past timber harvest, along with settlement, road construction, mining, fires, and floods, has contributed to the existing condition of the watershed. Fire exclusion and harvest practices have added 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.

Over the past 60 years, harvest has occurred on approximately 42,355 acres of the BLM forested land within these watersheds. Most of these harvested acres have had multiple harvest entries (for example, commercial thinning followed by regeneration harvest). Harvest practices ranged from mortality salvage, or selective cutting of individual trees, to regeneration harvest, including clearcut harvest (Figure 3-1.). The following is a general description of past harvest activities and trends on BLM land within the Evans Creek fifth field watershed.

1940s and 1950s

From the late 1940s and through the 1950s, approximately 9,000 acres of BLM land were harvested in the Project Area. The predominant harvest treatment was selection cutting with approximately 5,900 acres harvested. Selection harvest, which focused on the larger, high-valued Douglas-fir, sugar pine, and ponderosa pine trees, created openings in the forest stand and allowed natural regeneration to occur. Most harvesting was completed using tractor yarding and many new roads were built along the streams and drainages to access these acres. Tractor yarding and road building may have occurred under all weather and soil moisture conditions and likely resulted in soil compaction across these acres. Other harvest treatments included seed tree, overstory removal, and mortality salvage harvest treatments.

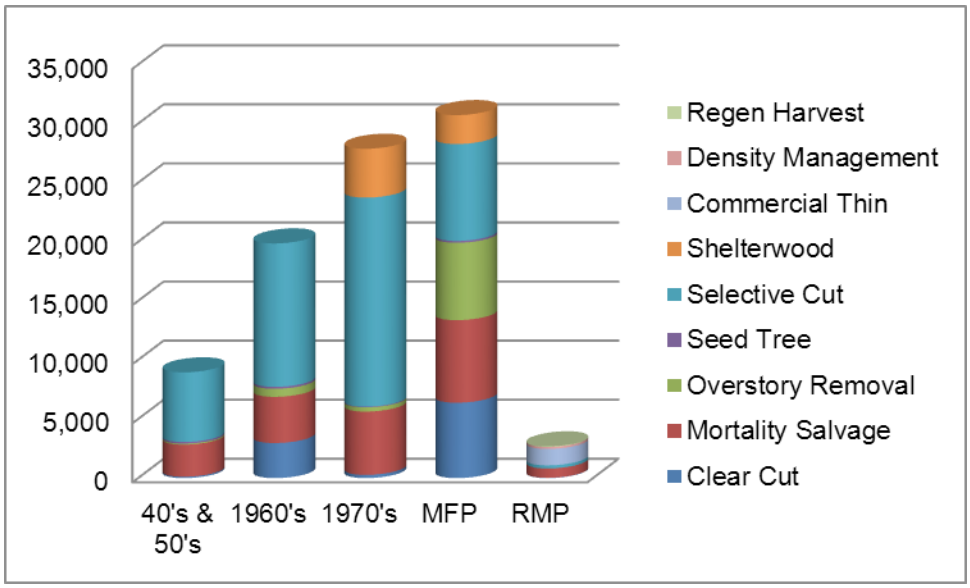


Figure 3-1. Past harvest on BLM lands in the Evans Creek fifth field watershed. The numbers reflect multiple entries that may have occurred on the same acres.

1960s

In the 1960s, approximately 19,900 acres of BLM lands were harvested in the Project Area with about 3,700 acres receiving multiple entries. Selection harvest, mortality salvage, and clearcut were the primary harvest treatments, with lesser amounts of overstory removal, seed tree, and shelterwood treatments. Approximately 2,970 acres in the watershed were clearcut. A combination of natural seeding and planting has reestablished these into forested stands.

1970s

In the 1970s, selection harvest, shelterwood and mortality salvage were the primary harvest treatments. Of the approximately 27,900 acres harvested in the 1970s approximately 17,700 acres received selection harvest treatment. The 1970s saw a decrease in clearcutting and an increase in the use of three-stage shelterwood systems with approximately 4,100 acres being shelterwood cut. Many of the harvested acres received multiple entries with selection harvest in the early 1970s and shelterwood harvest at the end of the decade. An increase in the use of cable yarding during this time necessitated the need for new roads. Roads were constructed in locations outside of drainages and across slopes and ridges.

In 1978, the Grave Creek fire burned approximately 1,443 acres of private and public lands in the Pleasant Creek sixth field watershed. These acres were subsequently salvage logged. Both tractor and cable yarding were used to salvage log on BLM lands. These lands were planted in 1980 and 1981.

1980-1993

In 1980, the BLM began implementing the Medford District's 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 clearcut, overstory removal, two-stage shelterwood, and single tree selection harvest. Intensive management practices to maximize growth and yield from these lands included reforestation of the harvested lands, herbicide spraying to control competing vegetation,

precommercial and commercial thinning, and fertilization. The MFP implemented a 100-foot no-harvest buffer on each side of Class 1 and 2 streams.

During the 1980s, logging units were designed for more sophisticated cable yarding machines that were capable of reaching further out into the units. The late 1980s and early 1990s also saw an increase in helicopter logging. These changes in logging systems provided greater access into hard to reach areas and reduced the need to for road construction.

The Medford District BLM operated under the MFP from 1980 through 1993. During this time, 30,500 acres were harvest in the Evans Creek Project Area. Forest management treatments included selective harvest, overstory removal, mortality salvage, shelterwood, and clearcut. The shelterwood and clearcut units were planted with Douglas-fir, ponderosa pine, or both following harvest.

Overstory removal was applied in past selection harvest or mortality salvage stands that had created openings where natural seeding occurred and a young stand of trees was 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.

In 1987, a late August thunderstorm ignited fires across public and private lands in Southern Oregon and Northern California; two fires were in the Evans Creek watershed. The Angel Fire burned a total of 3,640 acres in the Project Area: 530 acres in the Evans Creek watershed and 1,720 acres in the Upper Cow Creek watershed. The Sykes Creek Fire burned 9,167 acres—all within the Evans Creek watershed. The BLM salvage logged approximately 1,700 acres of these fires in 1988 and 1989. Areas where the fire had killed most of the trees were replanted after completion of salvage harvest.

In 1988, the Pleasant Creek Fire burned 1,241 acres of public and private lands. The BLM salvage logged 405 acres using tractor, cable, and helicopter yarding in 1989. These units were replanted in 1989 with a mixture of Douglas-fir, ponderosa pine, and incense cedar.

In 1992, the East Evans Creek Fire burned approximately 10,100 acres of public and private lands: about 1,000 acres in the Evans Creek watershed and 9,100 acres in the Gold Hill-Rogue River watershed. The BLM salvaged 80 acres of this fire within the Evans Creek watershed.

1994 to Present

In April 1994, the Record of Decision for the Northwest Forest Plan was signed. The Northwest Forest Plan amended the Medford District ROD/RMP, which was completed in June 1995. The Northwest Forest Plan and Medford District ROD/RMP established a system of reserves to protect habitat for the northern spotted owl and other old growth dependent species. The reserve system is comprised of riparian reserves and late-successional reserves, including 100-acre known northern spotted owl activity centers, located 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.

The matrix lands within Evans Creek fifth field watershed are allocated as northern GFMA and southern GFMA. BLM lands north of Grants Pass are within the northern GFMA land use allocation and those to the south are in the southern GFMA land use allocation. Under the Medford District ROD/RMP, direction for timber management on these lands includes regeneration harvest, commercial thinning, density management, and selection harvest

Since implementation of the ROD/RMP, commercial thinning has been the primary silvicultural prescription applied in the watershed. Mortality salvage occurred within the areas that burned in the fires. Clearcutting on 24 acres occurred in areas where road construction was needed across BLM to provide access to harvest units and for private landowners to access their land.

In 1994, about 9,800 acres of public and private lands burned in the Ramsey Canyon, Sprignett Butte, and Hull Mountain fires; approximately 4,100 acres were within the Evans Creek watershed. The BLM salvaged 750 of these acres. Planting of trees occurred across all the fire areas.

Other vegetative treatment activities that have occurred on BLM lands in this area include precommercial thinning of plantations on approximately 750 acres with brush control on 350 acres. Fuels reduction has occurred across approximately 3,200 acres.

Restoration treatments include decommissioning of approximately 19 miles of roads within the watershed. Other projects include culvert replacements, dam removal, large woody debris placement, coho carcass placement and road cutbank stabilization. A list of these projects can be found in Appendix I-Evans Creek Watershed Restoration Projects.

Future fuels reduction treatments in the Evans Creek watershed are proposed on 4,768 acres. Precommercial thinning and brushing will continue in the young plantations.

Two sixth field watersheds within the Upper Cow Creek fifth field watershed contain proposed harvest units. Past activity on US Forest Service lands within these watersheds includes commercial thinning on 80 acres, cattle grazing on 8,250 acres, and precommercial thinning on 180 acres. Current ongoing activities include continued cattle grazing and commercial thinning on 300 acres. Activities on private land within these watersheds include clearcutting on 739 acres and commercial thinning on 258 acres. Known future activities include continued cattle grazing on private land, commercial thinning, precommercial thinning, and prescribed burning on approximately 3,000 acres. Clearcutting on 150 acres of private land is also planned.

3.2 Forest Condition

This section analyzes the potential impacts of the proposed forest management and restoration activities on forest condition. The following definitions are for terms used in this section:

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

relative density. 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 (water, nutrients, and sunlight) to support.

3.2.1 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 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 watershed in which the projects are located.
- Field visits (stand exams) from 2004 to 2010 within the Evans Creek, Cow Creek, and Trail Creek fifth field watersheds provided stand-specific data related to tree density, structure, composition, and general stand health.

3.2.2 Assumptions

- Timber management activities will 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).
- Most private forestlands will be intensively managed with final harvest on commercial economic rotations averaging 60 years (PRMP 1994, 4-5).
- Impacts to forest vegetation by predicted regional climate change is uncertain. The regional climate has become warmer and wetter with reduced snowpack and continued change is likely (Bureau of Land Management 2008).

3.2.3 Affected Environment

3.2.3.1 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, large wildfires, and fire

containment strategies that have permitted the development and growth of dense forest stands. These factors 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.

3.2.3.2 Plant Series

The Douglas-fir and white fir plant series are the most common forest plant classifications in the Project Area (USDA 1996). Plant series follow an elevation gradient from lowest to highest with the Douglas-fir series occupying the lowest elevation lands in the southern two-thirds of the Evans Creek watershed and the white fir series occupying the highest elevations in the northern one-third of the watershed.

In the Douglas-fir series, 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-aged stands. Where even-aged stands of knobcone pine occur, the site quality is generally poor as soils are typically shallow and infertile.

The white fir series is characterized by Douglas-fir as the dominant overstory tree with white fir and lesser amounts of ponderosa pine, sugar pine, incense cedar, and hemlock (in higher and wetter areas) present. Hardwood species include madrone and chinquapin. Shrub species present in varying amounts are dwarf Oregon grape, pinemat manzanita, salal, rhododendron, baldhip rose, and snowberry.

3.2.3.3 Stand Density, Tree Vigor, and Tree Growth

Forest stands with relative densities above 65% 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. The average relative density in the forest stands proposed for treatment is 88%.

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. In the event of wildfires, forest stands with a canopy closure of 70% or greater have an increased fire spread rate, a higher probability of crown fires, and fires that are more difficult to control. The existing forest canopy closure in the stands proposed for treatment is 68 to 100%.

Tree species diversity is affected by high stand densities. Competition for limited site resources (nutrients, water, and sunlight) between dense understories and large overstory ponderosa and sugar pines has increased. This competition has affected pine species by reducing tree vigor, increasing tree susceptibility to bark beetle attack, and increasing pine mortality rates throughout the Evans Creek, Cow Creek, and Trail Creek fifth field watersheds. On average, the pine species are less abundant in the conifer population in this Project Area versus the dominant Douglas-fir species. Healthy pines are desired for species diversity and genetic longevity.

Tree growth is affected by environmental conditions such as high growing season temperatures, moisture and nutrient availability, vegetative competition, soil type, frequent frosts, and insects and disease. Conifer growth rate vary with tree age; young trees grow rapidly, but as they reach maturity, the rate of growth slows. The point at which growth slows and the growth curve flattens is called the culmination of mean annual increment. 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 (Bureau of Land Management 1995, 103).

3.2.4 Environmental Consequences

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

Direct and Indirect Effects

In Alternative 1, forest management activities would not occur. Stand densities would remain high (currently, average 88% relative density) and would continue to increase. 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. In stands with a relative density greater than 60%, the annual tree mortality rate is almost double (Hann and Wang 1990) compared to forest stands with relative densities less than 60%. Declining tree vigor and growth reduces a tree's ability to resist a variety of damaging agents (Franklin, Shugart and Harmon 1987). A higher risk of insect damage, disease, and wildfire would be expected because of high stand densities and fuel load (Powell 1999) (Filip 1998) (Oregon Department of Forestry 1990). In the absence of disturbance events such as wildfire or commercial thinning, the number of trees per acre would remain at levels above the carrying capacity of the site (Oliver, Ferrell and Tappeiner 1996). Stand canopy closure would remain at 90 to 100%.

Stand resiliency to disturbance events such as 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 soil, wildlife habitat, forest structure, and watershed processes would potentially occur, resulting in a longer restoration and landscape recovery period (Brown 2000) (Forest Service and US Department of the Interior 2001).

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 (Society of American Foresters 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 climate change.

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

Cumulative Effects

Past Actions

Timber harvest and wildfire have 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 number of conifer stands older than 80 years has declined. The impacts of these past events include forest fragmentation, simplification of stand structure, and reduced habitat diversity. Forest ecosystems, such as the Evans Creek watershed, 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 Medford District ROD/RMP in 1995, harvest has occurred on 2,721 acres of the 59,259 acres of BLM-administered lands within the Evans Creek fifth field watershed. Density reduction treatments (e.g., commercial thinning, density management, and individual tree selection) occurred on approximately 71% of the treatment acres, overstory removal about 15%, mortality salvage on 11% clearcut harvest about 2%, and regeneration harvest on about 1%. Commercial thinning and density management has redistributed growth from many small trees to fewer large healthy trees. Individual tree selection has removed trees across all diameter classes and has reduced intertree competition. The remaining trees have adequate site resources to maintain good growth rates with tree vigor at levels necessary to minimize mortality from competition or insects and disease. Overstory removal, clearcut harvest, and regeneration harvest have replaced stands that have passed the point of optimum wood production with young, fast-growing conifer stands that maximize the volume growth capability of the site. Mortality salvage has replaced trees killed or damaged by insects, wind, or wildfire with young conifer plantations.

On the 49,358 acres of private industrial timber lands in the Project Area, harvest activities have ranged from partial harvests to clearcuts. Most of the private industrial timber lands have been logged over the past 60 years. Within these stands, management objectives are to maximize volume growth per acre.

Of the 33,427 acres of privately owned lands within the Evans Creek fifth field watershed, varying levels of harvest have occurred over the past 60 to 80 years. Conifer growth and timber yield rates for these lands are unknown. Most of these lands are located near valley bottoms and generally occur in the lowest elevations in the watershed.

Fire exclusion since the early 1900s has contributed to development of high stand densities and forest stands have become overstocked with shrubs and smaller trees. As a result, tree growth and volume yield has declined within stands that have relative densities greater than 60%. Forest stands with relative densities above 60% have lower tree growth rates; higher mortality of suppressed trees; and a higher susceptibility to insects, disease, and more severe fire behavior (Hann and Wang 1990) (Perry 1994) (Curtis 1982).

Present Actions

No timber sales are occurring on BLM-administered lands in the Evans Creek fifth field watershed. On private industrial timber lands, some logging is happening, although the amount and duration of logging activity is unknown. On lands owned by private individuals, the amount of logging is unknown, but harvesting is generally limited to small areas and individual trees are used for lumber or firewood.

Vegetation treatments to reduce hazardous fuels on BLM-administered lands was initiated in 2009 (Butte Falls Hazardous Fuel Reduction Environmental Assessment, 2009) with a planned completion date of 2013. Approximately 4,000 acres are proposed for understory thinning or underburning. The benefits of this project on tree growth and stand health are dependent on the post-treatment stand density. Because understory thinning removes only a portion of the trees 7 inches in diameter and less, the remaining number of trees per acre of all size classes may still be higher than the site has resources to support. If post-treatment relative density levels are 60% or higher, the effects of the fuels management treatment on forest growth and stand health within the fifth field watershed would be minimal. Fuels treatments that reduce stands to less than 60% relative density will increase health and growth of conifers. Forest stands with relative densities above 60% have reduced tree growth; reduced volume production; higher mortality of suppressed trees; and a higher susceptibility to insects, disease, and severe fire behavior (Hann and Wang 1990) (Perry 1994) (Curtis 1982).

Future Actions

No future timber sales are being planned by the BLM in the Evans Creek fifth field watershed within the 5-year planning cycle. Vegetative reatments such as protection, maintenance, precommercial thinning, and release may occur. These treatments would enhance seedling survival, reduce vegetative competition, and allow for increased conifer growth.

On private industrial forest lands, harvest plans are unknown. However, in stands with an average 8-inch dbh and greater, we can reasonably expect commercial harvest within the next 5 to 10 years. Industrial landowners would most likely use silvicultural methods (e.g., clearcut and overstory removal) that create early seral stands. Post-harvest activities, such as conifer planting, applying herbicides to control brush and hardwoods, and precommercial thinning, would be scheduled to insure the survival, establishment, and maximum growth per acre of conifers. In stands less than 8 inches dbh, little commercial logging is expected in the next 15 to 20 years. Within such stands, brush and hardwood control and precommercial thinning are the two primary management activities most likely to occur, both of which would reduce stand densities, increase conifer growth, and redirect forest stands towards conditions that would be more resilient to landscape disturbances.

On privately owned lands, limited harvesting activities are expected. Occasional logging of large individual trees would occur and would most likely be limited to small areas.

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 and competition for limited site resources would remain high. Minimum growth per tree would occur with the maximum volume growth per acre offset by mortality (Ernst and Knapp 1985). Growth rates would remain stagnant or decline with tree mortality expected to increase. On private forest lands, harvesting would continue and older stands would be converted 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, 4-5). The rate of tree mortality, stand growth and vigor, and species composition would remain outside the range of natural conditions with the trend of forest conditions on BLM-administered lands continuing to deteriorate (PRMP/EIS 1994, 3-18).

3.2.4.2 Effects of Alternative 2 on Forest Condition

The primary objective of this alternative is to maintain dispersal and NRF habitat within the home ranges of the northern spotted owl. Outside of the home ranges, this alternative would implement Medford District RMP management direction for matrix land.

Table 3-1. Proposed Silviculture Treatments in Alternative 2

Silviculture Treatment	Acres
NGFMA Regeneration Harvest	9
SGFMA Regeneration Harvest	258
Selection Harvest—40% canopy cover	679
Selection Harvest—60% canopy cover	204
Commercial Thin—40% canopy cover	228
Density Management—40% canopy cover	514
Density Management—60% canopy cover	243
Small Diameter Thin and Hardwood Management	1,115
Total	**3,250**

Direct and Indirect Effects

Northern and southern GFMA regeneration harvest is proposed on 267 acres. 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 harvest would retain variable levels of healthy, large green trees greater than 20 inches dbh. Canopy closure would be reduced to 10 to 40%, depending on the level of green tree retention (Table 3-2). Retained overstory trees and down logs would provide for structural and biological legacies (J. Franklin 1992) (Hansen 1991) (Hunter 1995). These structural components are necessary to maintain ecosystem processes throughout the management cycle (Bureau of Land Management 1995, 188). Of the 9 acres of northern GFMA

regeneration harvest, 5 acres occur on fragile soils (granitics). On these 5 acres, a northern GFMA regeneration harvest is proposed because of deteriorating tree and stand conditions. Generally, the RMP prescription for granitic soils follows structural retention guidelines (southern GFMA) except in cases where site factors such as site quality, presence of disease, and visuals do not allow for southern GFMA forest health objectives to be met. In these cases, modified even-aged (northern GFMA) silvicultural systems can be applied (Bureau of Land Management 1995, 192).

Table 3-2. Green Tree Retention Levels for Regeneration Harvest

Regeneration Harvest Type	Green Trees Per Acre Retained (greater than 20″ dbh)	Residual Canopy Closure (%)
NGFMA	6 to 8	10 to 15
SGFMA	16 to 25	25 to 40

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, Shugart and Harmon 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.

In density reduction treatments (commercial thinning, density management, selection harvest, and small diameter thinning), 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, Ferrell and Tappeiner 1996). Depending on tree size, approximately 50 to 300 trees per acre greater than 8 inches in diameter would remain with relative density below 60%. With a reduction of tree density to below 60% relative density, the annual mortality rate would decline by about 50%. These silvicultural treatments would generally result in stands with fewer but larger trees and trees with increased growth rates. 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 use moisture, nutrients, and additional growing space. Tree crowns would increase in size and photosynthetic area, with stand crown closure increasing approximately 10% every 5 years (based on ORGANON growth and yield projections) until full canopy closure is reached (Hann 2003). Carbon uptake, pollen production, and viable seed production would also increase as tree vigor increases (Office of Science and Office of Fossil Energy 1999) (Kramer and Kozlowski 1979). These silvicultural treatments would result in healthier stands that are more resilient to environmental stresses (drought, insects, and disease).

Canopy closure in density reduction stands would decrease from 80-100% to 40-60%. Within the home range of the northern spotted owl, treated acres would maintain a minimum of 40%

canopy closure in dispersal habitat, and a minimum of 60% canopy closure in NRF habitat. Outside of the home range of the northern spotted owl, a minimum of 40% canopy closure would be reserved. 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 Tappeiner 2002).

Approximately 400 acres of the proposed treatment area would be underburned within 2 to 4 years following hand pile burning. Depending on the intensity of the fire, underburning may have a positive or negative effect on conifer growth and stand health. The positive effects include the reduction of competing understory vegetation, release of nutrients into the soil for tree growth, reduction of fire hazard, and retention of sufficient duff material to maintain the nutrients necessary to sustain long-term forest productivity. If the burn is too hot, the litter and duff layer may be lost with a subsequent loss of nitrogen and a reduction in long-term soil productivity and tree growth. A hot burn outside of the prescription may result in the mortality of reserve trees and growth loss to the remaining trees due to needle scorch and needle mortality. Excessive mortality of reserve trees would reduce the number of trees per acre to below optimum stocking levels and result in the loss of the growth and yield potential of a fully stocked stand.

Permanent and temporary road construction would remove all vegetation within the road prism. The permanent roads would be converted from conifer forests to nonforested lands and would no longer contribute to future conifer growth or yield. Approximately 0.2 mile of permanent road construction would convert about 1 acre of forested to nonforested lands. Approximately 4 miles of temporary road construction would remove all vegetation on approximately 7 acres of forested land. Following harvest activities, temporary roads would have the road bed tilled, mulched, and planted to reestablish conifer species. Removal of the compacted surface would restore site productivity and provide suitable growing conditions for planted conifers.

This alternative would meet the timber management assumptions and conifer growth and timber yield projections provided for in the Medford District PRMP/EIS on about 70% of the acres treated. On the remaining 30% of the treated acres, the silvicultural treatments (selection harvest and density management with 60% canopy cover) are different than RMP standards and guidelines and it is likely that conifer growth and yield projections would not be met on these acres. Other proposed projects within this analysis area would have minimal impacts on forest condition because they are relatively small in scale.

Cumulative Effects

See section 3.2.4.1, Effects of Alternative 1 (No Action) on Forest Condition, Cumulative Effects.

Regeneration harvest is proposed on 267 acres or approximately 4% of the BLM matrix lands greater than 120 years old in the Evans Creek fifth field watershed. Regeneration harvest would add to past and present actions by further reducing the number of forest stands 80 years and older in the watershed. At the watershed scale, regeneration harvest under Alternative 2 would reduce structural components, lower biological diversity, and increase habitat fragmentation. Regeneration harvests would occur on less than 1% of the total watershed acreage. Forest ecosystem sustainability is dependent on maintaining components, structures, and processes that have developed and adapted over extended periods of time.

At the larger spatial scale of the ROD/RMP 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 (Bureau of Land Management 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 that is thought to have existed on BLM-administered lands prior to logging and fire suppression (Bureau of Land Management 1994, 4-24).

Stand densities would be reduced on about 1,868 acres (42%) of BLM matrix lands 80 to 120 years old in the Evans Creek fifth field watershed and 1,115 acres (6%) of young stands on matrix lands between 20 to 120 years old. Density reduction treatments (commercial thinning, density management, selection harvest, and small diameter thinning) would reduce competition-related mortality, increase tree vigor and growth, and maintain preferred species. 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 (hazardous fuel reduction), and future density reduction treatments in the watershed would improve stand and landscape resistance and resiliency to environmental disturbances.

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

3.2.4.3 Effects of Alternative 3 on Forest Condition

The purpose of this alternative is to increase landscape resiliency to environmental disturbances (i.e. fire, insects, disease, and climate change) by reducing stand densities, retaining old trees, favoring drought-tolerant species, and increasing structural complexity while maintaining high suitability northern spotted owl habitat.

Table 3-3. Proposed Silviculture Treatments in Alternative 3

Silviculture Treatment	Acres
Dry Forest Management—40% canopy cover (less than 120 years old)	776
Dry Forest Management—40% canopy cover (more than 120 years old)	998
Dry Forest Management—60% canopy cover (less than 120 years old)	189
Dry Forest Management—60% canopy cover (more than 120 years old)	204
Small Diameter Thinning	1,115
Total	**3,282**

Direct and Indirect Effects

Under Alternative 3, dry forest management is proposed on 3,282 acres. Dry forest management (Johnson and Franklin 2009) would reduce stand density, retain old trees (>150 years), favor drought-tolerant species, provide structural complexity (unthinned patches and small openings), increase average stand diameter, and maintain at least 40% canopy cover. These characteristics would increase stand resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change) by removing smaller trees and vegetation that compete for limited site resources and provide surface and ladder fuels that increase fire intensity. Treatment acres within the home range of the northern spotted owl would maintain a minimum 40% canopy closure in dispersal habitat, and a minimum 60% canopy closure in NRF habitat. Outside of the home range of the northern spotted owl, a minimum of 40% canopy closure would be reserved.

Depending on the average diameter of the remaining trees, 50 to 300 trees per acre greater than 8 inches dbh would remain with relative densities at approximately 25% on lower productivity sites (<35 inches annual precipitation) and 35% on higher productivity sites (>35 inches annual precipitation). Stands with larger average diameter trees remaining would have fewer trees per acre left; stands with smaller average diameter leave trees would have more trees per acre left.

With a reduction of tree density to below 60% relative density, the annual mortality rate would decline by about 50%. 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 use moisture, nutrients, and additional growing space. Tree crowns would increase in size and photosynthetic area, with stand crown closure increasing approximately 10% every 5 years (based on ORGANON growth and yield projections) until 100% canopy closure is reached (Hann 2003). These silvicultural treatments would generally result in stands with fewer but larger trees and trees with increased growth rates. To minimize wildfire risk, activity slash would be treated.

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

In addition to the post-harvest treatment of logging slash, approximately 400 acres of the harvested acres would be underburned within 2 to 4 years following hand piling (section 3.2.4.2 Effects of Alternative 2 on Forest Condition, Direct and Indirect Effects).

Permanent and temporary road construction would remove all vegetation within the road prism. The permanent roads would be converted from conifer forests to nonforested lands and would no longer contribute to future conifer growth or yield. Approximately 0.2 mile of permanent road construction would convert about 1 acre of forested to nonforested lands. Approximately 4 miles of temporary road construction would remove all vegetation on 7 acres of forested land. Following harvest activities, temporary roads would have the road bed tilled, mulched, and planted to reestablish conifer species. Removal of the compacted surface would restore site productivity and provide suitable growing conditions for planted conifers.

This alternative would not meet the timber management assumptions and conifer growth and timber yield projections provided for in the Medford District PRMP/EIS. In stands less 120 years old, dry forest management and spotted owl habitat objectives are different than ROD/RMP guidelines and would result in post-harvest growth rates less than planned for. In older stands (>120 years), approximately 1,202 acres that meet the ROD/RMP guidelines for a regeneration harvest would be harvested under dry forest management guidelines. Changing the silvicultural treatment from a regeneration harvest to a dry forest management harvest would reduce growth and yield assumptions (Bureau of Land Management 1994, 207) and alter anticipated ROD/RMP landscape and stand development trajectories.

Cumulative Effects

See section 3.2.4.1, Effects of Alternative 1 (No Action) on Forest Condition, Cumulative Effects.

The short- and long-term timber management assumptions and conifer growth and timber yield projections for stands 100 years (northern GFMA) or 120 years (southern GFMA) or older on matrix lands would not be met. No regeneration silvicultural systems would be applied. The Medford District has completed harvest on less than half the regeneration acres analyzed and allowed for since the plan implementation in 1994. By not meeting the annual and decadal target for regeneration harvest acres, the developmental stand trajectories, stand age distribution, and sustained yield assumptions of the ROD/RMP would not be met. This alternative adds to the Medford District RMP regeneration acre deficit and leads further away from the anticipated growth and yield projections of the ROD/RMP.

Dry forest management (2,167 acres), small diameter thinning (1,115 acres), and fuel hazard reduction (4,000 acres) would reduce stand densities towards levels the site has resources to support.

Dry forest management and ongoing fuel hazard treatments would reduce stand densities on BLM-administered lands. Tree growth and vigor would improve by reducing the competition for limited site resources. This would increase the resiliency of stands and larger, older trees to ensure their longevity. This alternative would treat 2,167 acres (19%) of the BLM matrix lands that may be suitable for dry forest management within the Evans Creek fifth field watershed. Additionally, this alternative would treat 1,115 acres (6%) of the BLM matrix lands suitable for

small diameter thinning treatment within the Evans Creek fifth field watershed. Tree growth and vigor would be increased by reducing the competition for limited site resources. An increase in usable timber yield would occur by concentrating and increasing growth rates in fewer trees, resulting in larger and more valuable logs.

On private industrial timber lands, harvest would continue and older stands would be converted to early seral stands, with conifers planted to maximize growth and timber yield. Most private industrial timber lands would be intensively managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, 4-5).

3.2.4.4 Effects of Alternative 4 on Forest Condition

Under Alternative 4, all dispersal and NRF habitat within and outside the home ranges (1.3-mile radius) of the northern spotted owl would be maintained.

Table 3-4. Proposed Silviculture Treatments in Alternative 4

Silviculture Treatment	Acres
Selection Harvest—40% canopy cover	880
Selection Harvest—60% canopy cover	211
Density Management—40% canopy cover	704
Density Management—60% canopy cover	281
Small Diameter Thin	1,115
Total	3,191

Direct and Indirect Effects

Under Alternative 4, selection harvest, density management, and small diameter thinning would occur on a total of 3,191 acres. All of the harvested acres within and outside the home ranges of the northern spotted owl would have a minimum 40% canopy closure remaining for dispersal habitat, and a minimum 60% canopy closure for NRF habitat. In stands identified for selection harvest, low vigor trees from all diameter sizes would be removed individually or in groups at levels necessary to meet spotted owl habitat requirements. Stands identified for density management and small diameter thinning would have the smaller, less vigorous trees harvested. These silvicultural treatments would reduce the number of trees per acre toward levels the site has water and nutrients to sustain. Approximately 50 to 300 trees per acre greater than 8 inches dbh would remain with relative density below 60%. With a reduction of tree density to below 60% relative density, the annual mortality rate would decline by about 50%. 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 use moisture, nutrients, and additional growing space. These silviculture treatments would result in increased growth rates and increased volume yields.

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

In addition to the post-harvest treatment of logging slash, approximately 400 acres of the harvested acres would be underburned within 2 to 4 years following hand piling (section 3.2.4.2 Effects of Alternative 2 on Forest Condition, Direct and Indirect Effects).

Permanent and temporary road construction would remove all vegetation within the road prism. The permanent roads would be converted from conifer forests to nonforested lands and would no longer contribute to future conifer growth or yield. Approximately 0.2 mile of permanent road construction would convert about 1 acre of forested to nonforested lands. Approximately 5.5 miles of temporary spur road construction would temporarily remove all vegetation on approximately 8.75 acres of forested land. Following harvest activities, temporary roads would have the road bed tilled, mulched, and planted to reestablish conifer species. Removal of the compacted surface would restore site productivity and provide suitable growing conditions for planted conifers.

No regeneration harvest would occur in stands 100 years (northern GFMA) or 120 years (southern GFMA) or older on matrix lands in which the point of optimum net wood production has been reached. Conifer growth and timber yield would not be maximized on these sites. Stands above the age of culmination of mean annual increment would not receive the treatment necessary to maximize the volume growth capability of the site. Changing the silviculture treatment from a regeneration harvest to a selection harvest would result in growth rates less than those planned for and expected under the sustained yield objectives of the PRMP/EIS (Bureau of Land Management 1994, 207).

Cumulative Effects

See section 3.4.4.1, Effects of Alternative 1 (No Action) on Forest Condition, Cumulative Effects.

The short- and long-term timber management assumptions and conifer growth and timber yield projections for stands 100 years (northern GFMA) or 120 years (southern GFMA) or older on matrix lands would not be met. No regeneration harvests would be applied on 1,091 acres that meet the ROD/RMP guidelines for regeneration. The Medford District has harvested less than half of the regeneration acres analyzed and allowed for since the RMP implementation in 1995. By not meeting the annual and decadal target for regeneration harvest acres, the developmental stand trajectories, stand age distribution, and sustained yield assumptions of the ROD/RMP would not be met. This alternative adds to the Medford District RMP regeneration acre deficit and leads further away from the anticipated growth and yield projections of the ROD/RMP.

Density management (985 acres) and small diameter thinning (1,115 acres) proposed in this project in addition to future fuel hazard reduction (4,000 acres) would reduce stand densities toward levels the site has resources to support. Improved tree growth and vigor increases tree and stand resiliency to environmental disturbances. Approximately 6,200 acres or 10% of BLM-administered acres in the Evans Creek fifth field watershed would be treated.

On private industrial forest lands, harvest would continue and older stands would be converted to early seral stands, with conifers planted to maximize growth and timber yield.

Most private industrial forest lands would be intensively managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, 4-5).

Underburning would occur on 400 acres of the treated acres, or less than 1% of the BLM-administered lands within the Evans Creek 5th field watershed.

3.3 Soil

The following definitions are for terms used in this section:

alluvium. Material transported and deposited by streams or overland flow.

colluvium. Material deposited and accumulated at the base of slopes due to gravitational action.

compaction. The process by which the soil grains are rearranged to decrease void space (particularly large pores) and bring them into closer contact with another, thereby increasing the bulk density (SSA 1997) (Miller, Colbert and Morris 2004).

decomposed granitics. Soils weathered and formed from granitic rocks. These soils tend to be highly erodible and prone to gully erosion and debris slides. Low clay content and a coarse, single-grain structure contributes to a lack of cohesion; stabilizing these soils after a disturbance is very difficult. Decomposed granitic soils are identified in the Medford District ROD/RMP as fragile soils (FM) due to surface erosion (Bureau of Land Management 1995).

displacement. The act of moving soil laterally from narrow ruts or wider areas (Miller, Colbert and Morris 2004).

fragile soils. The Medford District's timber production capability classification identified four categories of soil types as sensitive to surface-disturbing activities and need special mitigation. The objective is to minimize surface disturbance and subsequent erosion on fragile suitable commercial forestland.

gully. Small incised drainage with steep sides cut by running water and through which water ordinarily runs only after rainfall. This is commonly seen on roads in poor condition.

residuum. Soil weathered and developed from bedrock in place.

schist. Decomposed metavolcanic rock (mica) that weathers to a medium (silt) texture. It is highly erodible and difficult to stabilize after a disturbance. Soils formed from schist are identified in the Medford District ROD/RMP as a fragile soil (FM) (Bureau of Land Management 1995).

sedimentation. The disposition of eroded particles from flowing water or wind that have since settled.

timber production capability classification (TPCC). The process of partitioning forestland into major classes indicating relative suitability to produce timber on a sustained yield basis.

From a soil perspective, the field-based inventory made determinations as to the capability of a soil to regenerate a forest stand after the completion of conventional timber harvest activities. Areas considered not capable due to the physical properties of the soil (e.g., erodibility, potential for mass movement) or landscape position (e.g., headwall, steep sideslopes adjacent to streams) were withdrawn from the timber base and classified as unsuitable for timber harvest.

3.3.1 Methodology

The project soil specialist used the following sources for analysis:

- The soil analysis area is the Evans Creek fifth field watershed. The watershed was analyzed further by the sixth field watersheds within the fifth field for possible increases in sedimentation.
- BLM soil scientists conducted field reconnaissance of the Evans Creek Project Area in order to assess the current conditions of the soils and the issues involved.
- GIS was used to calculate the watershed area, density of roads, amount of fragile soils, and other land area measurements.
- The density of roads and off-highway vehicle trails were obtained by calculating total road/trail length and dividing it by the area.
- The Soil Survey of Jackson County, Oregon (USDA National Cooperative Soil Survey 1993) (USDA National Cooperative Soil Survey 1993) was used for information about specific soils in the Project Area.
- Watershed analyses of Lower Evans Creek, Mid-Evans Creek, West Fork of Evans Creek, and East Evans Creek (USDI 1995, 1995, 1995, 1996) were used to characterize the smaller watersheds within the Evans Creek fifth field watershed.
- All proposed new and temporary road construction was field reviewed by the BLM soil scientists and layout forester with input from the hydrologist, engineering technician, and fish bio-tech. Road design and location were reviewed to ensure compliance with 1995 Medford District ROD/RMP objectives and recommendations (p. 157-165) to reduce erosion and sedimentation. Roads that could not be constructed without meeting the objectives were dropped from the plan or the yarding system was changed to helicopter yarding. Some roads required realignment to avoid unstable areas.
- All proposed tractor yarding units were field reviewed by the layout foresters or soil scientists to ensure compliance with 1995 Medford District ROD/RMP (p. 155-156) objectives for fragile soils (FM).
- For this analysis, the soils designated fragile that are granitics and schist will be grouped under the same term: fragile mineralogy (FM). This is because the treatment and issues regarding the two are essentially the same. Soils designated fragile that are high in pyroclastic clays will be identified as (FP).

3.3.2 Assumptions

- All proposed project design features will be implemented in order to meet resource objectives.
- Timber harvest activities (e.g., road construction, timber harvest including tractor

yarding) will occur on private industrial timber lands within the next 5 years with the majority of the harvest using tractor or skyline cable yarding.

- Tractor yarding on private industrial timber lands will occur on slopes greater than 20% in granitics.
- Short-term is less than 5 years and long-term is greater than 5 years.

3.3.3 Affected Environment

The main soil-related concern in the Project Area is sediment production from fragile soils with dissected terrain, off-highway vehicle use, high road density (5.7 miles per square mile), and skid trail density.

3.3.3.1 Topography and Soil Types

The Project Area is geomorphically comprised of three different physiographic provinces. Provinces are areas with a similar geomorphic history, geologic structures, and topographic relief, which are factors that greatly influence how soil is formed. The Evans Creek fifth field watershed contains the Klamath Mountain Province, Western Oregon Interior Valley Province, and Western Cascades Province (USDA National Cooperative Soil Survey 1993, 427-431).

Most of the Evans Creek fifth field watershed is in the Klamath Mountain Province. The Klamath Mountains are complex areas characterized by steep, rugged terrain. The mountains were formed from uplifted metamorphic rock with intrusions of ultramafic (peridotite and serpentinite) and granite rock. The erodibility of the residuum combined with the forces of stream flow has created a steep topography. The high dissection of the topography leads to stream channels that are typically narrow with high gradients (10-60%). Erosion is most active in areas with steep slopes, concave topography, and shallow soils (USDA National Cooperative Soil Survey 1993, 427-431).

A small portion of the Evans Creek fifth field watershed resides in the Western Oregon Interior Valley Province. The province contains floodplains and fluvial deposits below the mountain ranges. These areas are generally not forested. The extent of the characteristics are located along the lower reaches of Evans Creek and Pleasant Creek, beginning around Wimer and continuing southwest in the Evans Creek Valley (USDA National Cooperative Soil Survey 1993, 427-431).

The eastern edge of the Evans Creek watershed is within the Western Cascades Province where the dominant geologic type is weathered basalt (pyroclastic soils). The soils are derived from lava and pyroclastic rock, and gently sloping terrain with less dissection (USDA National Cooperative Soil Survey 1993, 427-431).

Soil Types in the Project Area

In order to provide a more complete picture of the soils in the Evans Creek Project Area, soil types are discussed for the 6 sixth field watersheds in the Evans Creek fifth field watershed. Also included are the 2 seventh field watersheds located outside the Evans Creek watershed that contain proposed projects. See Table D-1, Appendix D-Soil, for a more complete description of the soil types in the Evans Creek Project Area.

Lower Evans Creek Sixth Field Watershed

The Lower Evans Creek sixth field watershed is located in the southwest corner of the Evans Creek watershed. The western ridges of the Lower Evans Creek sixth field contain soils formed in parent materials derived from sedimentary rocks. The common soil series on the steeper (50-80%) upper and middle slopes of the ridge is Caris-Offenbacher; the Vannoy-Voorhies soil series is on the less steep (35-60%) middle and lower slopes of the ridge. These soils have moderate erosion potential and are relatively stable in terms of landslide potential. There are, however, depositional areas (draws and swales) that may have deep accumulations of ravel (Bureau of Land Management 1995, 10). Areas where the ravel is greater than 6 inches deep have been withdrawn from timber harvest in the TPCC. The most extensive soil series found on the foot slopes, alluvial fans, and bottomlands below the western ridges is the Ruch and Central Point series (ibid.). They are formed in parent materials of mixed mineralogy.

The eastern ridges of the Lower Evans Creek sixth field watershed contain soils formed in parent materials derived from decomposed granitics. The Tallowbox series is found on the sideslopes of the eastern ridges and the Schefflein series is found in the downslope positions and alluvial fans of the bottomland below the eastern ridges. Both soil types are highly erodible and have high potential to produce large amount of sediment (Bureau of Land Management 1995, 10).

Middle Evans Creek Sixth Field Watershed

The Middle Evans Creek sixth field watershed is located in the southern center of the Evans Creek watershed. The dominant soil types occurring in this watershed are the Beekman-Colestine and the Josephine-Speaker soil complexes. The Beekman-Colestine soils are moderately deep (20-40 inches) to highly fractured bedrock and are most commonly found on the steeper side slopes. The Beekman soil is skeletal (>35% rock fragments in subsoil), which limits water and nutrient supplying capacity, whereas the Colestine is nonskeletal. The Josephine-Speaker soils are relatively deep (20 to 60 inches) and are generally found on slopes less than 60%. In general, both these soil complexes are relatively stable in terms of slope stability and erodibility (Bureau of Land Management 1995, 8).

Pleasant Creek Sixth Field Watershed

The Pleasant Creek sixth field watershed is located on the western side of the Evans Creek watershed. The western ridges contain some serpentine-derived soils, which are typically located on ridgetops near where the highest amount of sedimentation occurs. The dominant soil type derived from serpentine is the Gravecreek soil series. Gravecreek has a cobbly loam surface texture and is only partially serpentinized.

The eastern ridges of the Pleasant Creek sixth field are primarily granitic soils in the Wolfpeak and Siskiyou soil series. Wolfpeak soil series has a sandy loam surface and Siskiyou soil series has a gravelly sandy loam surface. The western portion of the Pleasant Creek sixth field watershed is mainly colluvium and residuum derived from mudstone, metavolcanics, and metasedimentary rock. Common soil series are the Beekman-Colestine, Josephine-Speaker, Pollard, and Acker-Norling complexes.

Upper and Lower West Fork Evans Creek Sixth Field Watersheds

Upper and Lower West Fork Evans Creek sixth field watersheds are located in the northern portion of the Evans Creek watershed. Upper West Fork Evans Creek sixth field is composed predominately of decomposed granitic soils. The soils are highly erodible and prone to gully erosion and debris slides. Lower West Fork Evans Creek sixth field has a greater percentage of soils formed from relatively more stable metasedimentary and metavolcanic rocks. There are, however, frequent geologic contact zones with schistic rocks that create areas of instability especially during wet or saturated conditions. The Lower West Fork Evans Creek sixth field contains many headwalls and steep side slopes that are unstable and have been restricted or withdrawn from timber harvest through TPCC (Bureau of Land Management 1995, 2).

Upper Evans Creek Sixth Field Watershed

The Upper Evans Creek sixth field watershed is located on the east side of the Project Area. The eastern portion of the watershed contains gently sloping terrain along East Fork Evans Creek. The most common soil series derived in high pyroclastic clays is the McNull-Medco complex. These soils are weathered in colluviums from tuffs (breccia) or igneous rock.

The most extensive soils in the western portion of the Upper Evans Creek sixth field are the Musty and Goolaway soil series. This portion of the watershed has relatively steep (60-80%) canyon slopes (Upper Evans WA, 1996, 6). Both soils are silt loams, moderately deep (20-40 inches) and well-drained. The Musty soil has skeletal (>35%) rock fragments in the subsoil over fractured bedrock. The Goolaway soil has silt loam subsoil and is underlain by weathered bedrock. These soil types are prone to slumping and sliding, particularly on the steeper side slopes (>60%) and under saturated conditions (Bureau of Land Management 1996, 6). Other common soil series are Freezener, Geppert, and Josephine (USDA National Cooperative Soil Survey 1993). In the lower portion of the watershed where residential property and farmlands are located, the soils are characteristically deep alluvial silt deposits (Bureau of Land Management 1996, 6).

Upper South Fork Cow Creek, Upper Applegate Creek, and Chicago Creek Seventh Field Watersheds

A small portion of the Project Area is located high on the ridges just outside the Evans Creek fifth field watershed. These areas generally have the same characteristics as the adjacent watershed. The southern reaches of Upper South Fork Cow Creek and Upper Applegate Creek seventh field watersheds (in the Cow Creek fifth field watershed) bordering the northern reaches of the Evans Creek fifth field watershed are very similar to the adjacent Upper and Lower West Fork Evans sixth field watersheds. The dominant soil types in the Upper South Fork Cow Creek seventh field watershed are the Goolaway and Snowbrier soil series, derived from schist parent material. The dominant soil types in the Upper Applegate Creek seventh field watershed are the Steinmetz, Lettia, and Rogue soil series, derived from granitic parent material.

The Chicago Creek seventh field watershed (in the Trail Creek fifth field watershed) borders the eastern ridges of the Evans Creek fifth field watershed. The soil characteristics are similar to the adjacent Upper Evans Creek sixth field watershed. The primary soil types are the Freezener and Geppert soil complex weathered from basic igneous rock parent material.

These soils are considered to be relatively stable with respect to surface erosion and landslide potential. The typical topography is nondissected slopes.

3.3.3.2 Fragile Soils

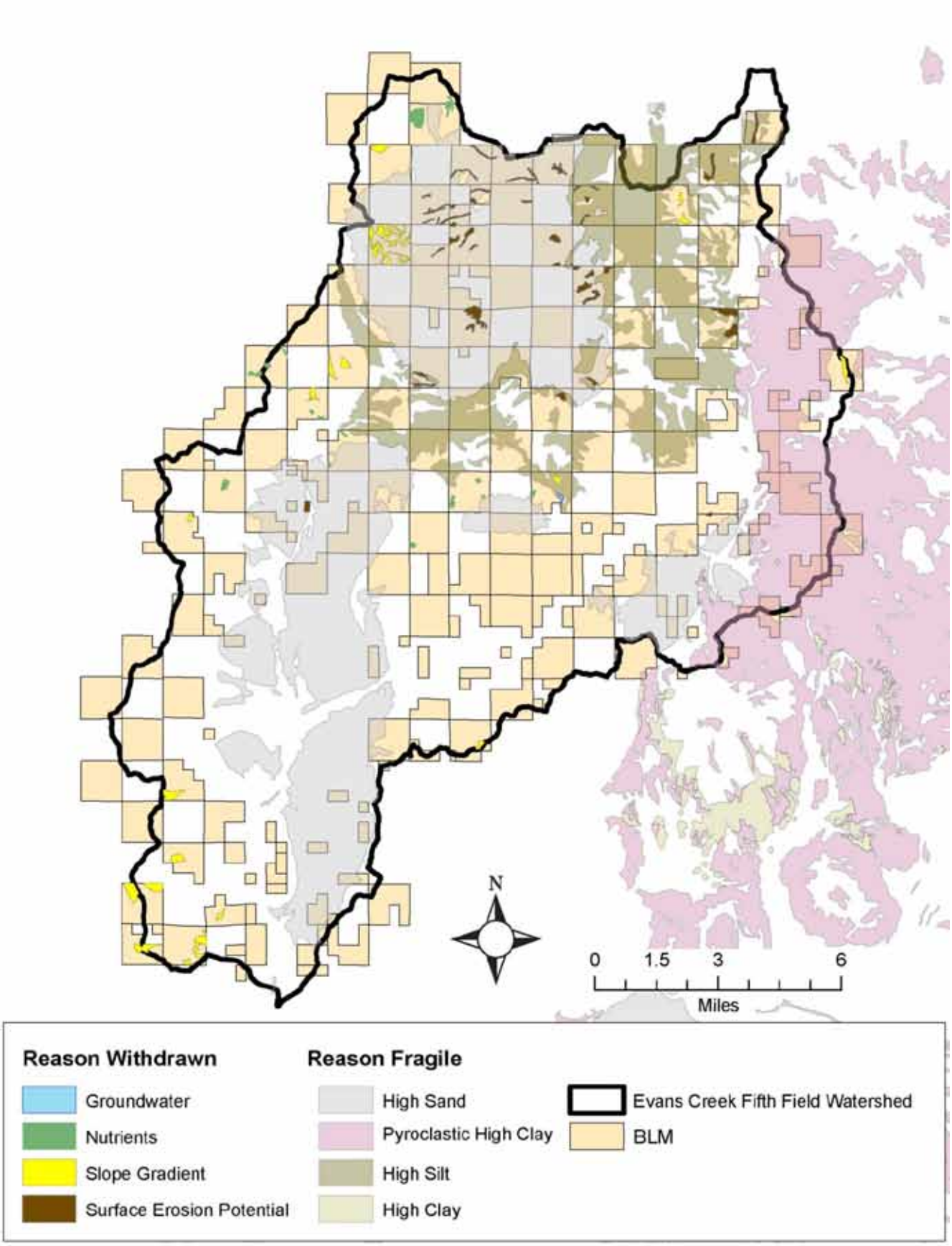
The BLM conducted an intensive inventory for the 1995 ROD/RMP to identify fragile sites where the potential to grow timber is reduced because of soil properties and landform characteristics (Bureau of Land Management 1994, 3-9). This land suitability inventory is called the timber production capability classification (TPCC) system. Various areas were withdrawn from scheduled timber harvest under the TPCC category nonsuitable woodland. Soil-related reasons for areas being withdrawn are high groundwater, low levels of nutrients, surface erosion potential, slope gradient, or soil moisture (Map 5).

Four categories of fragile soils sensitive to surface-disturbing activities were identified in the TPCC in order to minimize surface disturbance on fragile suitable commercial forestland (Table D-2, Appendix D-Soil): fragile slope gradient (FG), fragile mass movement (FP), fragile surface erosion (FM), and fragile groundwater (FW) (Bureau of Land Management 1995, 155). The Evans Creek fifth field watershed contains fragile soils with concerns related to mass movement (FP) and surface erosion (FM), and subsequent sedimentation.

Decomposed granitics and schistic soils are the most common fragile soils in this watershed. Soils formed in decomposed granitic and schistic parent materials typically have moderate to high erosion and mass movement potential depending predominantly on slope steepness and configuration. Low amounts of soil fines and organic material in the surface layer of these soils cause the soils to be susceptible to detachment and downslope movement after disturbance. These soils are subject to debris slides because of the decomposed and highly fractured parent materials.

Decomposed granitic soils are highly erodible and prone to gully erosion and debris slides, especially after ground-disturbing activities. The low clay content and high amount of coarse-grained sands contribute to the soil's weak structure and lack of cohesion (Bureau of Land Management 1995, 2). The two most abundant soil series in granitic bedrock are the Tallowbox and Steinmetz soil series on the upslope position formed in colluvium, and the Sheifflein and Lettia soil series on the downslope position formed in alluvium and residuum from decomposed granitics. Tallowbox and Steinmetz soils are highly erodible and are very sensitive to disturbances such as road construction, tractor yarding, and wildfire effects. These soils have high potential to produce large amounts of sediments (Bureau of Land Management 1995, 10) if not adequately mitigated. The Sheifflein and Lettia soil series have weathered to a finer texture and generally are not as erodible and sensitive to disturbances.

Schistic soils weather to a silt and very fine sand and are highly susceptible to mass movement under saturated conditions or on steep slopes (>60%) that are subject to sediment production. Schist soils have a high risk of slumping and landslides when large conifer trees are removed on side slopes adjacent to streams. Schist soils tend to be low in organic matter content and have weak granular structure. The Musty and Goolaway soil series are the most predominant soils formed in schists. Both Musty and Goolaway soil series are moderately deep (20-40 inches) silt loams but the Musty soil series is skeletal (>35% rock fragments) (East Evans WA, 1996, 6).



Map 5. Fragile and Withdrawn Soils in the Evans Creek Fifth Field Watershed

Nearly half (46%) the Evans Creek watershed contains fragile soils (Table 3-5). Decomposed granitics are found in the central portion of this watershed. Schist is commonly found around the edges of the granitics. The pyroclastic high clays are on the eastern side of the watershed. The geographic extent of the fragile soil is shown on Map 5. Serpentine is located on the far western and northern ridges of the watershed (the serpentine areas are not mapped).

Table 3-5 reflects the BLM lands withdrawn from timber production. The last column on the table indicates the percentage of the total amount of fragile soils that have been withdrawn.

Table 3-5. Amount of Fragile and Withdrawn Soils in the Evans Creek Fifth Field Watershed

TPCC Category	Acres	Percent of Watershed	Acres Withdrawn from the TPCC	Percent of Fragile Soils Area Withdrawn
Fragile–surface erosion (FM)	57,227	40	795*	1%
Fragile–mass movement (FP)	9,303	6	0.4	Less than 1%
Nonfragile/Typical soil	76,665	54	0	0
Total	143,275	100	795.4	1%

*Within the FM soils, areas were withdrawn for different reasons (e.g., slope gradient, surface erosion potential, and high groundwater). Since all of the areas were within the FM soils area they were added together.

In addition to fragile decomposed granitic and schistic soils (FM), fragile pyroclastic high clay soils (FP) are also found in the Project Area, but to a much lesser extent (Table 3-5). These soils are most common in the low elevation areas of the Upper Evans Creek sixth field watershed. The pyroclastic high clay soils are fragile because of the susceptibility to mass movement and ease of compaction. Pyroclastic clays have a large amount of high shrink-swell clays, which are subject to drying and cracking. When wet or saturated, pyroclastic clays are unstable, subject to slumping, and, if transported to water, can remain in suspension for long periods of time (Bureau of Land Management 1995).

Soils weathered from serpentine bedrock are also found in the Project Area. Although these soils are not identified as fragile in the ROD/RMP, areas categorized as fragile nonsuitable woodland in the TPCC due to poor nutrients are most likely serpentine (see Map 5). Serpentine is a concern because of the high ratio of magnesium to calcium in the rock. Residuum from serpentine soils is generally shallow, droughty, nutrient-poor, erodible, stony, and fine-textured (Schaetzl and Anderson 2005). Soil series with serpentine are the Dubakella series and the Gravecreek series.

3.3.3.3 Sedimentation

Roads are typically one of the major contributors of sediments in the Evans Creek watershed (Bureau of Land Management 1995, 2). Road density, location, design, use, and parent material can affect road-related sediment impacts. Roads in the Evans Creek fifth field watershed range from major paved county highways to private access roads (see Types of Roads found in the Evans Creek Project Area, Appendix D-Soil). Average road density for the Project Area is 5.7 miles per square mile (Table 3-6). The majority of roads in the Evans Creek watershed were constructed to access timber on private industrial timber lands and BLM-administered lands.

Table 3-6. Road Miles and Road Density in the Evans Creek Project Area by Analysis Area.

Analysis Area	Road Miles	Road Density (mile/square mile)
Chicago Creek	19.7	6.8
Upper Applegate Creek	33.8	4.8
Upper South Fork Cow Creek	25.7	4.1
Middle Evans Creek	167.4	4.5
Lower Evans Creek	201.0	5.9
Lower West Fork Evans Creek	235.1	6.5
Pleasant Creek	255.4	6.0
Upper Evans Creek	276.3	5.7
Upper West Fork Evans Creek	151.5	6.0
Totals	**1,365.9**	**5.7**

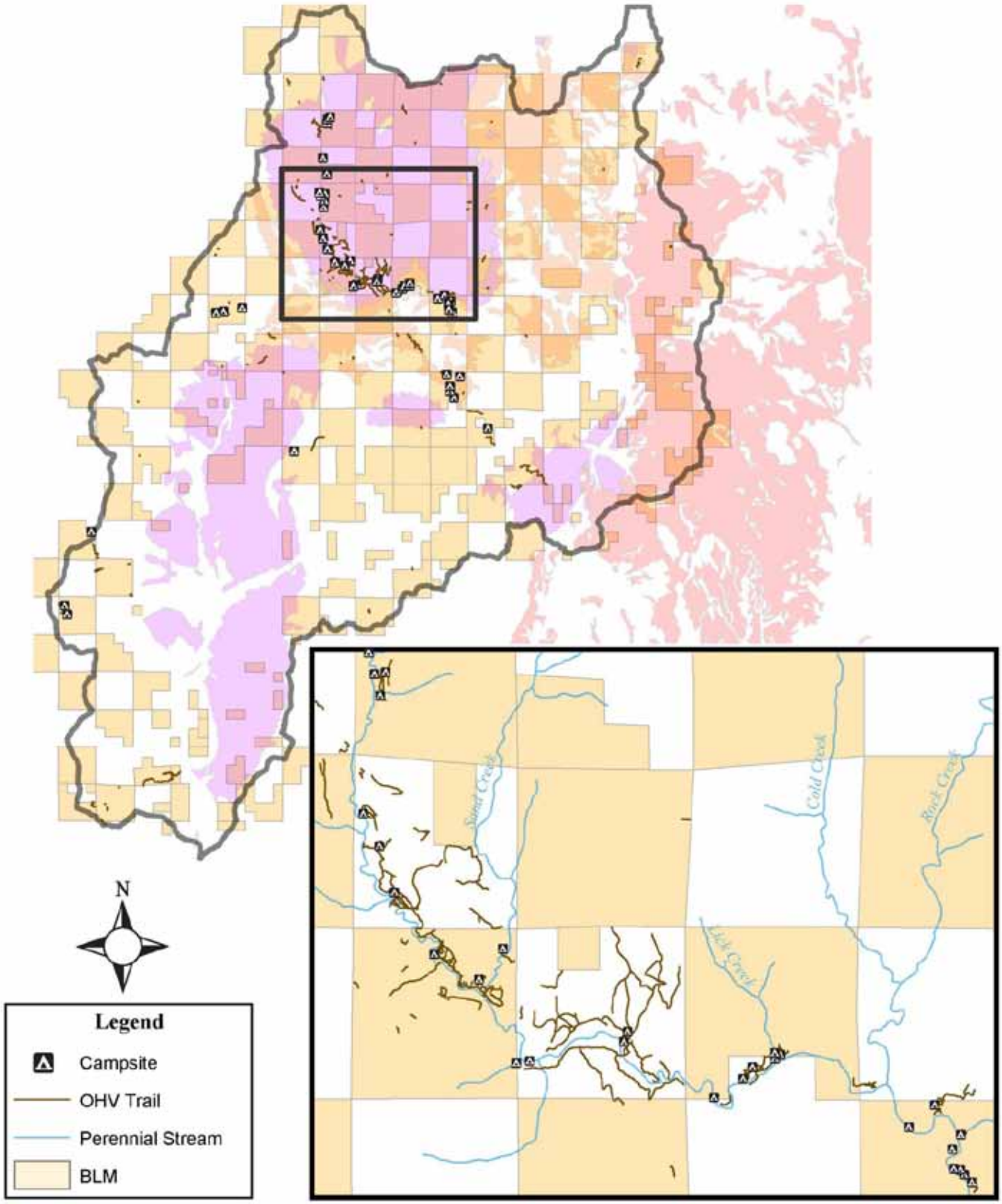
The potential for a road to be subjected to erosion and produce sediments depends on its position on the landscape (e.g., headwalls, ridge tops) where the road is constructed; the underlying geologic parent material (e.g., decomposed granitics, schistics, metavolcanics, pyroclastics) also determines the potential for erosion and sedimentation. The potential for erosion on all roads also depends on adequate maintenance of the road drainage features. Ultimately, the intensity, timing, and duration of local rainstorms will determine to a large extent the amount of sediment production from any given road.

The road surface type with the highest concern for sedimentation is natural surface. The BLM estimated the amount of sediment delivery from different road surface types. Bituminous surfaced roads (paved) are expected to contribute the least amount of sediment, aggregate produces more, and natural surface roads contribute the highest amount of sediment. Paved roads average 1.58 tons of sediment per square mile per year while natural surface roads average 9.61 tons per square mile per year (Bureau of Land Management 2008, 346). Nearly 132 miles of natural surface roads are located on BLM lands or are BLM controlled roads located on non-BLM lands.

Off-highway vehicle use also has the potential to deliver sediment to streams. OHV trails in the Project Area are made by recreationists and can be found anywhere an OHV can travel. Since the trails are made by recreationists, the trails are not 'designed' and can be found in and around streams and on steep sideslopes where erosion and sedimentation is at high risk. In addition, many of the trails are on FM soils. The West Fork Evans Creek drainage has the highest concentration of OHV use. Most of the trails radiate out from the Elderberry Flat Campground, but some are associated with dispersed campsites located on the banks of West Fork Evans Creek (Map 6).

3.3.3.4 Long-term Soil Productivity and Soil Compaction from Tractor Yarding

Long-term soil productivity as it relates to soil compaction from tractor yarding was analyzed on a unit-by-unit basis in the Medford District PRMP/EIS (Bureau of Land Management 1994, 3-9). Currently, all proposed tractor yarding units meet the ROD/RMP spacing requirement (150 feet) for skid trails. Since proposed tractor yarding units would require a minimum 150-



Map 6. Dispersed Campsites and OHV Trails in the Evans Creek Fifth Field Watershed

foot spacing for new skid trails, soil productivity is considered to be in compliance with the Medford District ROD/RMP standards and was not analyzed in detail for each alternative. Residual soil compaction from tractor yarding would be improved by ripping the tractor units after the final entry harvest.

3.3.4 Environmental Consequences

3.3.4.1 Effects of Alternative 1 (No Action) on Soil

Direct and Indirect Effects

Under Alternative 1 (No Action), no timber harvest would occur, no roads or landings would be constructed, and no logging slash would be treated. This would result in no direct effect to the soil resource and would maintain current sedimentation rates in the Project Area.

Road-related erosion and subsequent sedimentation in local stream channels would not be reduced because the proposed road renovation and road decommissioning would not be completed. There are 132 miles of natural surface roads in the Project Area and 88 miles are on fragile soils. Natural surface roads contribute 9.61 tons of sediment per square mile per year (Bureau of Land Management 2008, 346). Therefore, natural surface roads in the Project Area produce approximately 110 tons of sediment per year.

The existing road network would not receive any road renovation. Roads that are currently in poor functioning condition would not be renovated, which would lead to further erosion and sedimentation if left unmitigated.

By not completing the proposed road decommissioning, the current level of road-related sediment rates from roads in this watershed would be maintained and is likely to increase in the future if no maintenance is preformed; ACS objectives identified in the Medford District ROD/RMP (p. 22) for salmon and steelhead and water quality would not be addressed. Under this alternative, local streams in proximity to the individual roads proposed for decommissioning would not benefit from the expected reduction in sediment rates. Many of the roads proposed for decommissioning are natural surface or have existing drainage problems.

Under Alternative 1, no dispersed campsite rehabilitation would occur. This would continue the current condition of the campsites along the West Fork Evans Creek and would not address ACS objectives identified in the Medford District ROD/RMP (p. 22). The primary soil types found along West Fork Evans Creek are considered fragile soils in Medford District ROD/RMP. Left unmitigated, the size of these campsites would continue to increase and expose bare soil areas that would be subject to compaction, erosion, and sediment-laden runoff. Vehicle access would continue to be unrestricted in the campsites and the riparian areas would not recover. Not rehabilitating the campsites would continue the current degraded condition of the stream banks, the stream channels, and the riparian areas at the sites. Erosion and sedimentation would continue and would increase with greater use and unrestricted access.

Cumulative Effects

Past actions in the Project Area include timber harvest, road and landing construction, mining, power line construction, and OHV use on both private and BLM-administered lands. All of these activities create ground disturbance which can lead to increases in sedimentation. However, since 1995, all activities on BLM lands (excluding OHV use) have followed the Medford District BMPs so it is expected that the amount of sedimentation is not increased by those activities. Since implementation of the ROD/RMP in 1995, very little tractor yarding (309 acres) has occurred on BLM-administered lands as a result of implementing the BMP for timber harvest on fragile soils that recommends avoiding tractor yarding and using helicopter yarding (Bureau of Land Management 1995, 156).

Roads and skid trails have the greatest impacts because of the long-lasting effects these disturbances have on soils. Road runoff and landslides are the primary routes of sediment delivery to stream channels (Bureau of Land Management 2008, 343). Compaction, soil productivity loss, and erosion have resulted from roads and skid trails in the Project Area. Continuation of current management would maintain the current condition of roads and the current level of road-related erosion. Sedimentation rates are likely to increase on nonmaintained roads in the future without the road projects. Existing compaction would slowly decrease over time through ecological processes. Since roads traverse across almost all portions of the watershed, most streams are directly or indirectly affected by road-related sediment.

BLM projects to improve the quality of the roads in this watershed have reduced the sediment the roads were previously producing: 23.5 miles of culvert replacement and installation, 1.6 miles of road obliteration, 2.3 miles of road decommissioning, and 18.6 miles of road cut bank hydromulching. This alternative would not be consistent with BLM projects that were previously implemented to reduce road-related sediment in this fifth field watershed.

About 3,200 acres of underburning and hand pile burning has been completed in the Project Area since 1999. These treated areas revegetated within 1 to 2 years, so the long-term sedimentation resulting from fuels treatments was minimal to none.

Timber harvest activities (e.g., road construction, timber harvest including tractor yarding) are expected to continue on private industrial timber lands in the Project Area within the next 5 years with the majority of the harvest using tractor or skyline-cable yarding. It is assumed that tractor yarding on private lands would occur on slopes greater than 20% slopes. It is expected that these activities would contribute to increases in road density, soil erosion, and sedimentation in the Project Area. There is currently no site-specific data available in the watershed to quantify these activities or their impacts on soils.

3.3.4.2 Effects on Soil Common to All Action Alternatives

Direct and Indirect Effects

The following projects are identical for all action alternatives: Permanent Road Construction, Temporary Spur Road Construction, Road Decommissioning, Dispersed Campsite and Off-highway Vehicle Trail Rehabilitation, Water Source Restoration, and Special Forest Products. The direct, indirect, and cumulative effects of each will be discussed below.

Roads

Under all action alternatives, 0.2 mile of permanent road construction and 5.5 miles of temporary spur road construction are proposed. Up to 39 helicopter landings (1 acre or less) would be constructed or reconstructed.

The amount of soil erosion and mass wasting that can occur from road construction is primarily dependent on (1) physical properties of the soil; (2) stability of the underlying parent material; (3) slope steepness and configuration along the road prism; (4) soil moisture content at time of construction; (5) adequacy of road drainage and construction design features; and (6) the unknown factors of timing, intensity, and duration of rainstorms during and after construction (Poff 1996). The exposed soil created by road and landing construction is subject to erosion and mass wasting that can lead to an increase in sediments reaching streams. The greatest potential for erosion and mass wasting comes in the first 2 years after road construction (Luce and Black 2001). The erosion potential becomes exponentially lower each year after construction as the road prism stabilizes (Megahan 1974).

All proposed new and temporary road construction was field reviewed by BLM soil scientists and the layout forester with input from the hydrologist, engineering technician, and fish biologist. Road designs and locations were reviewed to ensure compliance with the 1995 Medford District ROD/RMP Best Management Practices (p. 157-165) to reduce erosion and sedimentation. Roads that could not be constructed without meeting ROD/RMP objectives were dropped from the project or the yarding system was changed to enable helicopter yarding methods. After review, some roads were realigned to avoid unstable areas and to maximize use of existing jeep roads and skid trails. Where possible, proposed timber harvest yarding systems were modified to reduce road lengths (Tables D-3 and D-4, Appendix D-Soil).

Helicopter landings are typically constructed on flat open areas (e.g., ridge tops, flat benches, and road intersections) and outside of riparian areas where the risk of erosion and sedimentation is typically much less.

The following project design features for permanent road construction, temporary spur road construction, and helicopter landing construction and reconstruction would minimize or eliminate soil erosion and sedimentation:

- Rip all temporary spur roads and associated landings to a depth of 18 inches using a subsoiler or winged-toothed ripper, apply native seed and weed-free mulch, and block upon completion of use. If hauling on a temporary spur road is not completed in the same year the road is constructed, the road will be blocked.
- Ripping would improve infiltration and reduce runoff, mulching would protect the soil surface from raindrop detachment, and grass seeding would provide long-term surface protection and promote organic development in the soil.
- Offset the amount of new road construction on fragile soil with an equal amount of road decommissioning on fragile soils.

  This would meet the intent of the Medford District ROD/RMP objective (p. 155) of avoiding sediment from road construction on (FP) fragile soils.
- Avoid unstable areas (i.e. headwalls, slumps and steep side slopes) to reduce potential for mass movement (Bureau of Land Management 1995, 157).

- This will reduce the potential for mass movement.
- Restrict all road construction, renovation, closure, and decommissioning work from October 15 to May 15, or when soil moisture exceeds 25%.
- This would reduce the potential for runoff and erosion from intensive winter storms and saturated soil conditions.
- Block or barricade identified roads after use and before beginning of rainy season (generally by October 15).
- This will deter unauthorized vehicle access and reduce erosion from the unprotected road surface during wet weather.
- Apply native seed and mulch to fill slopes and disturbed areas during permanent road construction and road decommissioning. Seeding and mulching will occur in the same operational season that construction activities occur.
- Restrict all log hauling during the winter season (October 15 to May 15) to roads with at least 10 inches of durable rock surfacing or if evidence of road damage (i.e., yielding of the subgrade or visual evidence of sediment laden runoff) is occurring.

Under all action alternatives, up to 130 miles of roads would be renovated before use. The soil disturbance from cleaning sediment from culvert catchments and ditchlines and grading the running surfaces can initially lead to a minor increase in road-related erosion and possible sedimentation following the first rainfall after completion. However, cleaning sediment and debris from catchments and ditchlines greatly reduces the potential for culvert plugging and debris jams, which can produce large amounts of sediments if failures occur. Plugged culverts can result in fill slope failures (washouts) and debris jams in the ditchline can reroute water across the road resulting in gullying and headcutting in the road running surface causing damage and safety issues. Grading the running surface reestablishes the drainage design of the road (e.g., crown, outslope, and inslope) and evenly distributes the road surfacing to protect the subgrade. Spot rocking would protect the road running surface from erosion and prevent damage to the road subgrade during log hauling in areas of deficient surface rock.

The following project design feature would eliminate or minimize erosion and subsequent sedimentation from road renovation by reducing the potential for runoff and erosion from intensive winter storms and saturated soil conditions:

- Restrict all road construction, renovation, closure, and decommissioning work from October 15 to May 15, or when soil moisture exceeds 25%.

Road renovation would slightly increase sedimentation due to the exposure of previously vegetated soil and vehicle road use during project implementation. Sediment production from roads that are barricaded or blocked and waterbarred after use would decrease or would be eliminated within 2 years. These roads would revegetate and would not have disturbance from vehicle use after they are barricaded or blocked.

In order to reduce the amount of sediment entering streams from roads, this project proposes to decommission approximately 16 miles of roads in the Evans Creek fifth field watershed. Road-related sediment was identified as a major contributor of sediment that can affect water quality and fish spawning habitat (West and Mid Evans Creek Watershed Analysis Road

Team's January 19, 1994 Report of Existing Conditions). Decommissioning 16 miles of roads would loosen compacted soil and improve water infiltration, reduce runoff, increase soil porosity, and accelerate reestablishment of vegetation. Road decommissioning would have short-term increases in sediment until revegetation occurs. An additional 0.2 mile of road decommissioning in fragile soil would be completed to offset the 0.2 mile of permanent road construction in fragile soil needed for access. The Medford District ROD/RMP recommends decommissioning roads to reduce soil compaction, minimize or reduce sedimentation, and improve site productivity (Bureau of Land Management, 1995, p. 165). The reduction in the overall road density for the Evans Creek watershed from 5.7 miles per square mile to 5.6 miles per square mile would reduce sediment delivery to streams from roads.

Natural surface roads contribute the highest amount of sediment of the road surface types (Bureau of Land Management 2008, 346). Proposed road decommissioning would reduce the miles of natural surface roads in the Evans Creek watershed by 5 miles. An estimated 9.61 tons of sediment is delivered to streams from natural surfaced roads per square mile per year (ibid.). By decommissioning 5 miles of natural surfaced road, sediment would be reduced by 2.23 tons each year. (Note: this number is an average of many different soil types throughout western Oregon; it does not account for the higher concentration of FM soils in this Project Area.) The decrease in the number of road miles in the Evans Creek watershed, especially a decrease in roads in fragile soils and natural surface roads, is expected to reduce sedimentation rates from roads.

Field observations by the BLM soil scientist for past road decommissioning projects in this watershed indicate that the majority of decommissioned BLM roads are producing an estimated 75 to 100% less sediment than similar existing roads. The primary factor is the disconnection created between roadway runoff and streams after applying similar decommissioning design techniques. These observations are similar to preliminary research findings that indicate road removal may temporarily increase sedimentation, but reduce chronic erosion and the risk of landslides over the long term (Switalski, et al. 2004, 21-28). The initial soil disturbance created during road prism ripping and culvert removal would increase sediment rates if a rainstorm occurred during the decommissioning process or immediately after. However, implementation of the PDF requiring all surface-disturbing work to be performed during the typically dry summer season would make this highly unlikely. After the surface-protecting straw mulch is applied and waterbars are constructed, the potential for sediments moving off-site would be greatly reduced. The application of native grass seed would provide long-term surface protection and improve surface organic matter needed for long-term soil productivity.

Ripping the road prism breaks up the existing compacted soil and allows for better water infiltration into the soil, reduces runoff, and improves vegetative recovery. This would reduce the introduction of sediments into nearby streams from these roads. Culvert removal would reduce the risk of culverts plugging or washing out during heavy rainstorms and depositing large amounts of sediments and debris in nearby stream channels. Stream channels without culverts are more dynamic and free to reach equilibrium with their natural, more stable gradients. This reduces streambank erosion and sedimentation.

The following project design features will be implemented to minimize negative impacts of culvert removal or replacement:

- When removing culverts, pull slopes back to the natural slope, or at least 1:1, to minimize sloughing and erosion, and to minimize the potential for the stream to undercut streambanks during periods of high streamflows. Mulch, plant and seed with native plant species on all sideslopes of the stream where the culvert was removed in the same season the culvert was removed.
- Dewater streams during culvert placement and replacement to maintain optimum bedding material moisture content and to minimize the movement of sediment downstream.
- Restrict all road construction, renovation, closure, culvert removal, culvert replacement, and decommissioning work from October 15 to May 15, or when soil moisture exceeds 25%.

In summary, all soil erosion from the road projects proposed in the Alternatives 2, 3, and 4 would be avoided or minimized in the first year after completion and road-related erosion would decline in the next 2 to 5 years.

Dispersed Campsite and OHV Trail Rehabilitation

Limiting the size of 17 dispersed campsites along the West Fork Evans Creek would require excavator-placed boulders or logs large enough to prevent them from being moved. Since most campsites have compacted areas from past vehicle use, the areas would be ripped or scarified to improve soil infiltration, reduce runoff, and facilitate native vegetative recovery. Native grass and straw mulch would be applied to all areas of soil disturbance to stabilize the soil. Riparian plant species would be planted to maintain long-term riparian function.

This project would confine traffic to designated areas, which would minimize erosion and sedimentation. It would limit access to the West Fork Evans Creek, which would also minimize sedimentation. Rehabilitation activity would occur within the riparian area so there is a concern for sedimentation in the creek caused by the proposed actions. The following PDFs would minimize or eliminate sedimentation or other damage to the soils resource:

- Do not rip portions of roads within 10 feet of a stream channel.
- Apply native seed and certified weed-free mulch to all decommissioned trails and areas that are disturbed due to operational procedures.
- Waterbar trails based on gradient and erosion class guidelines in the ROD/RMP (p. 167).
- Restrict all trail decommissioning work from October 15 to May 15, or when soil moisture exceeds 25%.
- While in riparian areas, carefully plan access needs for individual work sites within a Project Area to minimize exposure of bare soil, soil compaction, and damage to tree roots. Use existing trails when possible.

Water Source Restoration

Water source restoration would maintain and improve the condition of 21 existing water sources at locations throughout the Evans Creek fifth field watershed. Maintenance activities would vary for each water source, depending on current conditions, and could include removing accumulated sediment; installing, repairing, or replacing spring boxes and culverts; repairing or

replacing pipe lines; installing, repairing, or replacing pond liners; installing safety devices such as fences and exit ramps; and completing minor road work such as grading and adding rock. Each of these activities has the potential to produce sediment; however, implementation of the following PDFs would reduce erosion and keep sediment from entering streams:

- Minimize disturbance to existing riparian vegetation in order to maintain slope stability.
- Use sediment-control measures such as straw bales, filter cloth, or sediment fences.
- Limit instream work to the period from June 15 to September 15.
- Maximize maintenance activities during late summer and early fall to best avoid wet conditions.
- Temporarily suspend work if monitoring indicates rain storms have saturated soils to the extent there is potential for causing excessive stream sedimentation.
- Apply mulch as soon as possible after excavation or ripping to reduce erosion.

Special Forest Products and Scattered Salvage Harvest

The harvest of special forest products and scattered salvage would involve removal of a variety of vegetation throughout the watershed. This may involve the use of mechanical equipment such as chainsaws, log skidders, cable yarding equipment, helicopters, loaders, and log trucks. There may be some ground disturbance due to these actions. The project is dispersed across such a large area that the effects are expected to be minimal. The following project design features will be implemented to eliminate the amount of soil erosion:

- Use existing, well-defined trails that need little clearing for access. No new skid trails will be constructed.

  This would limit the amount of ground disturbance to areas that are already disturbed.
- Place woody debris or other barricade materials (e.g., rocks, logs, and slash) on the first 100 feet of skid trails originating off system roads upon project completion.

  This would minimize or eliminate soil erosion caused by vehicles by restricting vehicle access to the system roads.
- Construct waterbars on skid trails prior to fall rains using ROD/RMP (p. 167) waterbar spacing guidelines.

  This would allow proper drainage of the road which would minimize rill and gully erosion and subsequent sedimentation.
- Reconstruct barricades on skid trails/roads after use.
- Cover newly exposed soils with onsite materials or native seed and weed-free mulch. This would establish an adequate vegetative cover on disturbed sites to prevent erosion. (Bureau of Land Management, 1995, p. 168)

Cumulative Effects

Decommissioning 16 miles of road would lower the road density of the Project Area from approximately 5.7 miles of road per square mile to 5.6 miles of road per square mile. Of the total proposed road decommissioning, 10.5 miles are in fragile soils. This would lower the road density on fragile soils and reduce sedimentation.

Soil erosion from the road decommissioning would be avoided or minimized in the first year after completion and road-related erosion would decline in the next 2 to 5 years on the decommissioned roads.

Although the total amount of sediment reduction maybe small at the fifth field scale, individual creeks located in the vicinity of the proposed road decommissioning would benefit from reduced sediment rates, which improves the chance for better water quality and fish habitat throughout the watershed. When combined with past road rehabilitation projects (Appendix I-Evans Creek Restoration Projects) and with the expectation of future BLM road rehabilitation projects road decommissioning would move this watershed toward meeting ACS objectives and improving the upward trend toward reduction in road-related sediments.

On a fifth field scale, dispersed campsite and off-highway vehicle trail rehabilitation would cause no measureable addition of sediment to streams because of the relatively small area proposed for rehabilitation. However, in the Upper West Fork and Lower West Fork Evans Creek sixth field watersheds, stream bank erosion and the corresponding sedimentation would be reduced because PDFs would be implemented and the area would be stabilized by revegetating the riparian reserve.

Water source restoration would cause the addition of minimal to no amount of sediment to enter streams in the future due to the project design features implemented. The sediment that may be disturbed in the process of project implementation would stabilize after the first winter season.

Special forest product and scattered salvage harvest would not increase sedimentation rates with the implementation of PDFs; therefore, this project would not cumulatively add to sedimentation.

3.3.4.3 Effects of Alternative 2 on Soil

Direct and Indirect Effects

Timber Harvest Treatments

Under Alternative 2, timber harvest would occur on 3,250 acres using commercial thinning, density management, northern and southern GFMA regeneration harvest, selection harvest, small diameter thinning, and hardwood management.

Commercial thinning, density management, selection harvest, small diameter thinning, and hardwood management treatments would have similar effects on erosion and sedimentation rates because the amount of ground disturbance between these treatments is expected to be similar. The difference in the number of trees removed between these treatments would not decrease slope stability or increase soil disturbance. Therefore, based on the cutting regime of these treatments, the amount of soil erosion and sedimentation is expected to be minimal.

Northern GFMA regeneration harvest leaves the fewest trees after harvest (8-12 green trees per acre) of all the proposed treatments. Northern GFMA regeneration harvest is proposed on 9 acres; 5 acres would occur on FM soils. Management direction in the 1995 ROD/RMP (p. 44) is to manage lands dominated by fragile granitic and schist soils consistent with southern

GFMA guidelines. However, the ROD/RMP recognized that some minor losses in productivity could result due to surface disturbances caused by management activities. Implementing best management practices and minimizing the disturbance of fragile areas will keep losses to a minimum.

The following are the best management practices for skyline yarding in fragile (FM) soils (Bureau of Land Management 1995, 156):

- Use full or partial suspension when yarding on FG, FM, and FW soils.
- Construct hand waterbars in cable yarding corridors on FM soils where gouging occurs immediately after use according to guidelines in the ROD/RMP (p. 167).
- Restrict all cable yarding in fragile soils to the dry season (generally October 15 to May 15).

Southern GFMA regeneration harvest is proposed on 258 acres in Alternative 2 with 199 acres in FM soils. Southern GFMA regeneration harvest is similar to northern GFMA regeneration harvest in its effects but southern GFMA leaves more trees after harvest (16-25 green trees per acre). The increase in the number of remaining trees would decrease the potential for in-unit soil movement than would occur with northern GFMA. Southern GFMA harvest would have a slight increase in the potential for in-unit soil movement than the thinning and density management treatments; however, due to the site condition, it is not expected to increase sedimentation.

The acres of timber harvest proposed in Alternative 2 represents 2.1% of the total Project Area. Less than 4% of each sixth field watershed would be harvested. The amount of sediment from the harvest units would not be completely avoided; however, due to the scale and implementing project design features, the effects would be short term and minimal.

Yarding Systems

Alternative 2 proposes tractor yarding on 393 acres (including 245 acres of fragile soil), skyline yarding on 1,921 acres (including 1,270 acres on fragile soil), and helicopter yarding on 891 acres (including 426 acres on fragile soil) (Table D-7, Appendix D-Soil).

The ground disturbance created during tractor yarding creates unprotected soil areas that are subject to detachment and transportation off-site (sedimentation) during periods of runoff from rainstorms. The amount of erosion and the likelihood of sediments reaching stream channels from tractor yarding is dependent on several dominant factors:

1. Slope steepness: This influences the velocity of runoff which increases the erosivity of the runoff and the distance the sediment-laden runoff may travel.
2. Extent of ground disturbance created by tractors in a unit: Limiting the area impacted by tractors (designated skid trails with 150-foot average spacing) reduces the amount of unprotected soil areas subject to erosion and sedimentation.
3. Season of use: Restricting the use of heavy equipment to periods of low rainfall (typically dry summer months from May 15 through October 15) and dry soil conditions reduces the probability of sediment-laden runoff from saturated soil conditions during operational tractor yarding.
4. Riparian reserve buffers: Maintaining a one site-potential tree distance (175 feet for

Evans Creek watershed) from intermittent and perennial streams and a two site-potential tree distance (350 feet) from all fish-bearing streams greatly reduces the risk of possible in-unit erosion reaching nearby streams.

5. Waterbarring skid trails: Properly placed and adequately constructed waterbars slow and divert overland flow from the skid trails. This prevents formation of gullies and rills that can transport sediments to nearby streams.

For these reasons, the 1995 Medford District ROD/RMP (p. 156-157 and 166-167) recommends the selection and implementation of best management practices based on site-specific management actions to meet water quality, soil, or fish objectives (section 3.3.1, Methodology). The project ID Team identified the following PDFs (based on the ROD/RMP best management practices) to meet the intent of the 1995 ROD/RMP objectives and incorporate mitigation that addresses the dominant factors influencing sedimentation from tractor yarding:

1. Slope steepness: Restrict tractor and mechanical operations to slopes generally less than 20% on fragile soils and 35% on nonfragile soil types. In areas where it is necessary to exceed these gradients to access more tractor area, use ridge tops where possible.
2. Extent of ground disturbance: Designate skid roads at an average of 150-foot spacing. In order to minimize ground disturbance, avoid creating new skid roads and use existing roads, where feasible.
3. Use existing skid trails in harvest units, where feasible. Designate all other skid trails prior to falling timber at an average 100-foot spacing (Small Diameter Thinning)
4. To minimize soil disturbance, limit Feller-Bunchers and harvesters to existing skid trails in previously harvested areas and designated skid trails with an average of 100-foot spacing (Small Diameter Thinning).
5. Season of use: Restrict all tractor yarding and soil ripping operations from October 15 to May 15, or when soil moisture exceeds 25%.
6. Riparian reserve buffers: Operate ground-based equipment outside riparian reserves unless used for yarding from existing roads and landings.
7. Waterbarring skid trails: Waterbar skid trails based on gradient and erosion class guidelines in the ROD/RMP (p.167).

The following PDF is specific to yarding in fragile soils:

- Apply native seed and mulch for 100 feet above or below all landings and portions of skid trails that intersect logging roads on fragile soils.

The 1995 Medford District ROD/RMP (p. 156) recommends avoiding tractor yarding on FM classified soils. The primary intent is to reduce surface erosion and potential sedimentation from tractor yarding. The project soil scientist expects the intent of the 1995 ROD/RMP objectives would be met for the 245 acres of tractor yarding on fragile soils by implementing the above PDFs.

Small diameter thinning may use ground-based equipment called a cut-to-length harvester system (see Chapter 2, section 2.2.1.2 for description). This system is unique in that the harvester equipment can cut and limb the tree in place and is capable of walking over the logging slash it creates. This method of harvesting is typically used on timber stands with

smaller diameter trees. The low ground-pressure of the harvester equipment (6 pounds per square inch or less) coupled with the protective layer of the logging slash enables the harvester to maneuver around without the typical ground disturbance created by conventional mechanical equipment.

If the cut-to-length harvester system is used for small diameter thinning, the following additional PDFs and restrictions would apply:

- Cut-to-length harvester equipment with a ground pressure less than or equal to 6.0 psi, may be used instead of designated skid trails where stand conditions allow for adequate amounts of logging slash (typically 12 inches or more in depth) to support the equipment.
- The heavier forwarder equipment used to retrieve the logs would be required to operate perpendicular to the slope when slopes exceed 20% (no sidehilling).
- All forwarder trails will maintain 150-foot spacing and stay on sideslopes less than 35% (20% for fragile [FM] soils unless logging slash depth requirements are met).

Skyline-cable yarding uses the partial suspension of logs during yarding operations to reduce the amount of ground disturbance. This yarding system typically has much less ground disturbance than tractor yarding because suspension of the lead end of the log during haul back reduces the amount of gouging and lateral swing from the log.

The amount of estimated ground disturbance from skyline-cable yarding is very difficult to quantify because slope configuration (convex slopes, benched ground) along with the lift capability of the cable machine determines the amount of ground disturbance for a given harvest unit. This is reflected in the variability of the research results where Dyrness (1967) found 12.1% ground disturbance and Klock (1975) found 2.8% soil disturbance after skyline-cable yarding. The differences in results are mostly due to differences in topography, soil types, and cable machines used in study areas.

The following project design features would eliminate or minimize soil erosion or sedimentation:

- Use full or partial suspension when cable yarding. This would minimize soil damage and erosion caused by displacement or compaction.
- Avoid downhill yarding (Bureau of Land Management, 1995, p. 166).
- Restrict all tractor yarding and soil ripping operations from October 15 to May 15, or when soil moisture exceeds 25%.
- Restrict all log hauling during the winter season (October 15 to May 15) to roads with at least 10 inches of durable rock surfacing or if evidence of road damage (i.e., yielding of the subgrade or visual evidence of sediment-laden runoff) is occurring.

For fragile (FM) soils:

- Use full or partial suspension when yarding on FG, FM, and FW soils (Bureau of Land Management, 1995, p. 156).
- Construct hand waterbars in cable yarding corridors on FM soils where gouging occurs immediately after use according to guidelines in the ROD/RMP (p. 156).

- Restrict all cable yarding in fragile soils from October 15 to May 15, or when soil moisture exceeds 25%.

Helicopter yarding systems use helicopters to move logs from a harvest unit and transport them to a helicopter landing. Typically, helicopter yarding has the lowest amount of ground disturbance compared to tractor and cable yarding because the logs are flown to the landing as opposed to being dragged by a cable system or a tractor. Klock (1975) found 0.7% soil disturbance where McIver and Starr (2001) found 3.4% soil disturbance after helicopter yarding. These differences are probably due to topographical and climatic differences at the time of yarding.

Helicopter yarding requires the use of helicopter landings generally 1 acre or less in size. Helicopter landing construction (43 total: 12 new, 13 partial reconstruction, 18 existing) requires level ground with an open canopy for safety purposes. The selection of new helicopter landing sites was made with considerations for the amount of ground disturbance needed and the distance needed to fly the logs. The greatest potential for erosion and sedimentation from helicopter yarding is the ground disturbance from landing construction. Selecting areas with level ground reduces the amount of excavation needed to construct the landing.

The Medford District ROD/RMP recommends helicopter yarding to avoid or minimize new road construction on fragile soils (Bureau of Land Management 1995, 156). In the process of planning this project, the yarding systems for several harvest units were changed to helicopter yarding; as a result, road access was no longer needed and the associated road construction was dropped (see Appendix D-Soils for a list of units).

The following PDFs and requirements are expected to minimize or eliminate erosion and sedimentation from landing construction:

- Seasonal restrictions for landing construction would reduce the potential for sediment-laden runoff during construction.
- Where available, use existing helicopter landings and areas with level ground and open canopies (e.g. road intersections and turnouts). Limit helicopter landings to 1.0 acre or less in size. This will reduce the amount of soil disturbance during construction and the number of landings needed to be constructed.
- Rip all newly constructed helicopter landings, apply grass seed, and mulch with native plant materials in the same season after use.

Fuels Treatments Associated with Timber Harvest

Approximately 2,885 acres are planned for hand piling and hand pile burning and 400 acres are proposed for underburning (Table D-5, Appendix D-Soil). In harvest units proposed for pile burning, the BLM fuels specialist would assess the amount of slash and the treatment needs after the harvest is completed. Lop and scatter would be implemented in areas where fuel loadings are not high enough to warrant piling and burning. Lop and scatter treatments retain the highest amount of on-site nutrients from the residual logging slash as compared to handpile and burn or underburn treatments.

Soil erosion is a concern when soils are exposed to high intensity heat under burn piles during hand pile burning. The potential for erosion on bare soils after pile burning is dependent on the steepness of the slope, soil type, and amount and type of surrounding vegetation. Water repellency on the soil surface from severely burned soil can also contribute to an increase in run-off, erosion, and subsequent sedimentation. In most cases, and under normal southern Oregon rainfall scenarios, the undisturbed soil and vegetation surrounding the burned piles would reduce the movement of soil off-site by slowing down and dispersing runoff before it can become erosive. Another moderating factor is that operationally, 10% of slash piles are left unburned and, depending on the treatment, riparian reserve buffers would be applied (see PDFs, section 2.8.5 Fuels Treatments Associated with Timber Harvest). These factors would minimize or eliminate soil erosion from outside of the burn piles and keep erosion effects localized to inside the burned pile area until it recovers.

Soil productivity loss from the consumption of the duff layer is the most common adverse effect on the soil resource from pile burning. Even though burn piles are typically ignited during the wet winter season, the duff layer and the soil surface directly under the piles can be exposed to high intensity heat that can consume the duff layer. The loss in soil productivity resulting from this severely burned soil could last for more than 5 years, depending on size of the pile, soil type, vegetation type, slope configuration, aspect, and climate. The factors that would moderate this effect are the widely spread distribution and small size of the piles over the landscape. This allows for more biological interaction between the small islands of burned soil and the surrounding undisturbed areas, which helps to promote and accelerate recovery in soil productivity when compared to one large continuous burn area of the same acreage.

Burn piles typically average 50 piles per acre with the average pile size being approximately 6 feet by 6 feet (36 square feet). This equates to approximately 4% of the total burn pile unit acres. Therefore, it is expected that 4% of the unit acres proposed for pile burning may have soil productivity loss under the piles. Due to the widespread distribution and small size of the burn piles relative to the total amount of acres in the Project Area, the effects on soil erosion and productivity at the fifth field watershed scale would be minimal. There is currently no site-specific data available to quantify this effect.

The amount of duff layer (surface organic matter) consumed and mineral soil exposed during underburning is directly correlated to the potential increase in soil erosion and sedimentation. (Wonzell and Clifton n.d., 1)

The surface duff layer protects the soil surface from rain drop impact, which can detach mineral soil particles, and overland flow, which transports sediments to nearby stream channels. Underburning typically uses short-duration, low-intensity fire to reduce ground fuel loadings while protecting the overstory trees. These factors help to reduce the potential for duff and large down wood consumption during underburning. As with all potential sedimentation from ground disturbing activities, the timing, intensity, and duration of subsequent rainstorms play a large role in how much erosion and sedimentation would occur upon implementation. As the underburned areas begin to revegetate (typically 1-2 years), the effects of subsequent rainstorms diminish. The BLM soil scientist has observed that in the forests of southern Oregon, even areas heavily burned in wildland fires revegetate sufficiently to protect the soil from erosion after 5 years.

A study conducted by the Umatilla National Forest measured the amount of sedimentation caused by prescribed fire (Wonzell and Clifton n.d.). Prescribed fire and fuels treatments in uplands implemented under normal operating conditions are unlikely to be measurable or detectable in tributaries because the effects are small and well within the range of variability. Without large storm events in the first three years after prescribed fire, measured erosion rates were very low and there were no significant differences in hillslope erosion between burned and unburned plots. The significant relationship between bare ground and erosion rates, however, demonstrated the role of soil cover (duff) in controlling surface erosion (Wonzell and Clifton n.d.).

Sedimentation from underburning is expected to be minimized or avoided with implementation of the following PDFs:

- Stack hand piles more than 350 feet from fish-bearing, perennial streams and more than 175 feet from non-fish-bearing, intermittent streams. Piles will not be placed in channel bottoms.
- Allow low intensity underburns ignited outside the 175- or 350-foot stream buffers to back into the buffer, as long as mid- and upper level canopies are not at risk. No direct ignition will occur within the 175- or 350-foot stream buffers.
- In general, current riparian buffer design criteria (no ignition within riparian, only allowing fires to "back into" riparian areas) appear effective in preventing hillslope sediment from entering riparian areas and delivering to streams. (Wonzell and Clifton n.d., 1)
- To prevent fire escapes and to minimize damage to residual vegetation/trees, schedule burning to occur when weather and fuel conditions allow for lower fire intensities (typically late fall through spring).
- Within riparian reserves, build firelines less than 2 feet wide, construct in the same season as burn operations, and rehabilitate immediately following final mop-up. Handline rehabilitation will consist of waterbar construction and vegetation placement within the handline in order to minimize sediment flow into water bodies. All firelines will be located in a stable area and where topographic breaks occur and will be constructed manually using hand tools and chainsaws. Waterbars will be installed based on slope and soil type.

Fuels treatments may initially lead to minor increases in erosion; however, without the proposed fuels treatments, much of the Project Area would remain at a high to moderate risk for wildfire. A large, high-intensity wildfire and wildfire suppression activities (e.g., tractor firelines and drop zones) can directly lead to exposed or burned over soil areas that are susceptible to erosion, sedimentation, and losses in soil productivity. This would result in much more damage to the soil resource than a low-intensity underburn or in areas of pile burning.

Alternative 2 proposes 129 miles of road renovation, 16 miles of road decommissioning, 5.5 miles of temporary spur road construction, 0.2 mile of permanent road construction, and construction or renovation of 37 helicopter landings (Table D-6, Appendix D-Soil). The only sixth field watershed (Upper Evans) that has permanent road construction proposed (0.2 mile) has the highest amount of renovation (30.6 miles) proposed as well. The effects of the proposed road projects are discussed in section 3.3.4.2, Effects Common to All Action Alternatives.

The effects of permanent road construction, temporary spur road construction, road decommissioning, dispersed campsite and off-highway vehicle trail rehabilitation, water source restoration, and special forest products are discussed in section 3.3.4.2, Effects on Soil Common to All Action Alternatives.

Cumulative Effects

Past and present actions in the Project Area are identified in section 3.3.4.1, Effects of Alternative 1 (No Action) on Soil, Cumulative Effects. Cumulatively, Alternative 2 is not expected to increase sedimentation on the fifth field watershed scale. There may be a minimal increase in sedimentation in the sixth field watersheds due to the nature of the landscape; however the project design features are expected to minimize the potential for sedimentation. Additionally, the projects associated with this projects (road decommission, road renovation and campsite rehabilitation) are expected to cumulatively decrease the current amount of sedimentation. The special forest products and water source restoration are not expected to have cumulative impacts on sedimentation.

3.3.4.4 Effects of Alternative 3 on Soil

Direct and Indirect Effects

Under Alternative 3, timber harvest would occur on 2,167 acres using dry forest management. This is similar to proposed harvest in Alternative 2 in that all the proposed harvest acres are under 4% of all the sixth field watersheds. There are slight differences in acres in this alternative compared to Alternative 2 but the differences are not substantial considering the scale. Therefore, the effects of timber harvest in Alternative 2 and 3 would not be different.

Alternative 3 proposes tractor yarding on 393 acres (including 245 acres on fragile soil), skyline yarding on 1,931 acres (including 1,270 acres on fragile soil), and helicopter yarding on 913 acres (including 432 acres on fragile soil) (Table D-10, Appendix D-Soil. The tractor yarded acres are the same as Alternative 2; therefore, there would be no difference in the effects from tractor yarding between Alternative 2 and 3. Alternative 3 has more skyline and helicopter yarding than Alternative 2. The small increase in skyline yarding would not be substantial due to the scale of the project and there would be no increase in sedimentation from helicopter yarding. Therefore, there would be little to no difference in the effects from the proposed yarding systems between Alternative 2 and 3.

In Alternative 3, after timber harvest, activity slash would be hand piled and burned across 3,200 acres and underburned on 400 acres (Table D-8, Appendix D-Soil).

Alternative 3 proposes 130 miles of road renovation, 16 miles of road decommissioning, 5.5 miles of temporary spur road construction, 0.2 mile of permanent road construction, and construction or renovation of 39 helicopter landings (Table D-9, Appendix D-Soil). The differences in mileage for road projects and number of helicopter landings are very small or nonexistent. Therefore, the effects from roads and landings are not expected to be different in Alternative 2 and 3.

The effects on soil from permanent road construction, temporary spur road construction, road decommissioning, dispersed campsite and off-highway vehicle trail rehabilitation, water

source restoration, and special forest products are discussed in section 3.3.4.2, Effects on Soil Common to All Action Alternatives.

Cumulative Effects

The cumulative effects would be similar to Alternative 2.

3.3.4.5 Effects of Alternative 4 on Soil

Direct and Indirect Effects

Under Alternative 4, timber harvest would occur on 2,076 acres using density management and selection harvest. Harvest treatments would be nearly the same for Alternatives 2 and 4 except Alternative 4 does not propose regeneration harvest. Alternative 4 proposes the lowest amount of timber harvest of all the action alternatives. The effects of timber harvest in Alternative 4 would be similar to Alternative 2.

Alternative 4 proposes tractor yarding on 388 acres (including 240 acres on fragile soil), skyline yarding on 1,893 acres (including 1,265 acres on fragile soil), and helicopter yarding on 865 acres (including 417 acres on fragile soil) (Table D-13, Appendix D-Soil). The proposed yarding acreages are similar across all action alternatives; Alternative 4 has one less tractor yarded unit than Alternatives 2 and 3. Alternative 4 proposes the smallest amount of tractor yarded acres, so the effects on soils would be slightly less under this alternative than any of the other action alternatives. The difference between alternatives is small enough that there is no expected difference in the effects from Alternative 4 from the other Action Alternatives.

In Alternative 4, after timber harvest, activity slash would be hand piled and burned across 2,600 acres and underburned on 360 acres (Table D-11, Appendix D-Soil).

Alternative 4 proposes 123 miles of road renovation, 16 miles of road decommissioning, 5.5 miles of temporary spur road construction, 0.2 mile of permanent road construction, and construction or renovation of 35 helicopter landings (Table D-12, Appendix D-Soil).

The effects on soil from permanent road construction, temporary spur road construction, road decommissioning, dispersed campsite and off-highway vehicle trail rehabilitation, water source restoration, and special forest products are discussed in section 3.3.4.2, Effects on Soil Common to All Action Alternatives.

Cumulative Effects

The cumulative effects of this alternative are expected to be similar to Alternatives 2 and 3. Cumulatively, the effects may be slightly less than the other alternatives on the sixth field watershed scale due to slightly less tractor yarding and fewer helicopter landings. Additionally, there would be less effect than Alternative 2 because no regeneration harvest would occur in this alternative. However these differences would be minor at the fifth and sixth field watershed scales.

3.4 Water Resources

ephemeral. Stream that flows only in direct response to precipitation and whose channel is at all times above the water table.

colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

evapotranspiration. A collective term that includes water discharged to the atmosphere as a result of evaporation from the soil and surface-water bodies and as a result of plant transpiration.

ecoregions. Areas of land with similar physical characteristics such as climate, soil type, physical geography, and vegetation.

3.4.1 Methodology

The Evans Creek Project Area is located within the Evans Creek fifth field watershed (see Map 7). The Evans Creek fifth field watershed is one of 4, fifth field watersheds within the Middle Rogue fourth field subbasin. The land in the Project Area drains into Evans Creek.

The project hydrologist and hydrologic technician used the following sources for analysis:

- Field visits to proposed harvest units and associated roads in 2008 and 2010 to determine current watershed conditions and identify issues related to water resources.
- Lower Evans Creek, Mid Evans Creek, West Fork of Evans Creek, and East Evans Creek watershed analyses (USDI 1995, 1995, 1995, 1996) for general water resources background information for the Project Area.
- GIS to analyze the existing condition of the Project Area.
- 2005 aerial photographs to estimate conditions on private land.
- Site visits to identify stream types on BLM-administered lands; aerial photo interpretation and information on streams on BLM-administered lands were used to estimate adjacent Forest Service and non-Federal land stream types.
- The Oregon Watershed Assessment Manual to assess the potential risk for peak flow increases from the transient snow zone.
- The Water Resources analysis area is the same as the Evans Creek Project Area. It includes 3 seventh field drainages outside the Evans Creek fifth field watershed and 6 sixth field subwatersheds in the Evan Creek watershed. Cumulative effects for water resources were analyzed at the Evans Creek fifth field watershed scale.

3.4.2 Assumptions

- Short-term effects are 10 years or less; long-term effects last longer than 10 years (Bureau of Land Management 1994, 4-4).
- 60-year harvest rotation for private timber lands (Bureau of Land Management 1994, 4-5).

- Historic canopy closure is 30% for forested lands in the Inland Siskiyous, less than 30% for Oak Savanna, and 40% for Southern Cascades ecoregions (Watershed Professionals Network 2001, A-83).
- All proposed PDFs will be properly implemented in order to meet resource objectives.
- The Middle Rogue fourth field subbasin has the same range of natural variability for early successional vegetation (10 to 40%) as the Upper Rogue fourth field subbasin.

3.4.3 Affected Environment

The Evans Creek Project Area is located within the Evans Creek fifth field watershed. The Evans Creek fifth field watershed is one of 4, fifth field watersheds within the Middle Rogue fourth field subbasin. The land in the Project Area drains into Evans Creek.

The Evans Creek Project Area is comprised of the Evans Creek fifth field watershed (143,278 acres), broken into 6 smaller sixth field subwatersheds (between 16,052 and 31,054 acres in size), and 3 seventh field drainages (between 1,861 and 4,473 acres in size) located outside the Evans Creek fifth field watershed (Table 3-7). These sixth and seventh field watersheds make up the analysis areas for water resources. The total Project Area is 153,665 acres (240 square miles)(Map 7).

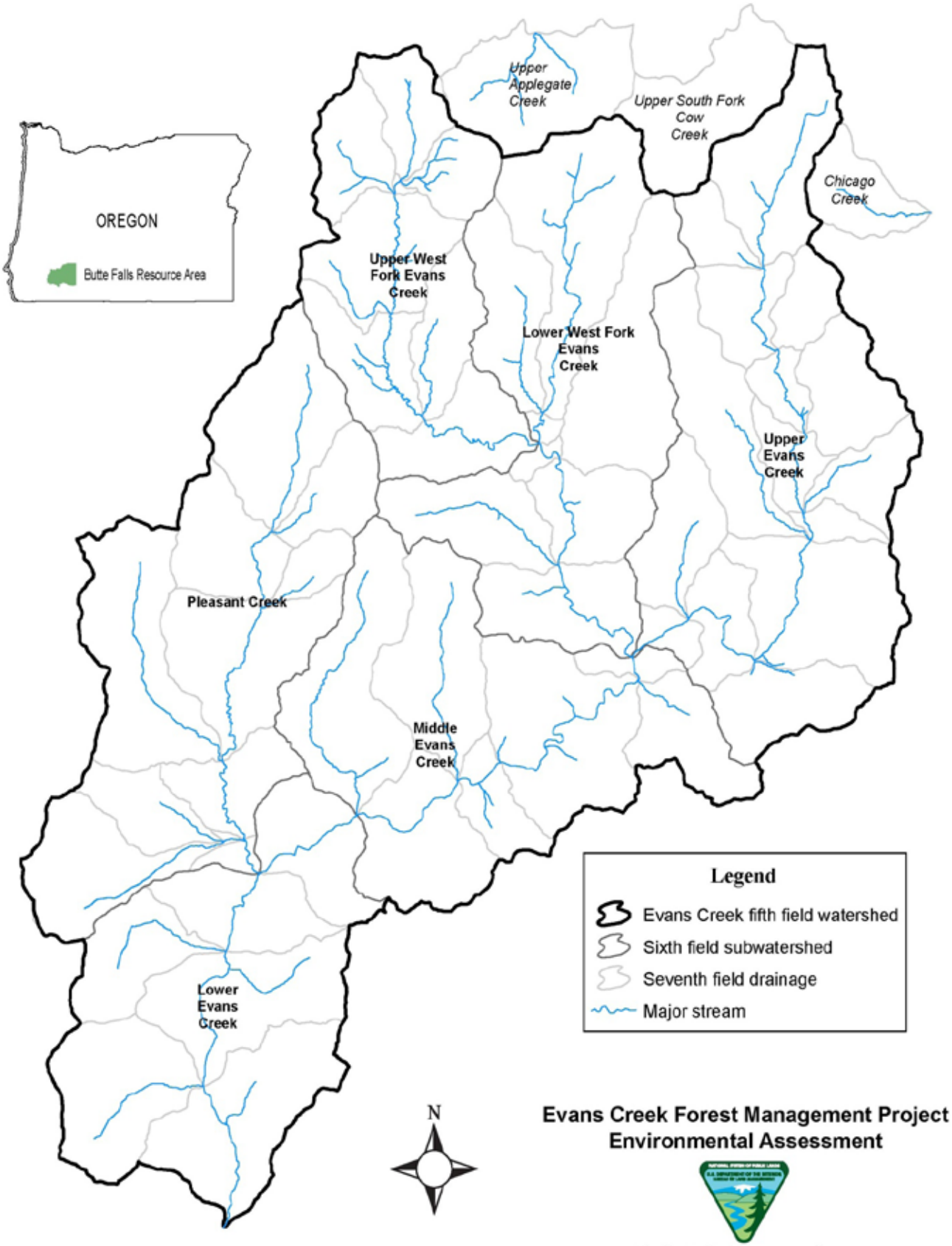
Table 3-7. Analysis Areas in the Evans Creek Project Area

5th Field Watershed	Analysis Area (7th Field Drainage or 6th Field Subwatershed)	Area	
		Acres	Square Miles
Trail Creek	Chicago Creek (7th field)	1,861	2.9
Upper Cow Creek	Upper Applegate Creek (7th field)	4,473	7.0
	Upper South Fork Cow Creek (7th field)	4,053	6.3
Evans Creek	Middle Evans Creek (6th field)	23,847	37.3
	Lower Evans Creek (6th field)	21,745	34.0
	Lower West Fork Evans Creek (6th field)	23,149	36.2
	Pleasant Creek (6th field)	27,431	42.9
	Upper Evans Creek (6th field)	31,054	48.5
	Upper West Fork Evans Creek (6th field)	16,052	25.1
	Total	**153,665**	**240.1**

The Evans Creek fifth field watershed contains five deferred watersheds:

- Sprignett Creek (East Fork Evans Creek sixth field watershed)
- West Fork Evans Creek (Headwaters), West Skeleton Mountain, and Ash Flat (Upper West Fork Evans Creek sixth field watershed)
- Cold Creek (Upper Evans Creek sixth field watershed)

The BLM hydrologist reanalyzed the deferral status of these seventh field drainages as directed in the 1995 Medford District ROD/RMP. As a result of the analysis, the hydrologist recommended removing these watersheds from deferral status with specific management actions for each drainage area. The analysis and recommendations can be found in Appendix J-Hydrology.



Map 7. Subwatersheds and Drainages within the Evans Creek Project Area

3.4.3.1 Water Quantity

Water quantity in the Project Area is a function of natural and human-caused factors. Natural site factors include climate, geology, and geographic location. Natural processes that have influenced water quantity include floods, wildfires, and drought. Human activities that have altered water quantity in the analysis areas consist of land clearing (for agricultural and residential use), timber harvest, road operations, water withdrawals, and fire suppression.

Surface Water

Average annual precipitation in the Evans Creek Project Area ranges from about 25 inches per year to 65 inches per year. Precipitation generally falls from November through March and summer months are typically very dry. The rain patterns in the winter months are widely based, relatively low intensity, and long duration in contrast to the localized, short-duration, and high-intensity summer storms that occasionally occur. A USGS (U.S. Geological Survey) gauging station located on Evans Creek near Bybee Springs collected streamflow data from 1925 to 1953. Mean monthly streamflows ranged from a mean low of 11 cfs (cubic feet per second) in September to a mean maximum of 664 cfs in February.

Elevation ranges from 990 feet (confluence of Evans Creek and the Rogue River) to 5,090 feet (Cedar Springs Mountain). Within the Project Area, rain predominates in the lower elevations (generally below 3,500 feet). Winter precipitation in the higher elevations (generally above 5,000 feet) usually occurs as snow, which ordinarily melts during the spring runoff season from April through June. A mixture of snow and rain occurs between approximately 3,500 and 5,000 feet elevation and this area is referred to as the transient snow zone. The snow level in this zone fluctuates throughout the winter in response to alternating warm and cold fronts. Snow packs in this elevation range are often shallow and are quickly melted by rain (rain-on-snow event) and warm winds. Rain-on-snow events are of interest because the melting of shallow snow packs can increase storm runoff. The highest streamflows usually occur between November and April. The maximum discharge recorded at the Evans Creek gauging station near Bybee Springs was 7,950 cfs on February 20, 1927.

The majority of the Project Area lies within the rainfall zone (136,824 acres or 89%). Nearly 11% (16,838 acres) of the Project Area is in the transient snow zone and a very small amount (3 acres) is in the snow zone. The Upper South Fork Cow Creek analysis area has the largest percentage (78%) of land in the transient snow zone (Table J-1, Appendix J-Hydrology).

Surface water in the Evans Creek Project Area includes streams, ditches, springs, wetlands, and reservoirs. Streams are classified as perennial, long-duration intermittent (intermittent with seasonal flow), short-duration intermittent (intermittent with ephemeral flow), and dry draws with ephemeral flow.

About 1,479 miles of streams are found in the Project Area: 563 miles (38%) on BLM-administered land, 39 miles (3%) on USFS-administered lands, and 877 miles (59%) on private lands (Table J-2, Appendix J-Hydrology). These streams are categorized into the following stream types: 354 miles (24%) of perennial streams, 330 miles (22%) of long-duration intermittent streams, and 795 miles (54%) of short-duration intermittent streams. Stream drainage densities range from 3.1 to 11.9 miles of stream per square mile. For specific

information about stream miles by ownership and stream types for each of the nine analysis areas found in the Evans Creek Project Area (Table J-2, Appendix J-Hydrology).

Streams categorized as perennial or intermittent on Federal lands are required to have riparian reserves as defined in the Northwest Forest Plan (USDA Forest Service and USDI Bureau of Land Management 1994). Dry draws do not meet the requirements for streams needing riparian reserves because they lack the combination of a defined channel and annual scour and deposition (Bureau of Land Management 1995). Streams on private forest lands are managed according to the Oregon Forest Practices Act, which classifies and protects streams based on three beneficial use categories—fish use, domestic water use without fish use, and all other streams.

Streamflows during April, May, and part of June are increased by melting snowpack in the high elevations. Low flows normally coincide with the period of low precipitation from July through October. Significant flows can also be produced by local, high intensity summer storms, although these events are relatively rare and their effects are localized.

Streamflows are naturally low during the summer due to low precipitation, reduced soil drainage, and sustained high evapotranspiration (Macdonald, Smart and Wissmar 1991). Fire suppression has resulted in overly dense forest stands with high evapotranspiration rates that likely contribute to decreasing the amount of water available for summer streamflows. Past harvest of riparian vegetation was followed by the vigorous regrowth of hardwoods that caused a reduction in summer flows by increasing evapotranspiration rates during the growing season (Hicks, Beschta and Harr 1991). Water withdrawals intensify the low flow condition.

A reduction in the vegetation canopy has the potential to cause the following hydrologic process changes: reduced interception, evaporation, and transpiration (more precipitation reaches the soil surface and less water is consumed by plants); increased snow accumulation in the transient snow zone; increased snow melt rate in the transient snow zone; increased soil water content (Moore and Wondzell 2005); and increased annual water yield and discharge during the normal low-flow period. Possible effects on streamflow from these processes include reduced time to hydrograph peak and increased frequency and magnitude of peak flows. Altered peak flows may affect stream channel conditions by eroding streambanks, scouring streambeds, and transporting and depositing sediments if the magnitude of flow reaches the level required for sediment transport. These are normal occurrences in a dynamic, properly functioning stream system.

The historic canopy closure for the Project Area varies by ecoregion. The analysis areas associated with the proposed project are in the Southern Cascades, Inland Siskiyous, and Oak Savanna Foothills ecoregions (Watershed Professionals Network 2001, A-80, A-204).

Historically, the Inland Siskiyou ecoregion had canopy closures greater than 30%. Fire kept stand densities down while fire suppression has allowed stand densities to increase substantially (Watershed Professionals Network 2001, A-219). Dense forests in the Oak Savanna Foothills ecoregion were confined to the mountain foothills and floodplains while much of the landscape was dominated by prairies and oak savannas with less than 30% crown closure (Watershed Professionals Network 2001, A-207). The OWAM ecosystem description

(WPN 2001) does not provide an historic canopy closure value for the forest lands in the mountain foothills. Forest types within the Southern Cascades ecoregion historically had 40 to 45% canopy closure (Watershed Professionals Network 2001, A-83). For analysis purposes, the project hydrologist assumed the historic canopy closure to be approximately 40% for forested lands in the Southern Cascades ecoregion. This assumption is at the low end of the range for canopy closure in the Southern Cascades ecoregion. Approximately 94% (143,939 acres) of the overall Project Area is forested (Table 3-8).

Table 3-8. Acres of Forested Land by Ecoregions for Analysis Areas in the Evans Creek Project Area

Analysis Area	Ecoregion			Total Forested Land	Total Area
	Inland Siskiyous	Oak Savanna Foothills	Southern Cascades		
Chicago Creek	—	—	1,851	1,851	1,861
Upper Applegate Creek	4,290	—	—	4,290	4,473
Upper South Fork Cow Creek	3,895	—	—	3,895	4,053
Middle Evans Creek	22,420	89	—	22,509	23,847
Lower Evans Creek	17,830	—	—	17,830	21,745
Lower West Fork Evans Creek	23,099	—	—	23,099	23,149
Pleasant Creek	25,167	—	—	25,167	27,431
Upper Evans Creek	18,288	8,492	2,468	29,248	31,054
Upper West Fork Evans Creek	16,050	—	—	16,050	16,052
Totals	**131,039**	**8,581**	**4,319**	**143,939**	**153,665**

The project hydrologist used 2005 aerial photographs to estimate forest stands with canopy closures less than the historic level (greater than 30% canopy closure for the Inland Siskiyou ecoregion, greater than 40% for the Southern Cascades ecoregion, and less than 30% for the Oak Savanna ecoregion) for lands across all ownerships. The percentage of forested lands in the analysis areas with canopy closures at less than historic levels range from 9% in Lower West Evans Creek to 46% in Upper South Fork Cow Creek. Overall, 17% of the forested lands in the Project Area have canopy closures less than historic levels (Table J-3, Appendix J-Hydrology).

For Forest Service lands in the Upper Rogue fourth field subbasin, the range of natural variability for canopy closure in early successional vegetation with snags is estimated to be from 10 to 40% (USDA National Cooperative Soil Survey 1993, 85). For this analysis, the BLM assumes the Middle Rogue fourth field subbasin (containing the Evans Creek fifth field watershed) would have the same range of natural variability as the Upper Rogue. This means that within the Middle Rogue subbasin, from 10 to 40% of the forest lands would have less than the historic canopy closure at any given time due to natural disturbances such as wildfire, drought, insect infestations, and forest pathogens. Using this range for the analysis areas would be a conservative estimate since the drier, lower elevation lands experienced a higher fire frequency and would contain more early successional stands than the National Forest lands in the higher elevations. Also, if the range is applicable to the entire subbasin, the range of natural variability would likely be wider at the smaller analysis area level. The percentage of forested lands below the historic canopy closure is within the conservative range of natural variability (10 to 40%) for all but two of the analysis areas: Upper South Fork Cow Creek and

Lower West Fork Evans Creek. More than 40% of the forested lands in the Upper South Fork Cow Creek have canopy closures less than historic levels. In the Lower West Fork Evans Creek analysis area, less than 10% of the forested lands have canopy closures less than historic levels (Table J-3, Appendix J-Hydrology).

The majority of the topography of the Evans Creek Project Area is characterized by steep, highly dissected landforms. The generally steep terrain with high-gradient streams results in a relatively high stream density (Table 3-9). Steep ground, high-energy streams, and high stream density result in more hydrologic connectivity from roads and skid trails to streams than in more gently sloping watersheds with lower stream densities.

Table 3-9. Stream Drainage Density for the Evans Creek Project Area

Analysis Area	Total Stream Miles	Total Area (square miles)	Stream Drainage Density (miles/square mile)
Chicago Creek	19.9	2.9	6.9
Upper Applegate Creek	21.5	7.0	3.1
Upper South Fork Cow Creek	38.2	6.3	6.1
Middle Evans Creek	370.6	37.3	9.9
Lower Evans Creek	288.1	34.0	8.5
Lower West Fork Evans Creek	386.9	36.2	10.7
Pleasant Creek	365.8	42.9	8.5
Upper Evans Creek	420.0	48.5	8.7
Upper West Fork Evans Creek	299.4	25.1	11.9
Totals	**2,210.4**	**240.2**	**9.2**

Roads have three primary effects on hydrologic processes: (1) they intercept subsurface water moving down the hillslope and rainfall directly on the road surface and road cutbanks; (2) they concentrate flow, either on the surface or in an adjacent ditch or channel; and (3) they divert or reroute water from paths it otherwise would take if the road was not present (Gucinski, et al. 2001). Roads connected to stream channels through ditch lines effectively extend the stream channel network, changing runoff timing and ultimately increasing the magnitude of peak flows (Wemple, Jones and Grant 1996). The effect of roads on peak stream flows depends strongly on the size of the watershed; for example, capturing and rerouting water can remove water from one small stream while causing major channel adjustments in another stream receiving the additional water (Gucinski, et al. 2001). Roads have relatively insignificant effects on peak flow in large watersheds where they constitute a small proportion of the land surface. They do not seem to change annual water yields and no studies have evaluated their effect on low flows (Gucinski, et al. 2001).

Roads that cross dry draws have the potential to route storm flow into the dry draw. Subsurface flow through the colluvium (i.e., loose rock and soil at the base of the slope) can be intercepted by a road cut or from compaction where a road crosses the bottom of a dry draw, initiating surface flow with scour and deposition in the draw. This has the potential to change the downstream flow characteristics of the draw to a short-duration intermittent stream, affecting the size of downstream peak flows due to the more rapid delivery of storm flow to downstream reaches (water flows much faster through the defined surface channel of a short-duration intermittent stream than it does subsurface through the colluvium of a dry draw).

Well-designed roads with a properly functioning drainage system attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the preroad condition. However, during extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects to the local environment.

The BLM obtained road miles from the BLM GIS database, 2005 aerial photograph analysis, and field visits. This is the best information available. Roads such as non-GIS roads that are hidden by tree canopy and private roads built after the 2005 photographs were taken may not be included. These additional roads would not change the outcome of the analysis because the existing roads outnumber any additional roads not identified.

Road density provides a general index of the relative amount of road in the analysis areas. Areas with higher road densities will generally experience more road-related effects; however, many other factors such as design, location, maintenance, use, surface type, gradient, and geology can influence the effect of any particular road. The Evans Creek Project Area contains 1,366 miles of road and a road density of 5.7 miles per square mile (Table J-4, Appendix J-Hydrology).

Road-stream crossings are used as an indication of connectivity between roads and streams. Concentration of runoff by road drainage systems may contribute to more rapid delivery of storm runoff directly to streams, resulting in increased peak flows. Road segments linked to the channel network increase flow routing efficiency and offer a plausible mechanism for peak flow increases (Wemple, Jones and Grant 1996). Drainages with a larger number of road-stream crossings are more likely to experience an increased magnitude and frequency of peak flows. More than three stream crossings per stream mile is considered greater than average and represents a risk of peak stream flow enhancement. Analysis areas in the Evans Creek Project Area have a density of road-stream crossings between 1.6 to 3.5 crossings per stream mile; the Evans Creek Project Area as a whole has 2.7 road-stream crossings per mile (Table J-5, Appendix J-Hydrology).

3.4.3.2 Water Quality

The Oregon Environmental Quality Commission adopted water quality standards to protect designated beneficial uses. In practice, water quality standards have been set at a level to protect the most sensitive uses. Cold water aquatic life such as salmon and trout are the most sensitive beneficial uses in the Rogue River and its tributaries (Oregon Department of Environmental Quality 2004). The DEQ (Department of Environmental Quality) is required by the Federal Clean Water Act to maintain a list of stream segments that do not meet water quality standards for one or more beneficial uses. This list is called the 303(d) list for the section of the Clean Water Act that makes the requirement. DEQ's 2004/2006 303(d) list is the most recent listing of these streams (Oregon Department of Environmental Quality 2006).

Within the Evans Creek Project Area, nine streams are included on DEQ's 2004/2006 303(d) list: Evans Creek, Battle Creek, Cold Creek, East Fork Evans Creek, Pleasant Creek, Ramsey Canyon, Rock Creek, Salt Creek, and West Fork Evans Creek (Table 3-10). Eight streams are listed for exceeding stream temperature parameter during at least some part of the year and Evans Creek is listed for exceeding the fecal coliform parameter.

Table 3-10. 2004/2006 Section 303(d) List of Water Quality Limited Water Bodies in the Evans Creek Project Area (ODEQ 2006a)

Stream Segment	303(d) List Date	Listed Parameter	Season	Miles of Stream Affected	
				Total	BLM
Evans Creek	1998	Fecal Coliform	Summer	19.1	0.3
	1998	Fecal Coliform	Fall/Winter/Spring	19.1	0.3
Battle Creek	1998	Temperature	Summer	3.9	2.4
Cold Creek	1998	Temperature	Summer	4.2	1.4
East Fork Evans Creek	2004	Temperature	Year around (nonspawning season)	17.7	4.7
Pleasant Creek	2004	Temperature	Year around (nonspawning season)	12	2.1
Ramsey Canyon	1998	Temperature	Summer	3.1	1.3
Rock Creek	1998	Temperature	Summer	6.5	2.7
Salt Creek	1998	Temperature	Summer	6.2	2.4
West Fork Evans Creek	1998	Temperature	Summer	17.1	8.8

Removal of riparian vegetation and the shade it provides contributes to elevated stream temperatures. Wildfires and past human activities in riparian areas such as timber harvest, road construction, residential and agricultural clearing, and livestock grazing have reduced the amount of riparian vegetation in the Project Area. Water withdrawals during the summer also contribute to elevated stream temperatures.

In December 2008, the Oregon DEQ issued the Rogue River Basin TMDL (Total Maximum Daily Load) as an executive order. The TMDL addresses temperature and bacteria (*E. coli*) impairments for an area that includes the Project Area. TMDLs are numerical loadings that are set to limit pollutant levels such that instream water quality standards are met. The BLM is recognized by Oregon DEQ as a DMA (Designated Management Agency) for implementing the Clean Water Act on BLM-administered lands in Oregon. Each DMA has 18 months from the time the Rogue River basin TMDL becomes an executive order to develop or submit to Oregon DEQ an implementation plan. The BLM and Oregon DEQ have a Memorandum of Agreement that defines the process by which the BLM will cooperatively meet State and Federal water quality rules and regulations. In accordance with the Memorandum of Agreement, the BLM will develop or revise existing WQRPs (Water Quality Restoration Plan) as described in the Memorandum of Agreement; the WQRPs will be the TMDL implementation plans for the BLM (ODEQ and USDI 2003). The BLM prepared a WQRP for BLM-administered lands in the Evans Creek watershed (Bureau of Land Management 2009) in 2009 and it was approved by the Oregon DEQ. Recovery goals focus on protecting areas where water quality standards are being met and avoiding future impairments of these areas, and restoring areas not currently meeting water quality standards.

Six segments in the Rogue River Basin were listed in the 2004/2006 Water Quality Assessment as sedimentation impaired; none are in the Evans Creek watershed. The impairments were based on Oregon Department of Fish and Wildlife (ODFW) reporting that a high percentage of fine sediment was measured in most reaches during a 1994 survey. At the time of the Rogue Basin TMDL writing, DEQ was in the process of developing a sedimentation assessment

methodology that could be used for implementing the narrative sedimentation standard. When the methodology and associated guidance is completed, the agency will establish sedimentation TMDLs for those waterways on the 303(d) list. DEQ also intends to revisit the Rogue River basin sedimentation impairments when the temperature and bacteria TMDLs are reviewed, every five years (Oregon Department of Environmental Quality 2008).

The sediment concern in the Evans Creek watershed comes from the fragile soils that make up this watershed along with high road densities. Sand makes up a large part of the substrate of West Fork Evans Creek and can be seen accumulating in depositional areas. The lack of data and difficulty involved in measuring sediment could partially account for the fact that there are no streams on the 303(d) list for sediment in the Evans Creek Watershed.

Forest management activities can lead to increased sediment yield. Most of the increase in sedimentation associated with forestry activities is attributed to forest roads (Sullivan 1985). Roads increase sediment loads in streams (1) from the increased incidence of mass failures; and (2) from the transport of material to streams from eroding road surfaces, cut banks, and ditches (Duncan, et al. 1987). In the Evans Creek Project Area, surface erosion from road surfaces, cut banks, and ditches represents the dominant source of road-related sediment input to streams (see section 3.3, Soil).

Sediment production is highly variable from road segment to road segment. Most segments produce little sediment, while only a few produce a great deal (Luce and Black, Sediment production from forest roads in western Oregon. 1999). Heavily used sections of road with steep gradients and that drain directly into larger streams have the highest potential to produce and deliver material of a size most apt to deposit on or in the streambed (Bilby, Sullivan and Duncan 1989). Older roads in mid-slope positions dominate the production of sediment during extreme storms (Wemple, Swanson and Jones 2001). Ridgetop roads usually have the least effect on streams (Furniss, Roelofs and Yee 1991).

Stream crossings by roads are particularly effective at increasing sediment yields because of their direct impact on the channel. The failure of inadequately designed and constructed culverts adds large amounts of sediment to streams (Kattelmann 1996). Although any stream crossing will have some impact on the channel, careful engineering, construction, and maintenance can limit the severity (Kattelmann 1996).

Several studies reporting on sediment movement below forest roads noted the importance of obstructions (including vegetation) on the slope below the road (Seyedbagheri 1996). Slash filter windrows placed at the toe of a road fill have been shown to reduce movement of sediment below fillslopes (Seyedbagheri 1996). Cross drain spacing was also recognized as an important predictor of sediment movement downslope from logging roads.

A study of soil loss from forest roads in the southern Appalachian Mountains (Swift 1984) concluded that soil loss rates from an unsurfaced roadbed were eight times greater than from roadbeds with six to eight inches of gravel. New fill slopes, although uncompacted and unvegetated, eroded only where storm runoff from culverts or water dips flowed over loose soil. Vegetation on the cut slope and ditch was shown to be effective in reducing erosion from forest roads in the Oregon Coast Range (Luce and Black, Sediment production from forest roads in western Oregon. 1999). Road segments where vegetation was cleared from the

cut slope and ditch produced about seven times as much sediment as road segments where vegetation was retained. Closure of unsurfaced roads during the wet season can also help to reduce erosion (Kattelmann 1996).

Studies conducted in western Washington and Oregon found that 80% of the road runoff points emptied directly into the drainage system (Duncan, et al. 1987). Of the stream entry drainage points, 88% entered smaller first or second order stream channels while only 13% emptied directly into larger permanent water. Thus, the delivery of road sediment to larger streams often depended on its transport through smaller, often ephemeral channels. Woody material in these small channels acted to trap and hold sediment, preventing it from reaching larger channels downstream.

Sediment production from forest roads declines substantially with time. A study in western Oregon of 74 road segments with graded road surfaces found 70% recovery by the second year and 90% recovery by the third year (Luce and Black 2001).

Culvert removal during road decommissioning in Idaho has been shown to increase sediment concentrations; however, sediment yields decreased rapidly downstream (Folts and Yanosek 2005). At the large scale of analysis for this project, roads and culverts are in varying conditions across the landscape. Reduced budgets for road maintenance have limited the amount of maintenance completed on many non-mainline roads throughout the watershed, resulting in increased road surface erosion and stream sedimentation. Some culverts in the watershed are perched or undersized and the lack of maintenance increases the risk for culvert failure, which would result in increased erosion and sedimentation. See section 3.3, Soil, for further discussion on roads in the watershed.

Implementation of BMPs during road and logging operations has reduced impacts on water quality. A review of forest management impacts on water quality concluded that the use of BMPs in forest operations was generally effective in avoiding significant water quality problems; however, the report noted that proper implementation of BMPs was essential to minimizing nonpoint source pollution (Kattelmann 1996).

Natural surface or unsurfaced roads are generally more likely than surfaced roads (rocked or paved) to contribute sediment to streams. The BLM determined road miles by surface type for all roads on BLM-administered lands and BLM-controlled roads on non-BLM lands within each analysis area (Table 3-11).

3.4.4 Environmental Consequences

Because no new management is proposed under Alternative 1, the effects described reflect current conditions and trends that are shaped by ongoing management, reasonably foreseeable future actions, and events unrelated to the Evans Creek project. Discussion for Alternatives 2, 3, and 4 reflects the direct and indirect impacts of the proposed action. Effects discussion also includes cumulative impacts of those direct and indirect actions when added incrementally to actions past, present, and reasonably foreseeable. Short-term effects are defined as those lasting 10 years or less and long-term effects last more than 10 years (Bureau of Land Management 1994).

Table 3-11. Road Miles by Surface Type for All Roads on BLM-administered Lands and BLM-controlled Roads on Non-BLM Lands

Analysis Area	Road Surface Type			Total (miles)	Percentage of Roads with Natural Surface
	Natural (miles)	Rocked (miles)	Paved (miles)		
Chicago Creek	0.8	9.3	0	10.1	8
Upper Applegate Creek	Information not available.				
Upper South Fork Cow Creek	Information not available.				
Middle Evans Creek	19.4	48.9	3.5	71.8	27
Lower Evans Creek	12.4	23.3	0.1	35.8	35
Lower West Fork Evans Creek	23.3	103.4	12.4	139.1	17
Pleasant Creek	20.4	73.2	2.7	96.3	22
Upper Evans Creek	41.0	51.8	5.4	98.2	43
Upper West Fork Evans Creek	14.4	68.2	10.9	93.5	16
Totals	**131.7**	**378.1**	**35.0**	**544.8**	**24**

3.4.4.2 Effects of Alternative 1 (No Action) on Water Resources

Direct and Indirect Effects

No actions are proposed under Alternative 1; therefore, direct and indirect effects are the current conditions in the Project Area that are the result of past actions not related to the Evans Creek project. Alternative 1 describes anticipated effects of not implementing the proposed project.

In Alternative 1, no timber harvest and yarding activities or road and landing construction would occur so there would be no change in existing water quality on BLM-administered lands from these actions. Streams in the analysis area that are on the DEQ's 2004/2006 303(d) list would continue to exceed water quality standards. Over the long-term, and absent any wildfires, shade would likely increase on the temperature-listed segments of streams on BLM-administered lands. Surface erosion from roads would continue and the risk of sediment inputs to streams would remain relatively constant. A minimum level of BLM road maintenance would occur to prevent major sediment input or repair drainage failures. There would be no action to decrease overall road densities or decrease road interactions with streams.

Overstocked stands proposed for small diameter thinning would not be thinned under Alternative 1. Riparian reserves that are currently overstocked with small diameter trees would not receive thinning treatment to reduce stand densities and increase growth of remaining trees. Riparian reserves would not receive the benefits of increasing growth rates on trees that, if completed, would provide benefits of large wood to streams and increased resiliency to large-scale disturbances such as wildfire.

Dispersed campsites would not be rehabilitated under this alternative. Off-highway vehicles would continue to access West Fork Evans Creek causing erosion and sedimentation in the stream. Off-highway vehicle trails would remain compacted and bare of vegetation adding sediment laden runoff to the stream.

Existing BLM water sources would not be renovated to the original design and would continue to remain below capacity or nonfunctional.

Cumulative Effects

The existing conditions in the Evans Creek fifth field watershed and Project Area are the result of past actions that occurred on both public and private lands. Past actions such as timber harvest, road building, water withdrawals, agriculture, off-highway vehicle use, and grazing have resulted in elevated stream temperatures, increased fine sediment levels above background levels, and simplified stream channels. The main actions in the watershed and Project Area that have contributed to these conditions are timber harvest and road building. For a detailed description of past projects, see section 3.1.3, Other Actions in the Watershed containing the Project Area.

Since implementation of the RMP, timber sales completed on BLM-administered lands in the Evans Creek fifth field watershed have implemented riparian reserve buffers and did not contribute to the increased stream temperatures. Road renovation and road improvement occurred as part of these projects to reduce the overall amount of sediment coming from roads.

Vegetation on BLM-administered lands has recovered substantially in all the deferred watersheds in the Project Area since their deferral from timber harvest and other surface-disturbing activities in 1993. This has reduced the amount of area at risk for stream flow alteration and decreased the openings in the transient snow zone. Although BLM-administered lands in these watersheds were deferred and vegetation has recovered, nonfederal lands continued to be actively managed and less recovery has occurred.

Restoration projects in the Evans Creek fifth field watershed added large wood to West Evans Creek, East Evans Creek, Rock Creek, Cold Creek, Battle Creek, Cedar Creek, Pleasant Creek, Right Fork Pleasant Creek, and Sand Creek (Appendix I-Evans Creek Watershed Restoration Projects). Adding large wood to streams aids in restoring stream complexity in simplified stream channels. The added structure dissipates stream energy which reduces erosion and promotes deposition of transported sediment. Culvert replacements have occurred throughout Evans Creek to accommodate 100-year floods. Future culvert replacements are planned on approximately 50 cross drains and draw culverts.

3.4.4.1 Effects on Water Resources Common to All Action Alternatives

Direct and Indirect Effects

Small Diameter Thinning and Hardwood Management

Small diameter thinning and hardwood management are proposed in 1,115 acres. Small diameter thinning would reduce stand densities to canopy closures between 40 to 50% under all alternatives. Trees would be harvested using skyline-cable yarding on 836 acres and tractor yarding on slopes less than 20% on 234 acres (Table J-6, Appendix J-Hydrology). On 45 acres of proposed progeny test site thinning, trees would not be yarded but would be cut and piled to be burned. This proposed harvest would not result in average post-treatment canopy closures below the historic levels for the ecoregions in the Project Area. Therefore, there would be no changes to peak flows resulting from changes to historic canopy cover.

Approximately 315 acres would be thinned in riparian reserves using skyline-cable yarding; however, no tractor yarding is proposed in riparian reserves. Keeping tractors out of riparian reserves would prevent an increase in soil compaction and soil disturbance near streams and would prevent sediment delivery to streams from proposed thinning in riparian reserves.

Harvest inside riparian reserves would be slightly different than the adjacent uplands because all riparian tree and brush species would be retained, regardless of density. Ground-based equipment would be operated outside riparian reserves unless used for lining from existing roads or landings. Retaining all vegetation within the 35-foot no-cut buffer on non-fish-bearing streams and the 60-foot no-cut buffer on fish-bearing streams would prevent any sediment from soil disturbance occurring outside the no-cut buffer from being transported to streams.

Small diameter thinning or hardwood management is proposed on 144 acres in previously deferred watersheds (Table 3-12). These treatments would maintain a canopy closure of 40 to 50% when completed resulting in increased growth on remaining trees. These harvest treatments would maintain water quality in these previously deferred watersheds.

Table 3-12. Harvest Acres for Small Diameter Thinning and Hardwood Management in Previously Deferred Watersheds

Previously Deferred Watershed	Small Diameter Thinning	Hardwood Management	Total
Ash Flat	64	0.1	64.1
Cold Creek	24	0	24.0
West Fork Evans (Headwaters)	56	0	56.0
Total	144	0.1	144.1

In all alternatives, 73 acres of small diameter thinning or hardwood management in the previously deferred watersheds would use tractor yarding to remove trees (Table J-7, Appendix J-Hydrology). Tractor yarding would use existing skid trails to minimize soil disturbance and additional compaction. Landings located within harvest units would be ripped, seeded, and mulched. Cut-to-length tractor yarding systems would walk on slash, minimize turns, and use low ground pressure equipment to minimize additional compaction and the resulting increase in surface runoff.

Road Decommissioning

Approximately 16 miles of existing roads are proposed for decommissioning; 10 miles are within riparian reserves. Sediment coming from roads would be reduced by decommissioning up to 16 miles of roads. Erosion and short-term sedimentation may increase as a result of ripping roadbeds and removing culverts, but PDFs would minimize the transport of sediment to streams. Decommissioning 16 miles of road would eliminate a total of 112 road-stream crossings. In the long-term, sedimentation from surface erosion and fill slope and cut slope failures would be reduced from decommissioning these roads.

Dispersed Campsite and OHV Trail Rehabilitation

User-created dispersed campsites and adjacent OHV trail rehabilitation is proposed at 17 sites. Boulders or other barricades would be placed to define the campsite extent and limit

OHV access to West Fork Evans Creek. Blocked portions of dispersed campsites and OHV trails would be ripped and planted with native vegetation. The dispersed campsite and OHV trail rehabilitation would limit the use of OHVs in riparian reserves at the campsite locations. Preventing OHV access to West Fork Evans Creek and reestablishing riparian vegetation would reduce the amount of sediment entering the stream. Applying project design features would minimize additional compaction and the amount of exposed bare soil to prevent sediment from entering West Fork Evans Creek (see project design features in section 2.8.6, Dispersed Campsite and Off-highway Vehicle Trail Rehabilitation).

Water Source Restoration

Restoration is proposed for 21 existing water sources. Because each site is unique, the amount and type of work needed to restore the water sources to their original design varies. Applying project design features would keep the soil disturbance localized and minimize or eliminate any downstream sedimentation (see project design features in section 2.8.7, Water Source Restoration).

Special Forest Product and Scattered Salvage Harvest

Special forest product and scattered salvage harvest includes allowing the public to collect a variety of vegetative products or harvest small amounts of salvage timber. Water quality would be maintained by implementing the project design features in section 2.8.9 Special Forest Product and Scattered Salvage Harvest and Appendix K-Special Forest Products.

3.4.4.3 Effects of Alternative 2 on Water Resources

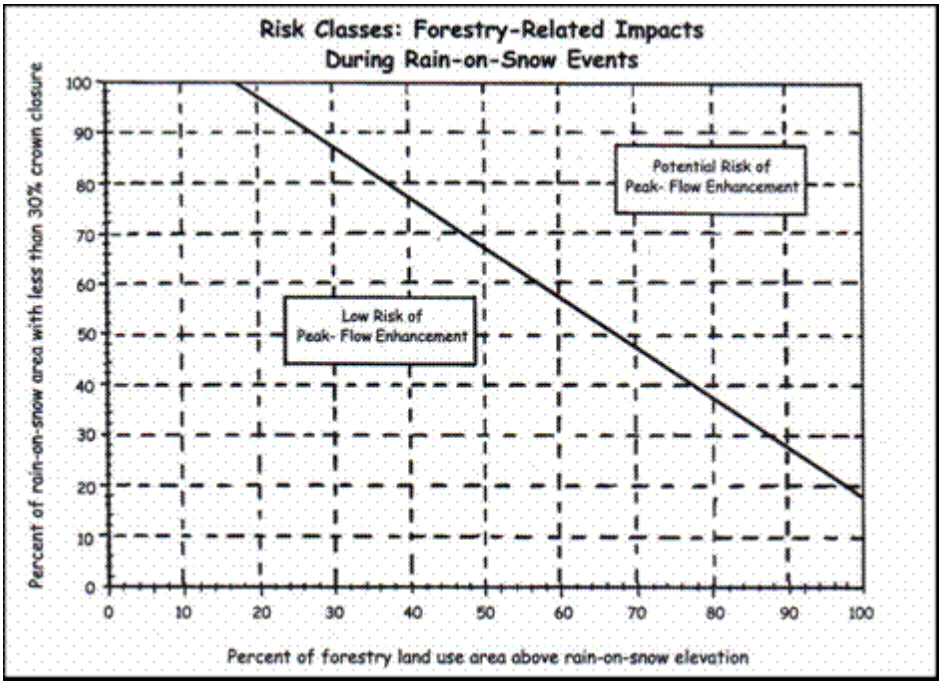
Direct and Indirect Effects

Five types of harvest would occur in Alternative 2: commercial thinning, selection harvest, density management, NGFMA regeneration harvest, and SGFMA regeneration harvest (see Table J-8, Appendix J-Hydrology, for harvest acres by analysis area). The average post-treatment canopy closure would vary between harvest types as well as between and within analysis areas for the same harvest type. The average post-treatment canopy closure would be above the historic levels (40%) for thinning, density management, and selection harvest, and below the historic levels for regeneration harvest. Proposed regeneration harvest would result in average post-treatment canopy closures below the historic levels in 6 of the 9 analysis areas (Upper south Fork Cow Creek, Lower Evans Creek, Lower West Fork Evans Creek, Pleasant Creek, Upper Evans Creek, and Upper West Fork Evans Creek).

The risk of peak-flow enhancement is estimated from the OWAM risk assessment graph (Figure 3-2) that uses the percentage of the analysis area within the rain-on-snow zone and the percentage of the rain-on-snow zone with less than 30% crown closure.

According to the OWAM risk assessment method, drainages with more than 25% of the area in transient snow zone may be at risk for possible peak flow increases during rain-on-snow events. Two analysis areas have more than 25% of the area in the transient snow zone: Upper Applegate Creek (33%) and Upper South Fork Cow Creek (78%).

Figure 3-2. Estimation of the risk of peak-flow enhancement from forestry-related impacts during rain-on-snow events (WPN 1999:IV-11).



In all analysis areas, the risk for peak stream flow enhancement remains low and unchanged from current conditions. Openings in the transient snow zone have a greater potential to influence changes in peak flows than canopy reductions outside the transient snow zone. Under Alternative 2, commercial harvest in the transient snow zone would occur on 917 acres. According to the OWAM (2001), forested canopy closure in the transient snow zone would have to be less than 30% to cause a detectable increase in peak flows. Commercial harvest prescriptions proposed under Alternative 2 that would reduce the average canopy closure to 30% or less are northern GFMA regeneration harvest (12.5%) and southern GFMA regeneration (30%). Southern GFMA regeneration harvest is proposed in the Upper South Fork Cow Creek analysis area (more than 25% of area in transient snow zone). Northern GFMA regeneration harvest is proposed on a total of 9 acres in Alternative 2, with 4 of those acres in the transient snow zone in the Lower West Fork Evans Creek. Southern GFMA regeneration harvest is proposed on 258 acres with 27 of those acres in the transient snow zone of Lower West Fork Evans Creek and 98 acres in the transient snow zone of Upper South Fork Cow Creek. Approximately 16% of Lower West Fork Evans Creek is in the transient snow zone. Since the amount of analysis area in the transient snow zone is less than 25%, there would be a low risk to peak flow enhancement from harvest in Alternative 2. About 78% of the Upper South Fork Cow Creek analysis area is in the transient snow zone. Although the amount of this analysis area in transient snow zone is above 25%, the canopy cover remaining after southern GFMA regeneration harvest would be at the 30% threshold or above for increased peak flow. The risk for an increase in peak flow would be low because the canopy cover is near the threshold and a small amount within transient snow zone (3%) would be treated. Consequently, there would be no increased risk of peak flows associated with rain-on-snow events as a result of the proposed timber harvest in these analysis areas.

Skid trails would be ripped on approximately 15 acres of regeneration harvest tractor yarding units. Ripping skid trails in regeneration harvest tractor yarding units on final entry would help ameliorate compacted conditions by increasing porosity and infiltration. In general, ripping skid trails would not occur in commercial thinning, density management, or selection harvest units in order to protect the roots of the remaining live trees.

Projects proposed under Alternative 2 would not affect steam temperatures because no shade would be removed on perennial streams as a result of timber harvest; therefore, this alternative would not affect 303(d) listed streams.

Upland timber harvest would occur on approximately 159 acres using tractor yarding (Table J-9, Appendix J-Hydrology). Tractors would use existing and designated skid trails on slopes less than 20% to minimize the area of soil disturbance. Water quality would be maintained during tractor yarding through the use of project design features, operating distance from stream channels, and relative gentle topography of these units.

A team of BLM interdisciplinary specialists completed Transportation Management Objectives (TMOs) for the entire Evans Creek fifth field watershed, including the five previously deferred watersheds, to determine the BLM's long-term objectives for roads within the watershed. The team made recommendations for the management of each road to be addressed in this project or in future projects. Recommendations included closing roads with a gate or barricade, decommissioning, or leaving open. Natural surface roads would be closed during the rainy season.

Under Alternative 2, proposed road projects would have the greatest potential for increasing the amount of sediment delivered to streams in the Project Area. Road projects proposed under Alternative 2 include road renovation, permanent road construction, temporary spur road construction, and road decommissioning.

The primary sediment source from road-related projects would be from on-site soil disturbance caused by installing, replacing, or removing culverts at road-stream crossings. All road work would be completed during the dry season to prevent or minimize sediment delivery to streams. The timing of road operations would reduce the amount of sediment that would enter streams at one time; new road construction and renovation would occur during the first year of the timber sale contract while road decommissioning would occur during the final dry season of the timber sale contract. Temporary roads would be constructed and decommissioned during the same year.

Road renovation, on 129 miles of roads, would include blading the road surface, cleaning ditch lines and culvert inlets, replacing deteriorated culverts, and applying rock to depleted areas. This road work would improve the long-term drainage of the roadway, which would reduce the amount of sediment being produced from these roads. Cleaning ditches and culverts would increase the amount of sediment transported to streams in the short-term, but this amount is expected to be small because work would occur during the dry season when sediment transport is low.

One new permanent road would be built for a total of 0.2 mile in the Upper Evans Creek analysis area. This short amount of road construction would not increase road density in

the analysis area. An equal amount of road would be decommissioned to offset the road construction.

Under Alternative 2, temporary spur road construction would require one new road-stream crossing in the Upper Evans Creek analysis area. The temporary spur road would cross a long duration intermittent stream and would be decommissioned after the completion of timber harvest. As a result, there would be no increase in the number of road-stream crossings.

Alternative 2 would have no direct or indirect adverse effects on summer stream temperature for any stream in the Project Area because shade on perennial streams would be maintained; therefore, 303(d) listed streams would not be affected. Long-term water quality benefits of road decommissioning across perennial streams and natural recovery would include increased shade and reduced stream temperatures improving conditions on all streams on BLM-administered lands, including 303(d) listed streams.

Three types of harvest on a total of 317 acres would occur in previously deferred watersheds that now have recommended special management practices: selection harvest, commercial thinning, and density management (Table J-10, Appendix J-Hydrology). No regeneration harvest is proposed in any of the previously deferred watersheds. All proposed harvest in previously deferred watersheds would maintain a canopy closure of 40% or greater and, therefore, would be above historic canopy closure levels. Only 1 acre located on a ridge top would be harvested within the Ash Flat drainage area and would not add to cumulative effects in Ash Flat. Harvest within the Cold Creek drainage area would occur on approximately 50 acres. The total percentage of area treated in Cold Creek would be less than 2% using harvest treatments that would be within historical canopy closure levels and would not increase cumulative effects in the drainage area from timber harvest. West Skeleton Mountain is the drainage area with the most proposed harvest on approximately 267 acres or 18% of the drainage area. All treatments proposed would maintain canopy closures at or above historic levels and would not add to cumulative effects of the West Skeleton Mountain drainage area.

Of the 317 acres of harvest proposed in the previously deferred watersheds, tractor yarding would be used on only 5.7 acres in the West Skeleton Mountain drainage area. The remaining would be harvested by skyline-cable (217 acres) or helicopter (95 acres). The 5.7 acres of tractor yarding would use existing skid trails to prevent additional compaction. In-unit landings would be ripped to reduce compaction, but skid trails would not be ripped at this time to protect the root systems of the leave trees. Using existing skid trails would be consistent with recommendations for these special management areas.

No permanent roads would be constructed in any of the previously deferred watersheds (Table J-11, Appendix J-Hydrology). Approximately 0.5 mile of temporary spurs would be constructed under Alternative 2, with 0.3 in Cold Creek and 0.2 in West Skeleton Mountain. These temporary roads would be ripped, seeded, and mulched in the same operating season as constructed to minimize sediment from moving off-site. Three helicopter landings that would be used in the previously deferred watersheds would be ripped, seeded, and mulched after use to reduce the risk of off-site sedimentation and improve infiltration. Approximately 3.2 miles of road decommissioning is proposed in the previously deferred watersheds: 2.2 miles in the Ash Flat drainage area and 1.0 mile in the Sprignett Creek drainage area. Decommissioning these roads would reduce the miles of roads in these drainage areas and reduce the amount

of runoff and sediment coming from roads. The road work proposed in these previously deferred watersheds is consistent with the recommendations for these areas: using temporary spurs instead of permanent roads, renovating existing roads, and decommissioning helicopter landings and roads (see Appendix G-Evans Creek Watershed Deferral Analysis).

Cumulative Effects

See section 3.4.4.2 Effects of Alternative 1 (No Action) on Water Resources, Cumulative Effects for previous, ongoing, and future projects in the area.

Projects proposed in Alternative 2 would not contribute to the cumulative watershed effect of increased stream temperatures because no forest canopy would be removed within riparian reserves.

The short-term supply of sediment to stream channels would increase under Alternative 2 during road renovation, culvert replacement, and road decommissioning; however, these projects would reduce the long-term sediment supply to stream channels. These projects would be beneficial to water quality and would reduce sedimentary cumulative effects.

The proposed 16 miles of road decommissioning would reduce the total miles of road in the Evans Creek fifth field watershed and the Evans Creek Project Area. While this amount of road decommissioning does not greatly affect road density in the fifth field watershed, the trend on BLM lands is to reduce the amount of roads while minimizing new construction.

3.4.4.4 Effects of Alternative 3 on Water Resources

Direct and Indirect Effects

All stands proposed for harvest in Alternative 3 would be managed as dry forests leaving an average canopy closure of 40 to 60% (Table J-12, Appendix J-Hydrology). Timber harvest would leave canopy cover above the historic canopy closure levels; therefore, peak flows would not change as a result of changes to canopy closure under Alternative 3.

Timber harvest would occur on 159 acres using tractor yarding (Able J-13, Appendix J-Hydrology). Tractors would use existing and designated skid trails on slopes less than 20% to minimize the area of soil disturbance. Water quality would be maintained during tractor yarding through the use of PDFs, distance from stream channels through riparian reserves, and relative gentle topography of these units.

A team of BLM interdisciplinary specialists completed Transportation Management Objectives (TMOs) for the entire Evans Creek fifth field watershed, including the five previously deferred watersheds, to determine the BLM's long-term objectives for roads within the watershed. The team made recommendations for the management of each road to be addressed in this project or in future projects. Recommendations included closing roads with a gate or barricade, decommissioning, or leaving open. Natural surface roads would be closed during the rainy season.

Road work proposed under Alternative 3 includes road renovation, permanent construction, temporary spur road construction, and road decommissioning (Table J-xx, Appendix J-Hydrology).

Under Alternative 3, proposed road-related actions would have the greatest potential for increasing the amount of sediment delivered to streams in the Project Area. The primary sediment source would be from on-site soil disturbance caused by installing, replacing, or removing culverts at road-stream crossings. All road work would be completed during the dry season to prevent or minimize sediment delivery to streams. The timing of road operations would reduce the amount of sediment that would enter streams at one time; road construction and renovation would occur during the first year of the timber sale contract while road decommissioning would occur during the final dry season of the timber sale contract. Temporary roads would be constructed and decommissioned during the same year.

Road renovation on 130 miles of roads would include blading the road surface, cleaning ditch lines and culvert inlets, replacing deteriorated culverts, and applying rock to depleted areas. This road work would improve the long-term drainage of the roadway, which would reduce the amount of sediment being produced from these roads. Cleaning ditches and culverts would increase the amount of sediment transported to streams in the short-term, but this amount is expected to be small because work would occur during the dry season when sediment transport is low.

One new permanent road would be built for a total of 0.2 mile in the Upper Evans Creek analysis area. This short amount of road construction would not increase road density in the analysis area. An equal amount of road would be decommissioned to offset the road construction.

Under Alternative 3, temporary spur road construction would require one new temporary road-stream crossing in the Upper Evans Creek analysis area. The temporary spur road would cross a long duration intermittent stream and would be decommissioned after the completion of timber harvest. As a result, there would be no increase in the number of road-stream crossings.

Alternative 3 would have no direct or indirect adverse effects on summer stream temperature for any stream in the Project Area because shade on perennial streams would be maintained; therefore, 303(d) listed streams would not be affected. Long-term water quality benefits of road decommissioning across perennial streams and natural recovery would include increased shade and reduced stream temperatures improving conditions on all streams on BLM-administered lands, including 303(d) listed streams.

Two types of harvest would occur under Alternative 3 in previously deferred watersheds: dry forest management leaving 40% canopy cover and dry forest management leaving 60% canopy cover (Table J-14, Appendix J-Hydrology). Both harvest types would maintain canopy closure above historic levels; therefore, peak flows would not increase as a result of canopy removal.

No permanent roads would be built in any of the previously deferred watersheds (Table J-15, Appendix J-Hydrology). There would be approximately 0.5 mile of temporary spur roads built under Alternative 3 (0.3 mile in Cold Creek and 0.2 mile in West Skeleton Mountain). These temporary spur roads would be ripped, seeded, and mulched in the same operating season as

built to minimize sediment from moving off-site. Three helicopter landings in the previously deferred watersheds would be ripped, seeded, and mulched after use to reduce the risk of off-site sedimentation and improve infiltration. Approximately 3.2 miles of road decommissioning is proposed in previously deferred watersheds: 2.2 miles in the Ash Flat drainage area and 1 mile in the Sprignett Creek drainage area. Decommissioning these roads would reduce the miles of roads in these drainage areas and reduce the amount of runoff and sediment coming from roads. The roadwork proposed in these previously deferred watersheds apply the recommendations for these areas by using temporary spurs instead of permanent roads, renovating existing roads, and decommissioning helicopter landings and roads (see Appendix G-Evans Creek Watershed Deferral Analysis).

Cumulative Effects

See section 3.4.4.2 Effects of Alternative 1 (No Action) on Water Resources, Cumulative Effects for previous, ongoing, and future projects in the area.

Projects proposed in Alternative 3 would not contribute to the cumulative watershed effect of increased stream temperatures because no overstory canopy would be removed within riparian reserves.

Culvert replacement, road decommissioning, and road renovation would cause short-term increases and long-term decreases in the supply of sediment to stream channels. These projects would be beneficial to water quality and would reduce sedimentary cumulative effects.

The proposed 16 miles of road decommissioning would reduce the total miles of road in the Evans Creek fifth field watershed and the Evans Creek Project Area. While this amount of road decommissioning does not greatly affect road density in the fifth field watershed, the trend on BLM lands is to reduce the amount of roads while minimizing new construction.

3.4.4.4 Effects of Alternative 4 on Water Resources

Direct and Indirect Effects

Three types of harvest would occur in Alternative 4: selection harvest, commercial thinning, and density management. The average post-treatment crown closure would vary between harvest types as well as between and within analysis areas for the same harvest type. The average post-treatment crown closure would be above the historic levels (40%) for selection harvest, thinning, and density management. There would be no harvest below the historic canopy closure levels in either the rain zone or the transient snow zone; therefore, there would be no changes to peak flows as a result of changes to canopy closure under Alternative 4.

Timber harvest would occur on 154 acres using tractor yarding (Table 3-xx). Ground-based machinery would use existing and designated skid trails on slopes less than 20% to minimize the area of soil disturbance. Water quality would be maintained while using ground-based equipment through the use of PDFs, distance from stream channels through riparian reserves, and relative flatness of these units.

A team of BLM interdisciplinary specialists completed Transportation Management Objectives (TMOs) for the entire Evans Creek fifth field watershed, including the five

previously deferred watersheds, to determine the BLM's long-term objectives for roads within the watershed. The team made recommendations for the management of each road to be addressed in this project or in future projects. Recommendations included closing roads with a gate or barricade, decommissioning, or leaving open. Natural surface roads would be closed during the rainy season.

Road work proposed under this alternative includes road renovation, permanent construction, temporary spur road construction, and road decommissioning (Table J-18, Appendix J-Hydrology).

Under Alternative 4, proposed road-related actions would have the greatest potential for increasing the amount of sediment delivered to streams in the Project Area. Road operations proposed under Alternative 4 include road renovation, permanent road construction, temporary spur road construction, and road decommissioning. The primary sediment source would be from on-site soil disturbance caused by installing, replacing, or removing culverts at road-stream crossings. All road work would be completed during the dry season to prevent or minimize sediment delivery to streams. The timing of road operations would reduce the amount of sediment that would enter streams at one time; new road construction and renovation would occur during the first year of the timber sale contract while road decommissioning would occur during the final dry season of the timber sale contract. Temporary roads would be constructed and decommissioned during the same year.

Road renovation on 123 miles of road would involve blading the road surface, cleaning ditch lines and culvert inlets, replacing deteriorated culverts, and applying rock to depleted areas. Road renovation would improve the long-term drainage of the roadway, which would reduce the amount of sediment being produced from these roads. Cleaning ditches and culverts would increase the amount of sediment transported to streams in the short-term; the amount would be small because work would occur during the dry season when sediment transport is low.

One new permanent road would be built for a total of 0.2 mile. Located in the Upper Evans Creek analysis area, the short length of this road would not increase road density in the analysis area. An equal amount of road would be decommissioned in the Project Area as part of the timber sale, resulting in no net increase in permanent road.

Under Alternative 4, temporary spur road construction would require one new road-stream crossing in the Upper Evans Creek analysis area. The temporary spur road would cross a long-duration intermittent stream and would be decommissioned after the completion of timber harvest. As a result, there would be no increase in the number of road-stream crossings.

Alternative 4 would have no direct or indirect adverse effects on summer stream temperature for any stream in the Project Area because shade on perennial streams would be maintained; therefore, 303(d)-listed streams would not be affected. Long-term water quality benefits of road decommissioning and natural recovery across perennial streams would include increased shade and reduced stream temperatures, improving conditions on all streams on BLM-administered lands, including 303(d)-listed streams.

Harvest on a total of 318 acres would occur in watersheds that were previously deferred and now have recommended special management practices (Table J-19, Appendix J-Hydrology).

All proposed harvest in previously deferred watersheds would maintain a canopy closure of 40% or greater and, therefore, would be above historic canopy closure levels. Only 1 acre located on a ridge top would be harvested within the Ash Flat area and would not add to cumulative effects in Ash Flat. Harvest within the Cold Creek drainage area would occur on approximately 50 acres. The total percentage of area treated in Cold Creek would be less than 2% using treatments that would be within historical canopy cover levels and would not increase cumulative effects in the drainage area from timber harvest. West Skeleton Mountain is the drainage area with the most proposed harvest on approximately 267 acres or 18% of the drainage area. All treatments proposed would maintain canopy closures at or above historic levels and would not add to cumulative effects of the West Skeleton Mountain drainage area.

Of the 318 acres of harvest proposed in the previously deferred watersheds, only 6 acres would be harvested using tractor yarding in the West Skeleton Mountain watershed. The remaining would be harvested using skyline-cable (217 acres) or helicopter (95 acres) yarding. Three helicopter landings that would be used in the previously deferred watersheds would be ripped, seeded, and mulched after use to reduce the risk of off-site sedimentation and improve infiltration. The 6 acres of tractor yarding would use existing skid trails to prevent additional compaction. In-unit landings would be ripped to reduce compaction, but skid trails would not be ripped at this time to protect the root systems of leave trees. Using existing skid trails is consistent with recommendations for these previously deferred watersheds (See Appendix G-Evans Creek Watershed Deferral Analysis).

No permanent road construction is proposed in any of the previously deferred watersheds (Table J-20, Appendix J-Hydrology). There would be 0.5 mile of temporary spur roads built under Alternative 4: 0.3 mile in Cold Creek and 0.2 mile in West Skeleton Mountain. These temporary roads would be ripped, seeded, and mulched in the same operating season as being built to minimize sediment from moving off-site. Approximately 3.2 miles of road decommissioning is proposed in the previously deferred watersheds: 2.2 miles in Ash Flat and 1.0 mile in Sprignett Creek. Decommissioning these roads would reduce the miles of roads in these drainage areas and reduce the amount of runoff and sediment coming from roads.

The roadwork proposed in these previously deferred watersheds is consistent with the recommendations for these areas by using temporary spur roads instead of permanent roads, renovating existing roads, and decommissioning helicopter landings and roads.

Cumulative Effects

See section 3.4.4.2 Effects of Alternative 1 (No Action) on Water Resources, Cumulative Effects for previous, ongoing, and future projects in the area.

Projects proposed in Alternative 4 would not contribute to the cumulative watershed effect of increased stream temperatures because no overstory canopy would be removed within riparian reserves.

Culvert replacement, road decommissioning, and road renovation would cause short-term increases and long-term decreases in the supply of sediment to stream channels. These projects would be beneficial to water quality and would reduce sedimentary cumulative effects.

The proposed 16 miles of road decommissioning would reduce the total miles of road in the Evans Creek fifth field watershed and the Evans Creek Project Area. While this amount of road decommissioning does not greatly affect road density in the fifth field watershed, the trend on BLM lands is to reduce the amount of roads while minimizing new construction.

3.5 Fish

3.5.1 Methodology

Information used in this analysis includes:

- GIS; Aquatic Habitat Inventories (Oregon Department of Fish and Wildlife 1994, 1995, 1996); BLM field observations; and East Evans Creek (Bureau of Land Management 1996), West Fork of Evans Creek (Bureau of Land Management 1995), and Lower Evans Creek watershed analyses (Bureau of Land Management 1995);
- Literature related to fisheries, streams, hydrology, road activities, and timber harvest was also used for the analysis of this project such as: (1) fish are dynamic, adaptive, and move throughout stream systems (Bramblett, Bryant, et al. 2002, Hilderbrand and Kershner 2000, Kahler, Roni and Quinn 2001) to avoid short-term increases in sediment levels (Kahler, Roni and Quinn 2001); (2) riparian reserves are successful in protecting streams during timber harvest (Murphy, et al. 1986).
- The fisheries analysis area is composed of the Evans Creek fifth field watershed.

3.5.2 Assumptions

- Dense numbers of trees in riparian reserves can be thinned without changing stream temperatures by maintaining shade levels (Forest Service and Bureau of Land Management 2005).
- Thinning young and overstocked riparian forests can more rapidly achieve larger diameter trees. (Berg and Maki 2003).
- Coho salmon, Chinook salmon, and steelhead trout numbers over Gold Ray Dam reflect the overall population trends for the Upper Rogue River subbasin and SONCC coho salmon evolutionarily significant unit (ESU).
- Aquatic habitat inventories conducted by ODFW and BLM in the Evans Creek fifth field watershed are considered to represent the overall trend of aquatic habitats in the watershed and therefore the Evans Creek Project Area.

3.5.3 Affected Environment

3.5.3.1 Introduction

The Fisheries analysis area is the Evans Creek fifth field watershed, which consists of 6, sixth field subwatersheds: Lower Evans, Pleasant Creek, Upper West Fork Evans Creek, Lower West Fork Evans Creek, Upper Evans Creek, and Middle Evans Creek. The Project Area also contains about 200 acres in 3, seventh field drainages located outside of the Evans Creek fifth

field watershed: Upper Applegate Creek and Upper South Fork Cow Creek in the Upper Cow Creek fifth field watershed and Chicago Creek in the Trail Creek fifth field watershed.

The Fisheries analysis area does not include the 3, seventh field drainages located outside the Evans Creek fifth field; however, it is representative of the outlying seventh field drainages because of their proximity to the Evans Creek watershed boundary, the lack of proximal fish habitat to the proposed treatment acres, and the similarity in existing conditions between the 3, seventh field drainages and the Evans Creek watershed. See Map 7, Subwatersheds and Drainages within the Evans Creek Project Area for a pictorial representation of the outlying seventh field drainages.

The proposed project acres in the outlying seventh field drainages are all located on ridgetop locations within 0.5 mile of the Evans Creek fifth field watershed boundary. The acres that are outside of the Evans Creek fifth field watershed make up less than 9% of the total proposed treatment acres. The conditions in the 3, seventh field drainages are not notably different than those in the Evans Creek fifth field watershed. There is no fish habitat in the Upper South Fork Cow Creek drainage. The nearest proposed unit in the Upper Applegate Creek drainage is about 0.5 stream miles to fish habitat. The nearest proposed unit in the Chicago Creek drainage is about 0.4 stream miles to fish (cutthroat trout) habitat.

3.5.3.2 Fish Populations

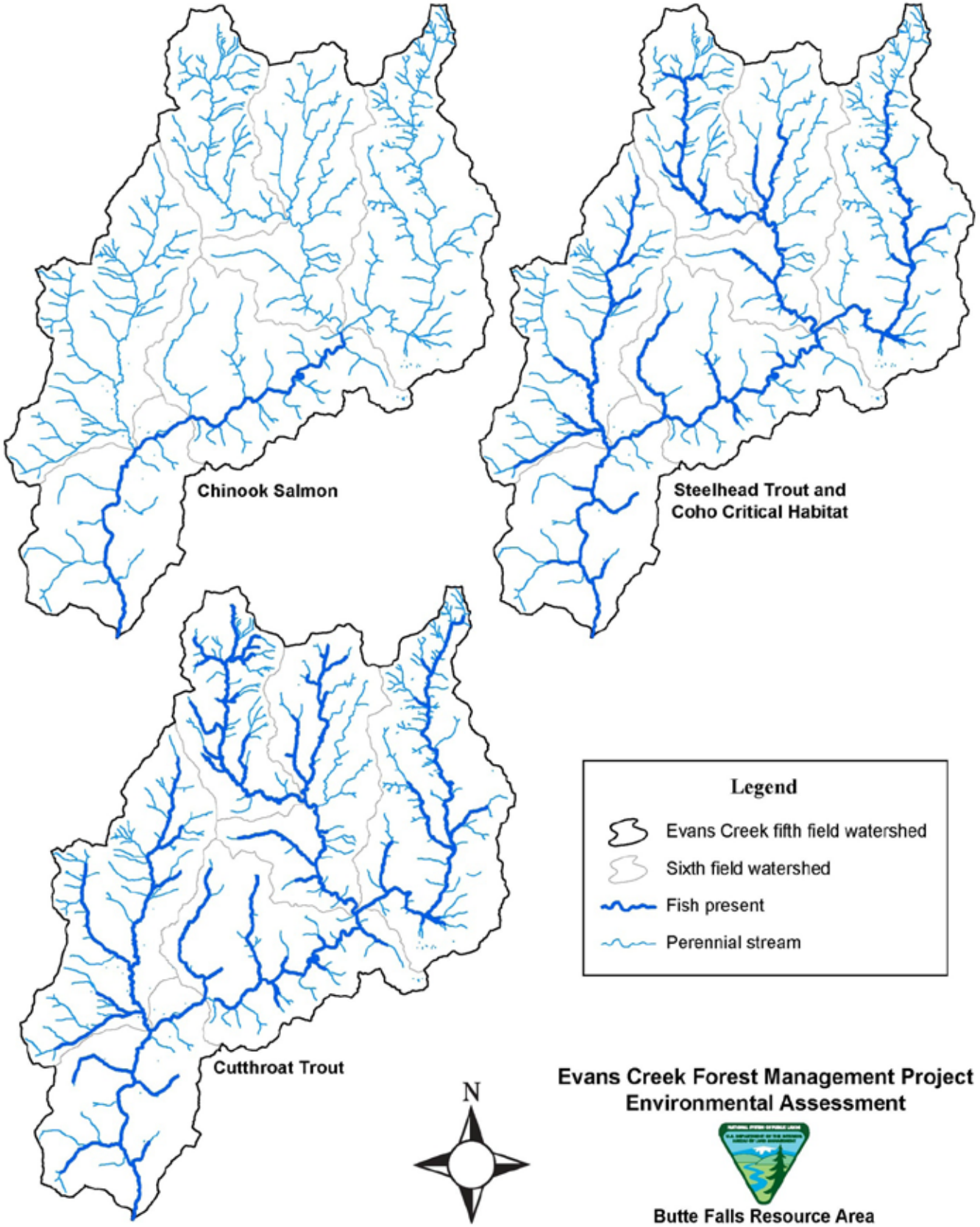
Major fish species found in the Evans Creek fifth field watershed include coho salmon (*Oncorhynchus kisutch*), steelhead trout (*O. mykiss*), cutthroat trout (*O. clarkii*), and Chinook salmon (*O. tshawytscha*). Cutthroat trout have the widest distribution, followed by steelhead trout, coho salmon, and Chinook salmon, which are found only in the mainstem of Evans Creek (see Map 8). Steelhead trout distribution is an indicator for coho critical habitat (CCH).

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, Williams and Lichatowich 1991).

Southern Oregon/Northern California coho salmon (SONCC) is the only special status fish species present in the Evans Creek fifth field watershed. It was federally listed as a threatened species in the Rogue River in 1997 in accord with the Endangered Species Act. Coho critical habitat (CCH) was designated in 1999. Essential fish habitat, in accord with the Magnuson-Stevens Fishery Conservation Act, was designated for salmon, and includes water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California. In the Evans Creek Project Area, the range of essential fish habitat is very similar to that of CCH; therefore, any reference to CCH in this analysis includes essential fish habitat.

Population Trends

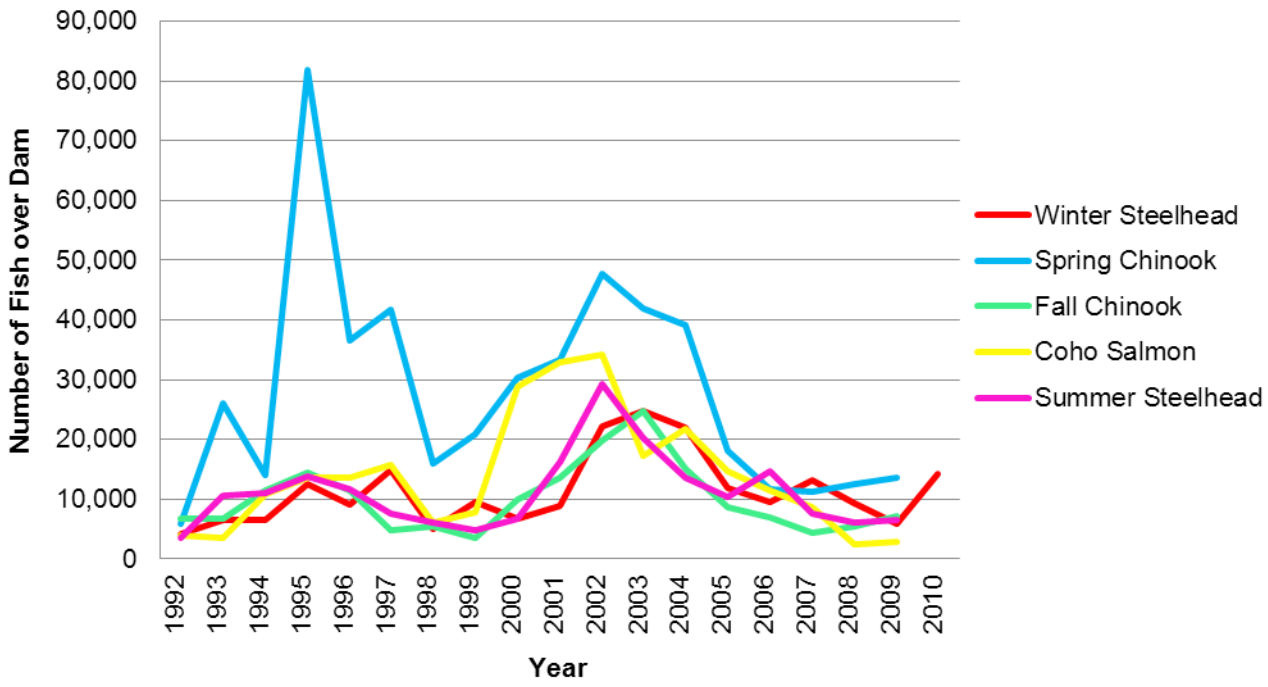
Limited information is available on the current fish populations in the Fisheries analysis area. Fish counts for the Rogue River basin have been monitored by ODFW at Gold Ray Dam since 1942. The coho salmon, winter and summer steelhead trout, and spring and fall Chinook salmon numbers over Gold Ray Dam reflect the overall population trends for the Upper Rogue



Map 8. Fish Distribution in the Evans Creek Fifth Field Watershed

River fourth field subbasin and ESU, including the Fisheries analysis area. Figure 3-3 illustrates the numbers of salmonids over Gold Ray Dam from 1992 through 2009 (Gold Ray Dam was removed in the summer of 2010).

Figure 3-3. Number of salmonids over Gold Ray Dam from 1992-2009.



3.5.3.3 Instream Habitat

The Evans Creek fifth field watershed contains about 148 stream miles of fish habitat; approximately 20 stream miles are used by Chinook salmon and about 106 stream miles are classified as CCH (Table 3-13).

Table 3-13. Stream Miles of Fish Habitat by Sixth Field Watershed in the Fisheries Analysis Area

Fifth Field Watershed	Sixth Field Watershed	Miles of Fish Habitat	
		Chinook	Coho
Evans Creek	Lower Evans Creek	11	16
	Lower West Fork Evans Creek	0	16
	Middle Evans Creek	9	18
	Pleasant Creek	0	21
	Upper Evans Creek	0	20
	Upper West Fork Evans Creek	0	14
	Total	**20**	**106**

Salmon and trout species need cool water temperatures, hiding cover, clean spawning gravels, rearing pools, adequate food supply, and unimpaired passage for good fish production. Large wood in the streams provides cover for fish and traps fine sediment, and can create rearing pools.

ODFW conducted physical aquatic habitat inventories over all land ownerships on about 104 miles (30%) of perennial streams in the Evans Creek fifth field watershed. Major habitat features found to be in impaired condition are spawning gravel quantity and quality, pool complexity, high stream temperatures, and large wood abundance. BLM direction is to maintain or enhance the fisheries potential of streams and other waters (Bureau of Land Management 1995, 49).

Temperature

Water temperature is one of the most important variables controlling habitat suitability for salmonids. Sun exposure is the largest cause of increasing temperatures. Other factors, such as climate, stream size, elevation, and groundwater flows, also influence stream temperature (Beschta, et al. 1987). Optimum temperatures for coho salmon, steelhead trout, Chinook salmon, and cutthroat trout are 50 to 65°F during different life stages from egg to adult (Bjornn and Reiser 1991). The Oregon DEQ established a 7-day average maximum temperature limit of 64.4°F for juvenile and adult fish.

The DEQ has listed 9 streams on a 303(d) list as water quality limited for temperature: Evans Creek, Battle Creek, Cold Creek, East Fork Evans Creek, Pleasant Creek, Ramsey Canyon, Rock Creek, Salt Creek, and West Fork Evans Creek. See Water Resources, section 3.4.3.3, for more information.

Sediment

Aquatic habitat inventories conducted from 1994 to 1996 indicate there is a historical high amount of sediment yet a moderate amount of spawning gravel in riffles and pools. Stream reaches in the Evans Creek watershed in general exceed 20% sediment, which is not preferred by salmon and trout. The majority of sediment moves out of a stream system quickly because of high discharges as compared to low gradient streams in valley bottoms. There is a moderate amount of gravel and pools to sustain survival and production for fish. Nearly all streams in the Evans Creek watershed have simplified fish habitat primarily because of the lack of large wood to retain sediment and create pools for juvenile fish. There has been a dramatic decrease in chronic erosion and very few episodic erosion events in the watershed over the past twenty years, which has helped to maintain fish populations at a moderate level. Episodic erosion events can contribute gravel, used by fish for spawning, and large wood, to retain sediment and provide cover for fish. It is doubtful sediment levels are a problem in spawning gravels or rearing pools because pool depths are not compromised by sediment, pools occur in moderate numbers, and pools contain adequate depth for fish cover. A moderate amount of pool depth, caused by the lack of large wood, is not restricted from sediment deposition.

Large Wood

Large wood is important for providing cover for fish, forming pools, stabilizing channels, and trapping and sorting fine sediment (Bjornn and Reiser, Habitat Requirements of Salmonids in Streams 1991). Large wood also provides pools, habitat complexity and channel roughness to dissipate stream energy that causes bank erosion and increases channel widths (Montgomery and Buffington 1997). Reductions in large wood through past wood removal and timber harvest in streams caused more simplified stream channels and reduced cover for fish. Wood helps trap sediment, which provides nutrients to aquatic life. Aquatic habitat inventories

indicate the majority of streams surveyed in the Evans Creek fifth field watershed were in undesirable condition for volume of large wood (Oregon Department of Fish and Wildlife 1994, 1995 ,1996).

Fish Passage

Fish access to all available habitat is important for fish production. 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, Roni and Quinn 2001).

A double culvert on BLM road #34-4W-11.01, which is passable to fish at medium to high water flows, is located in CCH on the Right Fork Pleasant Creek. The culverts are perched above the creek bottom, the bottoms are rusted out, and they are too small to accommodate a 100-year flood event. One culvert is blocked by debris and slumping off the streambank. At least 0.25 mile of fish habitat upstream from these culverts could be used by coho salmon, steelhead trout, and cutthroat trout.

3.5.3.4 Riparian Habitat

Riparian areas are important for fish and the aquatic ecosystem. Riparian vegetation provides large wood to streams and cover for fish. Streamside vegetation provides bank stability and shade to maintain cool water temperatures (Beschta, et al. 1987, Meehan 1991) on perennial streams during summer months. Riparian areas provide terrestrial insects for fish food. When substantial riparian vegetation is removed, increasing stream temperatures (Johnson and Jones 2000) and declining large woody debris levels can result in less fish production (Hartman, Scrivener and Powell 1987). Most of the shade on Evans Creek fifth field watershed is coming from smaller diameter conifers, hardwoods, and brush species.

3.5.3.5 Aquatic and Riparian Habitat Trends

Timber harvest has decreased significantly since 1985 on BLM-administered land in the Evans Creek fifth field watershed and timber harvest that has occurred has protected riparian reserves as designated by the Northwest Forest Plan (Bureau of Land Management 2008, 240). Most culverts allow fish passage and have been designed for a 100-year flood events. This reduces the risk of culvert failures and provides fish access to available habitat.

Regardless of the undesirable amount of sediment and low numbers of large wood, the amount of spawning gravel and pools appears to maintain fish populations. The Evans Creek fifth field watershed also has a good amount of water and good water quality, which helps to sustain fish populations in a range of natural variability. Fish and fish habitat overall are low to moderate to sustain fish populations.

3.5.4 Environmental Consequences

3.5.4.1 Effects of Alternative 1 (No Action) on Fisheries

Direct and Indirect Effects

No forest treatments would occur in Alternative 1. Aquatic and riparian habitat would continue at the current slow rate of recovery. It is likely more erosion from roads would occur in the long term without road improvements from timber sales. The magnitude of this effect would be negligible over the next 20 years when compared to other proposed alternatives.

Overstocked riparian reserves would not receive treatment to reduce stand densities and increase growth of remaining trees. Riparian reserves would not receive the benefits of thinning trees to increase tree growth rate, which would ultimately increase large woody recruitment to create more pools for young fish.

Dispersed campsites along West Fork Evans Creek would not be renovated. Off-highway vehicle traffic would continue to have access to West Fork Evans Creek. This would cause localized degradation of streambanks and addition of sediment to the West Fork Evans Creek. A double culvert in CCH on BLM road #34-4W-11.01 would continue to partially block fish passage during low flows. Water sources would remain nonfunctioning.

Cumulative Effects

Past actions including timber harvest, road construction, and fuels treatment have occurred on both public and private lands in the Evans Creek fifth field watershed. Past actions degraded fish habitat by decreasing levels of large wood, increasing stream temperatures, and increasing fine sediment levels. Since implementation of the 1995 ROD/RMP, timber and salvage harvest on BLM lands has been completed using riparian reserves and best management practices. Therefore, timber harvest on BLM lands since 1995 has not contributed to the decrease in large wood recruitment, decrease of instream large wood, or increase in stream temperature. Timber harvest completed before the implementation of the Northwest Forest Plan in 1994 likely had more of an effect on stream and riparian conditions.

Harvest on private lands would follow Oregon Department of Forestry (ODF) guidelines for riparian buffers. This would provide adequate shade for fish. Future road work on private lands would follow ODF guidelines and would probably produce an inconsequential amount of sediment to fish habitat.

Since 1996, the BLM has completed a variety of restoration projects in the Evans Creek fifth field watershed. Large wood was added to West Fork Evans Creek in 2003, 2004, 2005, and 2008. Large wood was added to West Fork Evans Creek, East Evans Creek, Rock Creek, Cold Creek, Battle Creek, Cedar Creek, Pleasant Creek, Right Fork Pleasant Creek, and Sand Creek in 2009; a total of 42 large wood sites were constructed over about 12 miles of stream.

Road improvement and renovation occurred as part of the timber harvest projects to reduce the overall amount of sediment coming from roads. Many culverts have been replaced to accommodate 100-year flood events and to provide fish passage. Two dams were removed to provide easier migration for fish: one on Maple Gulch and one on East Evans Creek. Coho

salmon carcass placement occurred for three years on West Fork Evans Creek to provide nutrient cycling and food for rearing juvenile coho salmon.

Planned restoration projects in the Evans Creek fifth field watershed include replacement or installation of approximately 50 cross drain culverts to improve drainage and accommodate 100-year flood events. Generally, PDFs and BMPs prevent or mitigate effects from all proposed activities. Potential effects are likely to be negligible and within the range of natural variability for fish survival and production. Natural variability would be normal historic fluctuations in fish populations and habitat with normal watershed natural disturbances. Normal fluctuations for restoration projects include short-term adverse and long-term beneficial effects within a fifth field watershed.

3.5.4.2 Effects on Fisheries Common to All Action Alternatives

The effects of activities proposed in all action alternatives are expected to be the same because of the action's proximity to streams and magnitude of effects. All proposed harvest activities are more than 0.25 mile from streams and, in one instance, two site potential trees (350 feet) from a stream. The magnitude of effects is expected to be negligible if detectable. Activities include full riparian reserves and no commercial harvest in riparian reserves, except small diameter thinning with a no-cut riparian buffer and road renovation. Other activities, such as dispersed campsite rehabilitation and water source restoration, would occur within riparian reserves but no trees would be harvested. Stream temperature and sediment from erosion are not expected to increase because PDFs and BMPs would minimize any adverse effects to fish or habitat.

Given the absence of direct effects, low potential of sediment delivery, and no effect on water temperature, implementation of this project would be a "No Effect" ESA determination on fish production, CCH, and fisheries resources in the Evans Creek fifth field watershed and the adjacent 200 acres in 3, seventh field drainages located outside of the Evans Creek fifth field watershed: Upper Applegate Creek and Upper South Fork Cow Creek in the Upper Cow Creek fifth field watershed and Chicago Creek in the Trail Creek fifth field watershed.

Direct and Indirect Effects

Implementation of PDFs and BMPs should prevent or mitigate effects from all proposed activities. Any potential effects would be negligible and would be within the range of natural variability for fish survival and production. Natural variability is the normal historic fluctuation in fish populations and habitat with normal watershed natural disturbances. Normal fluctuations include short-term adverse and long-term beneficial effects within a fifth field watershed. Past decades have demonstrated normal fluctuations of natural disturbances throughout the fifth field watershed. Riparian reserves would prevent short- and long-term adverse effects from harvest in all alternatives. Erosion and associated sediment is a concern for fish habitat. This project has no expectation for the occurrence of sediment to cause a short- or long-term adverse effect to fish or fish habitat from any proposed activities. If any sediment from erosion occurred it would be an inconsequential and a negligible amount, and unlikely to be detectable from background levels. Stream temperature is a concern for fish. There would be no effect to stream temperature from any activities proposed in this project because there is no mechanism or proximity to the stream from any activity to cause an effect to stream shade.

Past, future, and ongoing actions would be the same as Alternative 1. Effects from the implementation of the projects described above are site-specific and would not be measurable at the watershed scale.

Timber Harvest

There would be no direct or indirect effects to fish habitat, fish populations, riparian vegetation, and stream temperature or stream sediment deposition from timber harvest because most timber harvest is proposed outside riparian reserves (except for 315 acres of small diameter thinning). While stream temperature is a concern to fish and fish habitat, there would be no effect to stream temperature from any activities proposed in this project because full riparian reserves would be maintained along all stream channels (175 feet on non-fish-bearing streams and 350 feet on all fish-bearing streams). Timber harvest would have no expectation for the occurrence of sediment to cause a short- or long-term adverse effect to fish or fish habitat. Full riparian reserves would prevent sediment delivery from harvest. Potential large wood recruitment would not be affected by the proposed timber harvest.

All proposed timber harvest units would be assessed post-treatment to determine if additional treatment is necessary to reduce the fuel hazard. Fuel reduction treatments would include hand piling, hand pile burning, and underburning. Only activity slash would be treated and full riparian reserve buffers would be implemented.

Small diameter thinning prescriptions would vary based on stand type, age class, and amount of precipitation. All prescriptions would result in a canopy cover between 40 and 50%. All of the proposed treatment acres are within the Evans Creek fifth field watershed.

Small diameter thinning is proposed for dense tree stands within riparian reserves. Thinning would benefit the riparian areas by promoting stand health, creating structural diversity within stands, increasing resiliency from environmental disturbances, and promoting growth of larger trees.

Project design features include minimum 35-foot no-cut buffers on seasonal and ephemeral streams and 60-foot no-cut buffers on perennial and fish-bearing streams; no ground-based equipment within riparian reserves unless used for lining from existing roads and landings; and no treatment of riparian tree and brush species within riparian reserves. All units would be assessed post-treatment to determine if fuels treatments such as hand piling, hand pile burning, and underburning are needed to further reduce fuels hazard. One of these units is in the riparian reserve of cutthroat trout habitat on upper Morrison Creek No underburning would occur in CCH riparian reserves.

Small diameter thinning within riparian reserves is proposed in five units on fish-bearing streams. One skyline-cable yarding unit is in the Upper Evans Creek sixth field subwatershed on the upper end of cutthroat trout habitat on Morrison Creek (T33S, R2W, section 19). A skyline-cable yarding unit is proposed in Lower West Fork Evans Creek sixth field subwatershed along CCH on Rock Creek (T33S, R3W, section 27). This forest stand is very dense with few large conifers. For this unit, Rock Creek was buffered with a variable width no-cut buffer based on topography, floodplain width, presence of riparian species, and presence of large conifers. The variable width no-cut buffer ranges from a minimum of 60 feet up to 120 feet.

Small diameter thinning in the proposed riparian reserves on Rock Creek and Morrison Creek would promote the growth of larger conifers and lead to an increase of large wood recruitment. There would be no direct effects from proposed thinning to stream temperature or sediment. The proposed riparian reserve small diameter thinning units on West Fork Evans Creek are not expected to have any direct or indirect effects on riparian vegetation, stream sediment deposition, or fish habitat because of the full riparian reserve width provision. Long-term harvest studies have shown negligible effects to fish populations from harvest with stream buffers (Hall, Brown and Lantz 1987) (Hartman, Scrivener and Powell 1987) (Beschta, et al. 1987).

Existing landings would be used where feasible and new landings would not be constructed within riparian reserves. Two landings are located within riparian reserves associated with fish habitat—a helicopter landing in the CCH riparian reserve of East Evans Creek and a service landing in the CCH riparian reserve of West Fork Evans Creek. Both of these landings are located at existing three-way road intersections and would not require maintenance to use as a landing.

Project design features would be in place to rehabilitate all landings that are outside of the road right-of-ways through ripping and applying native seed and mulch to stabilize the soil. No direct or indirect effects are expected to stream sediment deposition, fish habitat, or riparian vegetation.

Road Projects

Road work proposed for the Evans Creek project is permanent road construction, temporary spur road construction, road renovation, and road decommissioning.

The 0.2 mile of permanent road construction would occur outside of riparian reserves, and would have a negligible contribution to the overall road density of the watershed. It would have no direct or indirect effects to large wood recruitment, stream temperature, stream sediment, fish populations, or fish habitat because of the distance from riparian reserves.

There are a total of about 5.5 miles of temporary spur road construction associated with all action alternatives. All temporary spur roads would be located in stable areas, would be fully decommissioned in the same season they are used, and would have native seed and mulch applied to stabilize soil. All temporary spur roads, whenever possible, would be aligned to avoid unstable ground and steep slopes.

One temporary spur road within a riparian reserve would have a designated stream crossing. The designated stream crossing is on an intermittent stream located about 0.6 mile from both cutthroat trout habitat and CCH on East Evans Creek. The stream crossing was designated in an area where the stream is narrow, with gradual banks, a well-armored channel, and an existing opening in the vegetation. Any trees that are cut within 35 feet of the stream channel for the construction of the temporary spur road would be left on-site to block motorized vehicle access to this area and to aid in the decommissioning of the temporary spur road after use. No direct or indirect effects on stream sediment deposition or fish habitat are expected to occur because PDFs and BMPs would minimize soil movement to streams.

Harvested timber would be hauled from the harvest site using 184 miles of haul routes; about 60 miles would travel through riparian reserves and about 6 miles are natural surface roads. There are 528 haul route stream crossings with 23 across streams identified as cutthroat trout habitat, and 8 across streams identified as CCH. All haul route stream crossings associated with fish habitat would be on existing rocked roads.

Proposed haul routes would be renovated where necessary prior to use. They would have ditch lines cleaned and catch basins cleaned or enlarged. Crushed aggregate material would be placed on sections of inadequately surfaced roads. Timber hauling would be restricted during the winter season (October 15 to May 15) on roads with 10 inches or less of durable rock surface. The application of dust abatement materials, such as lignin or Mag-Chloride, would be restricted during or just before wet weather, and at stream crossings or other locations that could result in direct delivery to a water body (typically 25 feet from a water body or stream channel). Timber haul is not expected to have a measurable adverse effect to fish habitat because PDFs and BMPs would minimize soil movement to streams.

Road renovation would occur within riparian reserves associated with fish habitat. About 7 miles of road renovation is proposed in riparian reserves of cutthroat trout habitat streams and about 10 miles in riparian reserves of CCH streams. Project design features would include restrictions on all road renovation work from October 15 through May 15. The proposed road renovation is expected to have a short-term effect from negligible stream sediment deposition that is unlikely to be detectable from background levels. There are a total of 25 miles of road proposed to be brushed, this would have no direct or indirect effects on fish habitat, riparian vegetation, or stream sediment deposition because brushing is not anticipated to reduce streamside shade or produce sediment to streams or fish habitat.

A double culvert on road #34-4W-11.01 is in CCH and is passable to coho during high flows. Road renovation would not contribute sediment from the road because renovation would provide additional rock to prevent erosion from the road into ditches.

Approximately 16 miles of roads are proposed for decommissioning; a little over 15 miles would be completed as funding allows for restoration purposes and about 0.2 mile would be completed to offset permanent road construction for timber harvest. All roads proposed for decommissioning are within the Evans Creek fifth field watershed. About 10 miles of roads proposed for decommissioning are within riparian reserves: 3 miles are in the riparian reserves of cutthroat habitat streams (Morrison Creek, Sprignett Creek, and Ditch Creek) and 0.7 mile are in the riparian reserves of CCH streams (West Evans Creek and Right Fork Pleasant Creek). The proposed road decommissioning would decrease erosion and protect fish habitat. Road decommissioning would temporarily produce a short-term negligible increase in erosion. Effects to fish habitat would be undetectable from background levels.

Private road access to Joelker's Quarry for crushed rock would cross the upper most part of Chapman Creek, an intermittent stream and tributary to East Evans Creek. Chapman Creek at the road ford is CCH; although, coho presence has never been known at this point. No coho salmon are found in Chapman Creek. Coho presence occurs in East Evans Creek, more than 1 mile downstream from the Chapman Creek crossing. Cutthroat trout could possibly occur in this area. The stream is approximately three feet wide and two inches deep in the summer. Filter cloth at the stream and road crossing would be used to prevent downstream sediment deposition.

Dispersed Campsite and Off-highway Vehicle Trail Rehabilitation

There are 17 dispersed campsites on BLM-administered lands along West Fork Evans Creek Road that are proposed for rehabilitation. People have created off-highway vehicle trails within the riparian areas of CCH on West Fork Evans Creek. Sediment from streambanks is a problem in these areas from recreational use. Defining the limits of these campsites, limiting access to foot traffic at user-created stream crossings on West Fork Evans Creek, and planting riparian vegetation would help to stabilize banks, improve riparian vegetation, and reduce sediment input into West Fork Evans Creek.

Project design features would keep heavy equipment out of the active stream channels and would limit ground-disturbing activities to areas that are already compacted or physically disturbed. This project would limit off-highway vehicle access to West Fork Evans Creek and would potentially decrease sediment input into West Fork Evans Creek and aid in the recovery of degraded stream banks.

Water Source Restoration

There are a total of 21 existing water sources proposed for restoration: 8 on seasonal streams, 9 on perennial streams, 3 on ephemeral streams, and 1 on a dry draw. Two water sources, Collapsing Road and Evans Log Weirs, are located on CCH and one water source, East Salt Creek, is located at the upper end of cutthroat trout habitat on Right Fork Salt Creek.

Collapsing Road is a natural water source located on CCH on East Fork Evans Creek. The stream channel in this location is primarily bedrock and is not fish habitat. Evans Log Weirs is a natural water source located just below the confluence of Wolf Creek on CCH on East Fork Evans Creek. The stream channel is primarily cobble and is not good fish habitat. East Salt Creek is a constructed water source, the stream channel is primarily gravel, the pump chance is in fair condition, and the stream channel is usually dry by the end of the summer.

The remaining water sources proposed for restoration range in distance to fish habitat from less than 0.1 mile to almost 2 miles. Project design features would be implemented to minimize effects to water quality, fish habitat, and riparian vegetation. Project design features include refueling equipment outside of riparian areas, minimizing disturbance of existing riparian vegetation, using sediment control measures to prohibit sediment delivery to fish habitat, and limiting instream maintenance activities to June 15 through September 15. Implementation of project design features and best management practices would prevent or minimize effects of any stream sediment deposition or loss of riparian vegetation.

Special Forest Product and Scattered Salvage Harvest

Special forest product and scatter salvage harvest would have no effect to fish habitat or fish populations because no heavy equipment would be used in riparian reserves, no new skid trails would be constructed, and no trees would be harvested from riparian reserves.

Cumulative Effects

Direct or indirect adverse effects to fish or fish habitat from sediment deposition are not expected to occur. Only a small part of chronic erosion actually causes indirect mortality to fish

(Everest 1987). Effects would be inconsequential because of the lack of a causal mechanism to cause sediment or decrease shade which both can affect fish.

Prior to 1990, timber harvest, road construction, and fuels treatment have occurred on both public and private lands in the Evans Creek fifth field watershed. Past actions have resulted in degraded fish and riparian habitat through decreased large wood recruitment, decreased instream large wood, increased stream temperatures, and increased fine sediment levels.

Timber and salvage harvest implemented riparian reserves and best management practices from the 1995 ROD/RMP; therefore, timber harvest on BLM lands since 1995 has not contributed to the decrease in large wood recruitment, decrease of instream large woody debris, or increase in stream temperature. Road improvement and renovation occurred as part of these projects to reduce the overall amount of sediment coming from roads. Timber harvest completed before the implementation of the Northwest Forest Plan in 1994 likely had more of an effect on stream and riparian conditions.

Harvest on private lands would follow Oregon Department of Forestry (ODF) guidelines for riparian buffers. This should provide adequate shade for fish. The amount of road work is unknown, yet historically, operations would follow ODF guidelines. This would produce an inconsequential amount of sediment to have an adverse effect on fish habitat.

The timber harvest on BLM-administered land would not contribute to cumulative effects especially to stream temperature, instream large wood, or stream sediment because no timber harvest is proposed within riparian reserves and project design features would prevent or minimize direct and indirect effects. Long-term large wood recruitment is expected to increase in the proposed riparian reserve from small diameter thinning. Road decommissioning in riparian reserves is not expected to increase short-term stream sediment deposition above negligible levels and would not have an adverse effect to fish or fish habitat. Long-term stream sediment deposition in streams is expected to decrease and is not likely to be detectable from the background sediment levels. Dispersed campgrounds and off-highway vehicle access areas proposed for rehabilitation are expected to have a positive effect on riparian vegetation growth in the local area and show a decrease in stream sediment deposition in local user-created stream crossings that would be blocked from off-highway vehicle access. Water source (pump chance) renovation is expected to have a negligible short-term increase in stream sediment in local area streams that is not likely to be detectable from the background sediment levels.

Since 1996, a variety of restoration projects have been implemented on BLM-administered land in the Evans Creek fifth field watershed. Large wood was added to West Fork Evans Creek in 2003, 2004, 2005, and 2008. In 2009, large wood was added to West Fork Evans Creek, East Evans Creek, Rock Creek, Cold Creek, Battle Creek, Cedar Creek, Pleasant Creek, Right Fork Pleasant Creek, and Sand Creek; a total of 42 large wood sites were constructed over about 12 miles of stream.

Many culverts have been replaced to accommodate 100-year flood events and to provide fish passage. Two dams were removed to provide easier migration for fish, one on Maple Gulch and one on East Evans Creek. Three years of coho salmon carcass placement was implemented on West Fork Evans Creek to provide nutrient cycling and food for rearing juvenile coho salmon. Planned restoration projects in the Evans Creek fifth field watershed include

replacement or installation of approximately 50 cross drain culverts to improve drainage and accommodate 100-year flood events.

It is unlikely adverse effects would occur to fish or fish habitat because there are very few causal mechanisms and any effects would be immeasurable and short-term. Additionally, past restoration activities have minimized short-term adverse effects from possible road erosion. All activities have conditions for adequate mitigation to protect the fishery resource by using prescribed PDFs and BMPs. The closest any proposed action is to CCH and other fish habitat is more than 0.25 mile, except for the small diameter thinning units in T33S, R2W, section 17, which are at least two site potential trees from CCH.

3.6 Wildlife

3.6.1 Methodology

- The process for conducting biological evaluations and assessments includes a review of existing records, field reconnaissance, field surveys, and analysis of potential impacts. The project wildlife biologist conducted a review of potential wildlife habitat using maps, aerial photographs, GIS software, field survey data, and stand exam records for the Project Area.
- The BLM biologist analyzed spotted owl habitat for the Evans Creek fifth field watershed using IVMP (Interagency Vegetation Mapping Project), TPCC (Timber Production Capability Classification), FOI (Forest Operations Inventory) information, and on-site habitat analysis.
- Spotted owl habitat classifications shown on Table 3-16 were derived using the 1997 IVMP and the BLM's FOI information. IVMP is a joint Forest Service/BLM project that derives a 25-meter pixel-based vegetation map from 1997 satellite imagery. The 1997 IVMP provides a representation of vegetation age classes across all ownerships within the Evans Creek fifth field watershed. The vegetation map has been classified into categories according to the Interagency Vegetation Standards that were adopted by the Interagency Advisory Committee. IVMP data is primarily useful for cumulative effects analysis that includes public and private lands. The FOI gives a more detailed description of age classes on BLM administered lands because it is based on field data as well as aerial photo inventories. The combined data allows the vegetation to be grouped into the early, mid-, and late seral age classes for comparison purposes, although these data sources have differing degrees of detail and resolution. The TPCC refers to the suitability of the soil to produce timber.
- In January 2010, the Rogue River-Siskiyou National Forest supervisor and BLM Medford District manager approved the use of the Recovery Action 32 (RA32) Habitat Evaluation Methodology 1.3. It complies with the 2010 Draft Revised Recovery Plan for the Northern Spotted Owl recommendation in RA32 to maintain all of the older and more structurally complex, multilayered conifer forests. The methodology was used to determine the presence or absence of highly suitable, structurally complex, spotted owl habitat in all project units under consideration in this analysis.
- The list of special status species known to be present in the Medford District BLM was updated in January 2008 with the latest information from the Oregon Natural Heritage

Program information. BLM wildlife biologists reviewed the Oregon State Director's Special Status species list to identify the impacts of the proposed actions and provide mitigation measures.

- Survey and Manage surveys were conducted for red tree voles, terrestrial mollusks, and great gray owls to meet standards from the January 2001 S&M (Survey and Manage) ROD (Forest Service and Bureau of Land Management 2001) and the 2003 Annual Species Review that were in effect during the early phase of the planning process. Protocol surveys for two S&M mollusk species known to be present in other parts of the Butte Falls Resource Area, and one suspected to be present, were completed across 4,400 acres of the Evans Creek fifth field watershed with a negative result. The mollusk surveys were or will be completed to interagency protocol standards, as described in Duncan et al. (2003), prior to implementation. Great gray owl surveys were completed using interagency protocol standards in areas where suitable great gray owl habitat was identified, as described in Quintana et al. (2004). Ground surveys and tree climbing for red tree voles will be completed prior to implementation in all project units where habitat removal will occur. The RTV surveys meet interagency protocol standards as described in Biswell et al. (2002).
- Protocol surveys for northern spotted owls were conducted in 2010. They will be continued until completion of the projects following the *2011 Protocol for Surveying Proposed Management Activities that May Impact Northern Spotted Owls* (2011 NSO Survey Protocol). The BLM has monitored most of the historic owl sites from the early 1990s through 2010 in the Evans Creek fifth field watershed, providing a long history of occupancy status in the Project Area. Following the current protocol, surveys were expanded into areas where occupancy status was unknown. NRF (nesting, roosting, and foraging) habitat was identified 1.3 miles out from NRF project units, using IVMP and BioMapper data in GIS, and surveyed if the status of those areas was unknown.

3.6.2 Assumptions

- Historic owl sites that were occupied at least once in the past five years were still occupied, and their home ranges were analyzed under that assumption.
- If no T&E (Threatened and Endangered) or special status species habitat is known or suspected to be present in the planning area or the area is outside the range for the species, then no further analysis is needed. If habitat is present, but no activities are planned for that habitat or the project would not impact the population, no further analysis is needed. If a T&E or special status species is known or suspected to be present and habitat is proposed to be disturbed, then the species will be analyzed. See Appendix E-Wildlife for a list of current T&E and special status species that were analyzed for the proposed action.
- Late-successional forest is forested habitat 80 years or older. Late-successional forest generally, but not always, provides suitable habitat for spotted owls. Suitable spotted owl habitat is usually 80 years and older, but it also contains other attributes, such as multiple tree layers, snags, and decaying logs. Spotted owl habitat is specifically rated for its suitability for spotted owls, while late-successional forest not rated as suitable spotted owl habitat may provide habitat for other wildlife species.

- All sites of known great gray owls will be protected according to current interagency protocols. Known active RTV nests will be protected with a buffer. All highly suitable, structurally complex forest identified using the RA32 methodology, would be dropped from consideration for timber harvest and small diameter thinning projects. Each historic and new spotted owl site will have a protected, unaltered, 300-meter nest patch, regardless of occupancy status.

3.6.3 Affected Environment

3.6.3.1 Connectivity/Diversity Blocks

Five connectivity/diversity blocks are located within the proposed Project Area (Table 3-14). The 1995 ROD/RMP requires the BLM to maintain 25 to 30% of Federal forested lands within the connectivity/diversity block in late-successional forest condition. The size and arrangement of habitat within a block will provide effective habitat to the extent possible (Bureau of Land Management 1995, 40).

Table 3-14. Connectivity/Diversity Block Habitat Assessment

Location	Forested Habitat (Acres)	Late-Successional Forest	
		Acres	Percent
T33S, R2W, section 29	607	431	71
T33S, R3W, section 3	583	476	82
T33S, R3W, section 5	626	404	65
T33S, R3W, section 27	611	409	67
T34S, R3W, section 17	613	357	58

3.6.3.2 Special Status Wildlife Species

Special status species are those species designated as Bureau Sensitive by the BLM or are federally threatened or endangered. The project wildlife biologist completed a review of the special status species that were identified in the Butte Falls Resource Area (Appendix E-Wildlife). The table does not include all S&M species. They will be discussed separately. The table does include all the special status species considered in the Project Area, but only the species known or suspected to be present in the Project Area are discussed in further detail.

Federally Listed Species

Northern Spotted Owl

The northern spotted owl, listed as threatened under the Endangered Species Act, is associated with the existing habitats found within the Evans Creek Project Area.

Northern spotted owls prefer coniferous forest with multiple vertical layers of vegetation and a variety of tree species and age classes with the presence of large logs and large diameter live and dead trees (snags), for nesting, roosting, and foraging habitat. They may also be found in younger stands with multilayered, closed canopies, large diameter trees, and abundance of dead and down woody material. Based on studies of owl habitat selection, 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 (Thomas, et al. 1990) (Table 3-15).

Table 3-15. Northern Spotted Owl Habitat Types

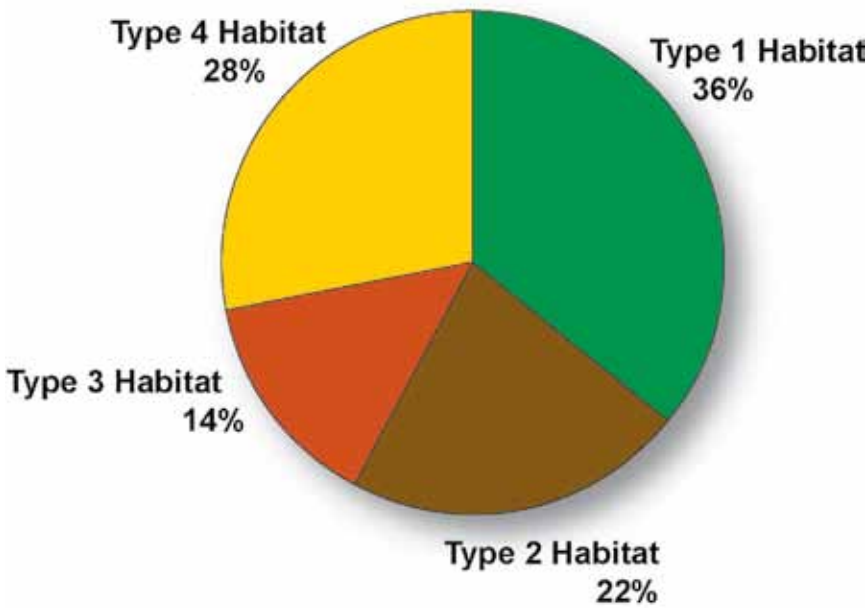
Habitat Type	Description
Type 1: Suitable Nesting, Roosting, Foraging (NRF)	NRF habitat meets all spotted owl life requirements. These forests have a high canopy closure (greater than 60%), a multilayered structure, and large overstory trees. Deformed, diseased, and broken-top trees, as well as large snags and down logs, are also present.
Type 2: Dispersal	This habitat is not suitable for nesting, but provides spotted owls with roosting, foraging, and dispersal habitat. Canopy closure is usually greater than 40% but with a more uniform structure and moderately sized overstory trees. Deformed trees, snags, and down wood are less prevalent than in Type 1 habitat.
Type 3: Capable	Does not presently meet spotted owl needs but has the potential to grow into Habitat Types 1 and 2.
Type 4: Noncapable	Does not have the potential of developing into late-successional forest or supporting old growth dependent species.
High-quality habitat (RA32)	Older, multilayered, structurally complex forests characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees. This is a subset of Type 1 habitat and may vary due to climatic gradients across the range.

Suitable habitat (NRF) in southwest Oregon is typified by mixed-conifer habitats with recurrent fire history, patchy habitat components, and a higher incidence of woodrats (U.S. Fish and Wildlife Service 2006, BA-6). A review of current habitat ratings of Federal lands within the Evans Creek fifth field watershed indicates that approximately 21,000 acres, or 36% of BLM-administered lands, provide NRF habitat. Suitable, NRF habitat also functions as dispersal habitat. Dispersal-only habitat is provided on approximately 13,000 acres (22%) of Federal land (Figure 3-4).

On September 8, 2010, the USFWS released the *Draft Revised Recovery Plan for the Northern Spotted Owl* (Strix occidentalis caurina) for public comment. The plan is currently under review and has not been finalized. The draft plan recommends retaining all occupied spotted owl sites as well as high quality habitat (RA 32). The plan provides guidance to bring about recovery through prescribed management actions and supplies criteria to determine when recovery has been achieved.

The current foundation of the spotted owl recovery plan is the 1994 Northwest Forest Plan. Management direction and land allocations in the standards and guidelines of the Northwest Forest Plan are intended to constitute the Forest Service and BLM contributions to the recovery of the northern spotted owl (Forest Service and Bureau of Land Management 1994, A-2). The Medford RMP and the Northwest Forest Plan provide a network of late-successional reserves, 100-acre activity centers, connecting riparian corridors, connectivity blocks, and 15% late-successional forest retention on Federal lands in fifth field watersheds.

Figure 3-4. Existing northern spotted owl habitat on BLM-administered lands in the Evans Creek fifth field watershed.



The Northwest Forest Plan designated 100 acres of the best habitat on Federal lands to be retained as close as possible to the spotted owl nest site, or owl activity center, for all sites known as of January 1, 1994. This was intended to preserve an intensively used portion of the breeding season home range close to a nest site or center of activity (Bureau of Land Management 1995, 32) (Forest Service and Bureau of Land Management 1994, C-10).

Approximately 200 northern spotted owl 100-acre activity centers have been designated and mapped as late-successional reserve in the Medford District BLM. Critical habitat was designated by USFWS on BLM lands in 1992 and revised in 2008. Critical habitat identifies geographic areas that contain features essential for the conservation of the spotted owl and may require special management considerations. For the northern spotted owl, these features include particular forest types of sufficient area, quality, and configuration to support the needs of territorial owl pairs throughout the year distributed across the species' range, including habitat for nesting, roosting, foraging, and dispersal. No critical habitat, as designated in 2008 (73 FR 157), is found in the proposed Project Area. The current habitat modeling effort initiated by the USFWS, as described in the 2010 draft revised recovery plan, will be used to develop potential habitat conservation networks and map new critical habitat across the range of the northern spotted owl.

Proposed projects are located within the provincial home ranges (1.3-mile radius from the site center for the Klamath Province) of 32 known, active spotted owl sites, which include sites outside the Evans Creek fifth field watershed. A known, active spotted owl site is defined as a location with evidence of continued use by spotted owls. Evidence includes breeding, repeated location of a pair or single bird during a single season or over several years, presence of young before dispersal, or some other strong indication of continued occupation. Within the Project Area, 14 spotted owl sites are considered unoccupied because a spotted owl pair or resident single has not been located at these sites during surveys for the past five years. Additionally, four known sites are being surveyed where occupancy status is uncertain. Eight of the known

spotted owl sites were discovered after January 1, 1994, and do not have established 100-acre activity centers (Forest Service and Bureau of Land Management 1994, C-10).

Spotted owl productivity varies widely year-to-year, depending on how spring weather conditions affect prey availability (reproduction) (Franklin, et al. 2000, 539). Ongoing demographic monitoring of two study areas located east and northwest of the Project Area indicates the population of spotted owls in southwest Oregon is statistically stable (R. Anthony, E. Forsman and A. Franklin, et al. 2006).

Barred owls are thought to compete with spotted owls (Courtney, et al. 2004) (Kelly, Forsman and Anthony 2003) and their distribution has spread in recent decades. There is a perceived threat because barred owls use habitats typical of spotted owl habitat. There is great uncertainty associated with the actual and potential effects of the barred owl on spotted owls (Courtney, et al. 2004). "Although barred owls are having a negative impact on spotted owls at least in some areas, the extent of this impact and its ultimate outcome is uncertain" (ibid.). The barred owl may be more of a habitat generalist and occupy a wider diversity of habitat types than the spotted owl. The response of spotted owls to barred owls may be avoidance. The rate and extent of spotted owl displacement by barred owls is unknown and other issues may be causing or adding to the displacement (ibid.).

BLM biologists have observed barred owls at five historic spotted owl sites in the fifth field watershed. Surveys specifically for barred owls have not been conducted in the Project Area, but the species has been detected during spotted owl surveys. Four of the barred owls were single birds. A pair of barred owls has been observed at one of the historic spotted owl sites, but nesting status was not determined. In 2000 and 2002, a barred owl was present in a 100-acre activity center that had been consistently occupied by spotted owls since 1992. A pair of spotted owls returned to the site in 2003 and barred owls have not been detected there since. In a nearby spotted owl site where a barred owl took residence, the spotted owl pair moved 0.75 mile south. It is unknown whether spotted owls are excluded from the historic center of activity by barred owls or whether the spotted owls just become more difficult to detect during surveys.

Bureau Sensitive Species

Bald Eagle

Bald eagles were removed from the threatened and endangered species list on July 9, 2007 (172 FR 130). They remain on the BLM special status species list.

Bald eagles build their nests in large, dominant overstory trees, often at the edge of a stand or on a ridge. In southern Oregon, the majority of bald eagle nests are found in large trees near lakes, rivers, and large ponds.

Eagles have been observed flying and foraging in the lower elevation lands near towns of Wimer and Rogue River. There is one known nest on the south side of the Rogue River about three miles south of the Project Area. There are no known nests in the Evans Creek fifth field watershed.

Bats

Abandoned gold and cinnabar mines are present in three sections where actions are proposed. These mines have been surveyed in the past for bat presence. Townsend's big-eared bats (*Corynorhinos townsendii*) were found using the mines for roosting in the summer and hibernating in the winter. A big-eared bat was also observed roosting in an abandoned cabin in the Cinnabar mine complex. A big-eared bat maternity colony is present in one mine adit. The mines are located in T35S, R3W, section 17 and T34S, R2W, sections 5 and 17. The mine near a road in Murphy Gulch has been gated with a bat-friendly gate to prevent human entry. Currently, there is an effort to gate all mine adits across the Medford District that pose a danger to people.

Townsend's big-eared bats are associated with a wide variety of habitats. They are commonly considered a cave-dwelling species, using caves or cave-like roosting habitat. They may use rock outcrops or buildings. All mines and abandoned buildings where bats have been found would be protected with a 250-foot no-cut buffer (ROD/RMP, 57).

The range of fringed myotis (*Myotis thysanodes*) and pallid bat (*Antrozous pallidus*) includes the Evans Creek fifth field watershed. Mist-net surveys in a pond in the northern part of the Evans Creek fifth field watershed did not detect these species but they could be present.

Fringed myotis appear adapted to live in areas with diverse vegetative substrates. They are associated with a variety of habitats including conifer forests and oak woodlands. They roost in buildings, caves, mines, and crevices and cavities in large trees. Mines and abandoned buildings would be buffered with a 250-foot no-cut buffer.

Pallid bats are usually associated with drier areas. West of the Cascade Range, pallid bats are restricted to the drier interior valleys of the southern portion of the state. They are usually found in brushy, rocky terrain, but have been observed at edges of coniferous and deciduous woods and open farmland (Verts and Carraway 1998, 116).

Fisher

Fishers use a variety of habitats. Their occurrence is closely associated with low to mid-elevation (generally less than 4,100 feet) 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 2003).

In general, the habitats used by fishers are forest woodland landscape mosaics that include conifer-dominated stands. Their habitats include 5- to 10-year-old regeneration harvests and heavily thinned stands with large residual trees associated with them, either within the stands or at the edge. Forest type is probably not as important to fishers as the vegetative and structural aspects that lead to abundant prey populations. Prey and scavenged remains recovered from den and rest sites in southwest Oregon include rabbit, ground squirrel, flying squirrel, woodrat, opossum, skunk, porcupine, bobcat, deer and elk carrion, jay, woodpecker, grouse, berries, and yellow jackets (Aubry and Raley 2006, 26).

Fishers may select forests that have low and closed canopies (69 FR 68:18773). They will use harvested areas if patches of habitat with residual components (i.e., logs, hardwoods) and areas

where patches of larger trees are left in the landscape (Diller, Hamm and Thompson 2004). Important features include canopy closure and denning sites with snags and down wood.

The Pacific Northwest Research Station Olympia Forestry Services Laboratory (PNW) and Rogue River National Forest (RRNF) conducted a fisher research project from 1995 to 2000 in the Prospect Ranger District. The research project included setting cameras, trapping fishers, and placing radio-collars on captured fishers. Researchers captured 22 fishers during the project (Aubry and Raley 2006, 10). The majority of the radio-telemetry locations were on RRNF lands. The proposed action is over 20 miles from the area where the nearest detection occurred during the study.

The research project established that fishers travel over large areas. The average home range for females was approximately 6,200 acres (25 square kilometers). Male home ranges varied from approximately 36,300 acres (147 square kilometers) during breeding season to 15,300 acres (62 square kilometers) during the nonbreeding season (Aubry and Raley 2006, 14). One male dispersed approximately 34 miles (55 kilometers) (ibid., 13).

Currently, there are two populations of fisher in Oregon which appear to be genetically isolated from each other: a small population in the Southern Cascades near Prospect and Butte Falls and a second population in the southwestern corner of the state in the Oregon Siskiyou Mountains (Zielinski, Kucera and Barrett 1995) (Aubrey, et al. 2004). This is considered to be due to the presence of potentially strong ecological and anthropogenic barriers including the white oak savanna habitat of the Rogue Valley and Interstate 5. Based on DNA analyses, individuals in the southern Oregon Cascades appear to be descendants of animals reintroduced from British Columbia and Minnesota during the late 1970s and early 1980s by the Oregon Department of Fish and Wildlife (Drew, et al. 2003). Animals in the eastern Siskiyou Mountains of Oregon are genetically related to individuals in the northwestern California population, which is indigenous (Wisely, et al. 2004) (Farber and Franklin 2005). The Evans Creek fifth field watershed is isolated from the indigenous population by Interstate 5 and the Rogue Valley and is outside the current known range of fishers in Oregon. There is, however, a current effort to try to detect fishers within the Evans Creek watershed.

Camera and hair tube protocol fisher surveys that covered 5 sample units in the Evans Creek fifth field watershed were conducted from 2007 to 2010. Each sample unit covers 4 square miles. The surveys were in the Fielder Mountain, Square Donut, and Skeleton Mountain areas. No fishers were detected. An unconfirmed historic (1980s) report of a fisher sighting in Sardine Creek (Rogue River-Gold Hill fifth field watershed) was surveyed in 2007 with a 4-square-mile protocol survey using bait stations with cameras and hair tubes. No fishers were detected.

Females usually give birth in cavities in large live or dead trees. These cavities are in trees with openings that access hollows created by heartwood decay (Aubry and Raley 2002, 7). After the kits become more active, the females move them to a larger den on or near the forest floor. These dens are primarily cavities in the lower bole or butt of live or dead large trees. Fishers also use mistletoe brooms and rodent nests for rest sites (ibid., 23). Connectivity of late-successional forests is important. Radio telemetry locations in the South Cascade study area found that 1% of the locations were in nonforested habitats (Aubry and Raley 2006).

No habitat management guidelines relative to stand characteristics and the amount of each stand type that should be maintained have been established for fisher. Patches of older seral habitat are present in the Project Area within riparian management zones, spotted owl cores, and connectivity blocks. Within the BLM-administered lands in the Evans Creek fifth field watershed, 54,205 acres are forested and 24,608 acres are classed as late-successional forest (80 years old or more). Fishers also will use managed second growth forests for denning, resting, and foraging, even resting in debris piles created during timber harvest operations (Aubry and Raley 2006). Most of the forested land could be used for fishers for their life activities (traveling, foraging, and resting). Older forests would provide habitat that could also be used for breeding and denning. Second growth private lands in the watershed also provide habitat for fisher (traveling, foraging, and resting) in the areas where the canopy is recovering.

USFWS published a finding in April 2004 that a petition to list fishers as a "Federally Threatened" species was warranted but precluded by higher priority listing actions. The species remains a USFWS candidate species (69 FR 68:18770). An interagency team of Federal agency and state biologists from British Columbia, Washington, Oregon, and California completed a conservation assessment and strategy for the fisher in 2010. Fishers remain a BLM Bureau Sensitive species.

Frogs

Foothill yellow-legged frogs have been observed in the creek in Maple Gulch 0.25 mile above the confluence with Evans Creek. Yellow-legged frogs are likely present in East Fork Evans Creek as well. The range of the foothill yellow-legged frogs is sea level up to about 1,800 feet. These frogs are closely confined to the vicinity of permanent streams. Riparian buffer widths in the watershed are 175 feet for non-fish-bearing streams and 350 feet for fish-bearing streams.

Oregon spotted frogs have been observed on the Medford District BLM outside of the Butte Falls Resource Area. It is not known if the species is present within the Project Area, although they were not located during pond surveys. Spotted frogs live where there is abundant aquatic vegetation in slow streams, permanent ponds, marshes, or lake edges, and breed in very shallow water in early or mid-spring.

Grasshopper Sparrow

Grasshopper sparrows have been found nesting in one small colony in the Rogue Valley outside of land administered by the BLM. They prefer to nest and forage in relatively dry habitats in open grasslands and grain fields, generally free of woody shrubs. They nest on the ground in dome-shaped nests, concealed by vegetation. Forage consists of seeds and insects gleaned from the ground.

Lewis' Woodpecker

Lewis's woodpeckers are associated with open woodlands near streams and rivers. They breed sparingly along Bear Creek and areas of the Upper Rogue Valley in Jackson County. They have been observed in the Project Area in oak woodlands during the winter months, but none have been observed during the breeding season. Habitat preference includes hardwood oak stands with scattered ponderosa pine near grassland shrub communities.

Mollusks

The travelling sideband (*Monadenia fidelis celeuthia*) is documented in low to moderate elevations in Jackson County, Oregon. It is found in somewhat dry and open forested terrain, in talus and rock outcrops, and along springs in rocks and moist vegetation. The Siskiyou hesperian (*Vespericola sierranus*) is found in southern Oregon and northern California primarily in perennially moist habitat. Moist valley, ravine, gorge, or talus sites are preferred. They may occur in areas with running water or along streams and springs.

The BLM surveyed 2,850 acres for mollusks across the Evans Creek watershed. The 2,850 acres were surveyed twice, generally once in the fall and once in the spring, and followed interagency protocol standards. Surveyors were looking for all mollusk species on the Bureau Sensitive list and the Survey and Manage list. No Bureau Sensitive mollusks were found in the Project Area during protocol surveys.

Northwestern Pond Turtle

Water sources on BLM-administered lands in the fifth field watershed have been surveyed with no detections of northwestern pond turtles. The water sources may be too small to support turtles. The turtles are present in East and West Fork Evans Creek and in the main stem Evans Creek.

Oregon Vesper Sparrow

Vesper sparrows are known to breed in the foothills and mountains above the Rogue Valley, although it is not known if they are in the proposed Project Area. Dry, grassy foothills are especially favored for nesting around the Rogue Valley.

Peregrine Falcon

Peregrine falcon nest sites are present across the Butte Falls Resource Area, but only one is located near proposed project units. The active nest site is on a cliff 1.5 miles from proposed timber harvest units. No other peregrine sites have been found in the Evans Creek fifth field watershed.

White-tailed Kite

White-tailed kites are present in the low elevation farmlands in the Rogue Valley. They may be present near the southern edge of the Project Area, although they are unlikely to be present within the forested project units.

Neotropical Migratory Bird Species of Conservation Concern and Game Birds below Desired Condition

BLM management direction states that NEPA analysis would occur for actions having the potential to negatively or positively affect birds identified by USFWS in *A Blueprint for the Future of Migratory Birds, Migratory Bird Program Strategic Plan 2004-2014* (U.S. Fish and Wildife Service 2004). This publication includes a list of "Western BLM Bird Species of Conservation Concern" (Migratory Birds of Concern) and "Game Birds below Desired Condition," which was compiled from historical records and surveys. BLM biologists reviewed bird species

determined to be of concern for the lands in the region where Medford District BLM is located (Bird Conservation Region 5, USGWS Region 1) and compiled the list of Migratory Birds of Concern and Game Birds below Desired Condition found in Appendix E-Wildlife.

The following species have been located within the Project Area. The species are not on the BLM sensitive species list, but are species of concern.

Band-tailed Pigeon

Band-tailed pigeons are a common summer resident in forested areas west of the Cascade crest and typically nest in forested mountain areas below 4,000 feet (Marshall, Hunter and Contreras 2003). Their abundance increases from east to west with higher abundance in the Coast Range. They have been observed within the Project Area.

Mourning Dove

Mourning doves are well distributed throughout the Butte Falls Resource Area and have adapted to a variety of habitats. They are abundant in grasslands and agricultural habitats in Oregon. Doves forage on a wide variety of seeds and require a source of water nearby.

Olive-sided Flycatcher

Olive-sided flycatchers are likely present within the Project Area. They commonly can be heard singing during the spring and summer across the Butte Falls Resource Area in or adjacent to coniferous woodlands, especially in stands near clearings or burned areas.

Purple Finch

The purple finch is fairly common in the Butte Falls Resource Area and likely breeds within the Evans Creek fifth field watershed.

Rufous Hummingbird

The rufous hummingbird, a Neotropical migratory bird species, is the most common and widespread of the Oregon hummingbirds. It may also be the most wide-ranging hummingbird in North America, occurring in every state and most Canadian provinces (Marshall, Hunter and Contreras 2003). Rufous hummingbirds are positively associated with nectar produced by flowering plants, deciduous shrubs, and trees in early successional habitats (Rich, et al. 2004). Rufous hummingbirds are likely present in the Project Area.

Willow Flycatcher

Willow flycatchers have been found in several localities in Jackson County and are closely associated with shrub-dominated habitats that contain dense shrubs or tall herbaceous plants, with patches of shorter vegetation (Marshall, Hunter and Contreras 2003). They are likely present within the Evans Creek fifth field watershed.

Survey and Manage Species

Great Gray Owl

Great gray owls forage for voles, mice, and gophers in open areas such as meadows, recent clearcuts, and oak woodlands. Most great gray owl nests located by BLM biologists on the Medford District were found in the broken tops of snags. The Evans Creek fifth field watershed is at the edge of the great gray owl's range. Two historic sites are known in the watershed. Great gray owls need large trees for nesting, but they do not need high canopy cover. They generally nest in broken-top trees and snags or in abandoned raptor nests.

According to protocol standards, two years of great gray owl protocol surveys (6 visits per year for 2 years) are required (Quintana-Coyer, et al. 2004, 5). Wildlife biologists completed 2 years of protocol surveys in and near project units containing great gray owl habitat. Two great gray owl nest sites were found within the fifth field watershed prior to the additional 2-year surveys. These nest sites are outside all project units. All other great gray owl surveys in the fifth field watershed have been negative. Great gray owl nests will be protected with a 0.25-mile buffer, according to current management guidelines.

Mollusks

Three species of mollusks (snails) are on the Survey and Manage list for Butte Falls Resource Area: Chace sideband (*Monadenia chaceana*), Crater Lake tightcoil (*Pristiloma arcticum crateris*), and Oregon shoulderband (*Helminthoglypta hertleini*). The BLM has never documented *Pristiloma arcticum crateris* on the Medford District, however. These mollusks have only been documented at higher elevations in a spring near Crater Lake National Park. Pristiloma are found within 10 meters of streams, springs, and perennially wet areas. Approximately 2,850 acres were surveyed for mollusks across the Evans Creek watershed. The 2,850 acres were surveyed twice, generally once in the fall and once in the spring, and followed interagency protocol standards. Surveyors were looking for all mollusk species on the Survey and Manage list and the Bureau Sensitive list. No Survey and Manage mollusks were found in the Project Area during protocol surveys.

Red Tree Voles

Red tree voles are present in the Evans Creek fifth field watershed. Surveys for red tree voles will be completed in all forested areas where there is a potential for habitat removal. Active red tree vole nests will be buffered and protected according to interagency protocol standards. Optimal habitat for red tree voles is identified as older, mature Douglas-fir forests (Carey 1991). Hardwoods are not generally recognized as an important habitat component and the species is not found in hardwood stands (Gomez 1992). The species occurs in older, more mature forests with large, live Douglas fir, significantly more than in younger forests. Younger forests are unlikely to provide population persistence over the long term.

3.6.3.3 Big Game Winter Range and Elk Management Area

A Big Game Winter Range and Elk Management Area is located in the southeast part of the Project Area in T34S, R2W, sections 9, 15, and 16. Deer and elk also migrate through the rest of the Project Area during the spring and fall. Many historic game trails are present and used annually within the winter range and elk management areas. ROD/RMP guidelines

recommend closing all roads except major collectors and arterials during the seasonal restriction (November 15 to April 1) and minimizing new road construction.

3.6.4 Environmental Consequences

3.6.4.1 Effects of Alternative 1 (No Action) on Wildlife

Direct and Indirect Effects

Special Status Wildlife Species

Federally Listed Species

Under Alternative 1, no harvest would occur. Stands providing suitable northern spotted owl habitat would be maintained as owl habitat. With no thinning (selection harvest or density management), the trajectory of some stands to grow into suitable habitat would continue at a slower rate and would remain at a higher risk of stand-replacement fire than if the stands were thinned.

Bureau Sensitive Species

Existing habitat for other special status species would remain at current levels. Some stands in need of small diameter thinning treatments would take longer to become suitable habitat for species dependent upon mature forest. There would be no change in habitat for bald eagles, bats, foothill yellow-legged frogs, or Oregon spotted frogs in the Project Area.

Although Pacific fishers have not been documented in the Project Area, there is a possibility the area could overlap with one or two fisher territories. If fishers are in the Project Area, they will continue to use the area with no disturbance. Habitat would not be removed and disturbance from work activities, such as temporary and permanent road construction and associated noise, would not occur. Forested stands would continue to develop into mature seral stages, increasing the availability of large decadent trees that could provide future resting and denning structures. Patches of trees in root rot pockets would continue to die and fall over. Adjacent large green trees would be impacted and continue to die. Snags and coarse wood habitat would increase. Larger overstory trees would take longer to develop as competition for nutrients and light continues. No disturbance or removal of any constituent elements would occur under the No Action Alternative.

Neotropical Migratory Bird Species of Conservation Concern and Game Birds below Desired Condition

There would be no change in habitat trends under the No Action Alternative. As the trees grow and canopy cover increases in the more open stands, there would be a reduction in understory forbs and flowering shrubs. An increase in nesting habitat for band-tailed pigeons would occur. A slight decline in foraging habitat for hummingbirds could occur, along with a decline in nesting and foraging habitat for willow flycatchers. Stands with dense understory tree and shrub layers would continue to be less suitable for species that use open understory, such as olive-sided flycatchers and purple finches. There would be an expected long-term increase in productivity in other species that use older forests with high canopy. There would be a slight decrease in productivity in species that use early to mid-seral forests. There would

be no change to the grassland and hardwood oak habitats preferred by grasshopper sparrows, Lewis' woodpeckers, mourning doves, and Oregon vesper sparrows.

The No Action Alternative would not remove or modify any habitats currently used by northwestern pond turtles and there would be no change in habitat for peregrine falcons.

Survey and Manage

There would be no change in habitat trends for great gray owls and mollusks under the No Action Alternative.

Stands providing red tree vole habitat would be maintained as habitat. With no thinning (selection harvest or density management), the trajectory of some stands to grow into red tree vole habitat would continue at a slower rate and would remain at a higher risk of stand-replacement fire than if the stands were thinned.

Big Game Winter Range and Elk Management Area

No new temporary roads would be built and existing roads would be left unmaintained and closed within the deer and elk winter range in T34S, R2W, sections 9, 15, and 16. No proposed timber harvest would occur within deer and elk winter range. No change in foraging habitat and no noise disturbance would occur.

Cumulative Effects

No change from current trends in the Evans Creek fifth field watershed is expected. Private industrial timber lands adjacent to the Project Area would be harvested and most would remain in early to mid-seral conditions.

Suitable owl habitat removed in the last decade by BLM timber sales in the Evans Creek fifth field watershed (Home Run, Salty Bones, Cleveland Railroad, Anti Sypher, and Salt Air) was included in the analysis for consultation with USFWS (BA/BO #1-14-03-F-511, 20 October 2003). Suitable owl habitat was removed on 57 acres of regeneration harvest. Suitable habitat was downgraded 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 would return to being suitable habitat in the next decade.

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

The following reports 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: *Scientific Evaluation of the Status of the Northern Spotted Owl* (Courtney, et al. 2004); *Status and Trends in Demography of Northern Spotted Owls, 1985-2003* (R. Anthony, E. Forsman and A. Franklin, et al. 2006); *U.S. Fish & Wildlife Service 5-Year Status Review* (U.S. Fish and Wildlife Service 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 2005). 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, while 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. Barred owls may continue to immigrate into the Project Area, even without proposed actions on BLM lands. Since 1990, the emergence of barred owls as invasive competitors with spotted owls suggests an increase in risk to the species. Barred owls may be more of a habitat generalist and may occupy a wider diversity of habitat types than spotted owls. The displacement of spotted owls by barred owls is likely occurring, but the rate and extent of this are unknown. Predictions of the potential impacts and long-term threats posed by barred owls, West Nile Virus, and Sudden Oak Death are beyond the scope of this analysis. Only site-specific analyses will be conducted for the proposed action alternatives within the Project Area.

3.6.4.2 Effects on Wildlife Common to All Action Alternatives

Direct and Indirect Effects

Special Status Wildlife Species

Federally Listed Species

Northern Spotted Owl—The BLM wildlife biologist evaluated and identified approximately 1,100 acres of highly suitable, structurally complex RA32 habitat. These acres were dropped from further consideration for the activities proposed in this analysis.

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 tree spacing 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.

Bureau Sensitive Species

Bald Eagle—The projects proposed in the action alternatives would have no effect on the ability for bald eagles to persist in the Evans Creek fifth field watershed. Bald eagles in Oregon primarily nest within 1 mile of water sources such as lakes, rivers, reservoirs, or oceans (Marshall, Hunter and Contreras 2003). They prefer large diameter, live trees with large enough limbs to support their nest, often overlooking meadows or the water source they forage in. The vast majority of the known nest locations on the Medford District BLM are along the Rogue River and next to reservoirs. The closest proposed timber harvest units to the river are 2.5 miles to the north. Those units have been surveyed for nests and no eagle nests were found. There have been no documented or reported nesting eagles along Evans Creek.

Bats—Large snags and decadent trees (included in the standard and guidelines for green tree patches in the matrix), riparian reserves, 100-acre known northern owl activity centers, and other reserves would provide snag and large tree habitat for bats. Although some trees that could be used by bats as roost sites could be harvested, existing snags and coarse woody

debris would be retained. Proposed activities would not affect persistence of any of the three Bureau Sensitive bat species known or suspected to be present in the Evans Creek fifth field watershed.

Frogs—Projects proposed under each of the action alternatives would not negatively affect foothill yellow-legged frogs or Oregon spotted frogs. Riparian buffer widths in the watershed are 175 feet for non-fish-bearing streams and 350 feet for fish-bearing streams.

Proposed maintenance of 21 water sources, or pump chances, would have a positive, long-term impact on frogs. Water sources that have accumulated debris, vegetation, and sediment would be cleaned out, providing for future breeding habitat for Oregon spotted frogs. If the species is already present, the brief, direct affect would be minimal because the disturbance of existing riparian vegetation would be minimized to the greatest extent practical; maintenance activities would be maximized during late summer and early fall to best avoid wet conditions and water withdrawal equipment would have a fish screen installed.

Grasshopper Sparrow—Mainly found east of the Rocky Mountains, grasshopper sparrows nest and forage in grasslands and grain fields in relatively dry habitats. A small population has been observed in the Rogue Valley. They may be present adjacent to project units along the southern edge of the Evans Creek watershed. No projects or treatments are proposed in grasslands or meadows and nesting and foraging habitat would not be altered.

Northwestern Pond Turtle—Northwestern pond turtles nest on dry ground, generally within 300 feet of water, where they cover their deposited eggs with soil and vegetation. Excessive ground disturbance may result in the loss of vegetative cover used for covering their eggs. Pond turtles have been observed in Evans Creek. The prescribed timber harvest buffer on fish-bearing streams such as Evans Creek and West Fork Evans Creek is 350 feet. Approximately 50 acres of proposed small diameter thinning would occur within 300 feet of West Fork Evans Creek. There will be a buffer from ground disturbance from 60 to 100 feet of the creek for small diameter thinning projects. The potential disturbance within these 50 acres may affect individual animals, but is not expected to negatively affect the persistence of the species within the watershed. Although pond turtles have not been observed in the water sources (pump chances) within the Project Area, the proposed maintenance of 21 water sources may provide for future habitat for the species.

Oregon Vesper Sparrow—Like the grasshopper sparrow, the vesper sparrow nests on the ground in dry grasslands in the foothills of the Rogue Valley. They may be present adjacent to the southernmost project units. No management activities are proposed that would alter or remove their foraging or nesting habitat.

Peregrine Falcon—Cliffs occupied by peregrine falcons and used for nesting have been identified across the Butte Falls Resource Area. Potential nest sites have also been surveyed and only one has been found to be active in the proposed Project Area. Approximately 15 acres timber harvest is proposed 1.5 miles from the active nest site. Peregrines are not dependent upon forested habitat for nesting and would not be positively or negatively impacted by the proposed actions within the watershed. There would be no change in their ability to forage from the sky above the watershed.

Neotropical Migratory Bird Species of Conservation Concern and Game Birds below Desired Condition

Mourning Dove—Mourning doves forage on the seeds of grasses, herbaceous plants, and trees. They prefer nesting on the ground, but will also nest in trees. Mourning doves are well distributed throughout the Butte Falls Resource Area and have adapted to a wide variety of habitats, from forests to clearcuts, as well as agricultural to suburban areas. They are not found in densely forested sites and alpine areas. They are likely more prevalent along the agricultural areas and oak woodlands in the southern edge of the Project Area. Besides temporary noise disturbance, harvest activities are not anticipated to affect the mourning dove population in the watershed.

Survey and Manage Species

Great Gray Owl—The proposed actions would have no expected negative impacts on great gray owls because the two nest sites that were located during protocol surveys will be buffered and a seasonal restriction will be implemented during their nesting season. The proposed actions would not affect the ability of great gray owls to forage or nest in the watershed. If a new great gray owl nest is found while the projects are being implemented, PDFs will be applied to protect the nest from disturbance.

Red Tree Vole—Actions proposed in Alternatives 2, 3, and 4 are not expected to negatively affect the persistence of red tree voles in the Project Area because active nest trees located during protocol surveys will receive the required management buffers. Active red tree vole nests found in stands where potential habitat removal would occur will be buffered as prescribed in Management Recommendations for the Oregon Red Tree Vole Version 2.0. Active red tree vole habitat areas will also continue to provide potential prey for predatory species such as the northern spotted ow**Mollusks**—Protocol surveys for mollusks on 2,850 acres during the spring and fall seasons, where potential habitat disturbance may occur, detected no chace sideband, Siskiyou hesperian, or Oregon shoulderband snails. Potential habitat would remain within the Project Area to provide for future expansion of Survey and Manage and Bureau Sensitive mollusk species. Decadence components would remain in spotted owl NRF-maintained units; prescribed underburning would only occur in selected simplified, owl dispersal habitat; talus habitat would be retained; and hardwood stands would be treated to favor the retention of the large, old hardwoods.

Cumulative Effects

Suitable owl habitat removed in the last decade by BLM timber sales in the Evans Creek fifth field watershed (Home Run, Salty Bones, Cleveland Railroad, Anti Sypher, and Salt Air) was included in the analysis for consultation with the USFWS (U.S. Fish and Wildlife Service 2003). As thinned canopies continue to grow, some of these stands would return to suitable NRF habitat in the next decade. Approximately 2,400 acres of forested land (including 180 acres of the South Trail timber sale) was harvested since 1996 through a combination of commercial thin, density management, and selection harvest. Approximately 400 of those acres included removal of the overstory trees and 40 acres of regeneration harvest. BLM sales completed in the last 14 years in the Evans Creek fifth field watershed changed 505 acres of owl suitable habitat to unsuitable and downgraded 1,893 acres to dispersal. This change in habitat was included in the basin-wide update of the baseline situation.

Most private timber lands that are interspersed with land managed by the BLM would remain in early to mid-seral conditions as harvesting would likely continue on them. In accordance with State Forest Practices, private industrial lands are managed for timber production and harvested as trees reach 40 to 60 years of age. Private industrial timber lands within Evans Creek continue to be logged with very little NRF remaining.

Prescribed underburning to reduce fuels would occur on approximately 260 acres of small diameter thinning units and 127 acres of timber sale units. The units are currently rated as spotted owl dispersal habitat. The action would reduce the risk of stand-replacing forest fires slightly in 4 active owl home ranges and 2 inactive home ranges. In addition to the prescribed burning, the small diameter thinning treatments in dispersal habitat would reduce the risk of fire in 9 active owl home ranges and 5 inactive home ranges by removing small diameter trees and retaining large diameter trees.

3.6.4.2 Effects of Alternative 2 on Wildlife

Direct and Indirect Effects

Connectivity/Diversity Blocks

The actions proposed under Alternative 2 meet Medford District ROD/RMP requirements for retaining 25% late-successional forest in connectivity/diversity blocks. Late-successional stands reserved from harvest at this time that contribute to meeting late-successional habitat requirements include 100 acres in the known northern spotted owl activity centers. Structurally complex RA32 stands, which are also late-successional forest, would also be reserved from harvest at this time. Within connectivity blocks, Alternative 2 proposes commercial thinning on 180 acres of late-successional forest, selection harvest on 105 acres, and small diameter thinning on 140 acres of stands greater than 80 years of age. Table 3-16 shows the amount of late-successional forest following timber harvest and small diameter thinning.

Table 3-16. Connectivity/Diversity Block Habitat Assessment—Alternative 2

Location	Late-Successional Forest Preharvest		Late-Successional Forest Post-harvest (percent)
	Acres	Percent	
T33S, R2W, section 29	431	71	71
T33S, R3W, section 3	476	82	82
T33S, R3W, section 5	404	65	65
T33S, R3W, section 27	409	67	67
T34S, R3W, section 17	357	58	58

Special Status Wildlife Species

Federally Listed Species

Northern Spotted Owl—Alternative 2 meets Medford District ROD/RMP and Northwest Forest Plan requirements for management on matrix and riparian reserve lands. Under this alternative, 2,135 acres are proposed for timber harvest and 1,115 acres are proposed for small diameter thinning treatments. Of the 1,115 acres of small diameter thinning, 323 acres are proposed for harvest of hardwoods for firewood. Small diameter thinning units are comprised of 623 acres of dispersal habitat (type 2) and 492 acres of capable habitat (type 3). The special

forest products harvest proposed under this alternative will implement project design features and seasonal restrictions that would prevent these activities from downgrading or removing spotted owl habitat or disturbing owls during the nesting season. No actions are proposed in the designated 100-acre northern spotted owl activity centers or RA32 stands.

Density management and selection harvest would treat and maintain approximately 447 acres of NRF habitat in timber harvest stands. After harvest, these stands would have at least 60% canopy cover. Understory tree layers and existing snags and course woody debris would be retained.

Spotted owl habitat on 38 acres would be changed from NRF habitat to dispersal habitat. The proposed commercial thinning and selection harvest in NRF habitat would maintain at least 40% canopy cover so these stands could be used by dispersing spotted owls. Snags that do not have to be felled for safety reasons would be left in the stand and large coarse woody debris would also remain after the action.

Northern and southern GFMA harvest would remove 9 acres of NRF habitat and 258 acres of dispersal habitat. Northern GFMA harvest would maintain 6 to 8 trees per acre and southern GFMA harvest would retain 16 to 25 trees per acre. After harvest, these stands would have less than 40% canopy cover. Stands containing less than 40% canopy cover would no longer provide dispersal or nesting habitat because the stands would be too open. The remaining 1,930 acres of small diameter thinning and timber harvest in dispersal habitat would be commercially thinned and selection harvested, leaving 40% canopy and retaining characteristics that would allow owls to disperse through them.

The remaining 625 acres of proposed timber harvest and small diameter thinning are in habitat that does not currently meet conditions for use by spotted owls and would have no negative affect on spotted owls.

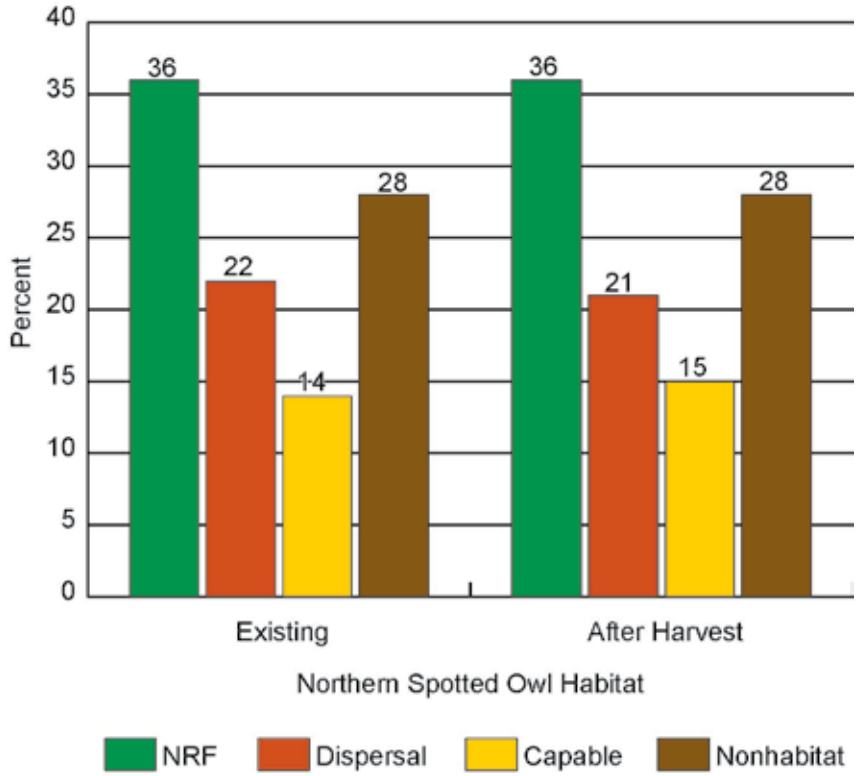
Following proposed harvest, the amount of dispersal habitat would decrease slightly in the Evans Creek fifth field watershed and capable habitat would increase slightly (Figure 3-5). Spotted owls can use NRF and dispersal habitat for dispersing through the landscape. Spotted owls can disperse across a fragmented mosaic of nonforest areas and a variety of forest age classes (Forsman, et al. 2002).

Timber harvest proposed in Alternative 2 may affect, is likely to adversely affect spotted owls because 258 acres of dispersal and 9 acres of NRF habitat would be removed and 38 acres of NRF habitat would be changed to dispersal habitat. The BLM will conduct protocol surveys in the Project Area following the 2011 NSO Survey Protocol before forest management activities begin. Through protocol surveys and review of historic information, active spotted owl home ranges have been identified across the Project Area. Spotted owl home ranges within the Klamath Province are defined as 1.3-mile radius circles from the site centers. Impacts to known spotted owls in the Project Area would be minimal because the 9 acres of NRF removed, 38 acres of NRF downgraded, and 258 acres of dispersal removed are outside active home ranges.

Bureau Sensitive Species

Fisher—About half the forested Federal land in the Evans Creek fifth field watershed is considered to be fisher habitat. The BLM administers 54,205 acres of forested acres in the

Figure 3-5. Alternative 2—Change in northern spotted owl habitat on BLM-administered land.



fifth field watershed; 45% of the BLM-administered land is late-successional forest. Late-successional forest generally has the features that fishers use: large overstory trees, hardwoods, high canopy, snags, and coarse woody debris. Stands that provide spotted owl NRF and dispersal habitat also provide fisher habitat. Stands that are not suitable spotted owl habitat may provide fisher habitat because fishers will forage in young stands with high canopies that may not be suitable spotted owl habitat.

Fishers have not been documented in the Project Area; however, fishers are highly mobile and could select a proposed harvest unit for a natal or maternal den. Fishers have been detected approximately 18 miles west, 20 miles east, and 15 miles south of the Project Area in different years. The Evans Creek watershed appears to be outside of the current range of fishers from the Southern Oregon Cascade and Siskiyou Mountains populations.

Alternative 2 proposes forest management on 3,250 acres. An array of stand ages and structures would remain after completion of the proposed actions. Fishers were found to avoid recent clearcuts and forested stands with less than 40% canopy cover (Aubry and Lewis 2003). An array of stand ages and structures would remain after completion of the proposed action. All snags that are not felled for safety reasons and existing large coarse woody debris would remain in the stands.

Under Alternative 2, northern and southern GFMA regeneration harvest on 267 acres would leave a residual canopy cover less than 40%. Fishers would likely not use these areas until the understory brush and small trees begin to grow and provide habitat in 5 to 10 years. Brush and forbs in the recovering regeneration harvest areas provide berries for quail and other birds and for small mammals (e.g., squirrels, skunks, rabbits, hares) that are part of the fisher's diet.

Proposed density management, commercial thinning, and small diameter thinning would maintain fisher constituent elements (e.g., canopy, snags, and large trees) within the stands and they could be used for denning, resting, and foraging. The unharvested acres would continue to provide denning, resting, and foraging in the fifth field watershed after the proposed action is completed. The Pacific Northwest Research Station study (Aubry and Raley 2006) showed that although 56% of fisher den locations were in unmanaged forests and 38% of the den locations were in managed forests, 12% of the den locations were in managed forest with more than 66% of the overstory trees removed. Younger forested acres, which retain some large overstory trees and dense canopy, also provide fisher habitat.

Noise disturbance from timber harvest and work activities would occur. Since fishers are highly mobile, however, they could move out of the area when the action is ongoing. A loss of habitat in the proposed regeneration harvest areas (267 acres) would occur but fishers have large home ranges and riparian reserves, 100-acre known northern spotted owl activity centers, and unharvested areas would be available to fishers in the Project Area.

Little information is available about the direct impact of logging with the associated noise and spur road construction on fishers. There is evidence that fishers avoid road areas (Harris and Ogan 1997), but they will cross roads in their territories. Alternative 2 would include 0.2 mile of permanent road construction and 16 miles of road decommissioning, resulting in a net loss in road miles. Temporary spur roads (5.5 miles) would be constructed and decommissioned after use.

The impacts from road construction are expected to be minimal, as fishers could move into another area when the disturbance occurs. The amount of road decommissioning versus road construction would lead to a net decrease in open roads. There is no evidence that road construction or use proposed in this alternative would reduce the persistence of fisher in the fifth field watershed because they could still move through the area and denning, resting, and foraging cover would still be available.

Slash removal is proposed in Alternative 2. In units where there are heavy concentrations of remaining stems and branches that have broken off as they are harvested, slash would be burned in place or piled and burned. Fishers occasionally forage in logging slash piles. Activity slash on 442 acres of timber harvest and small diameter thinning units would be underburned to reduce the risk of fire posed by leaving dead wood on the ground. In units with light concentrations of slash (less than 11 tons per acre), stems and branches would be cut, scattered, and left on the ground.

Impacts will be mitigated through retention of no-cut buffers in riparian reserves, owl activity centers, and RA32 habitat in the watershed. Approximately 24,296 acres (45% of forested land) of late- successional habitat on BLM-administered lands would remain after the proposed action. Canopy cover of 40% in the commercial thin, density management, and small diameter thinning areas, plus retention of snags and coarse wood, would maintain the forests for use by fishers for their daily activities. Younger stands 5- to 10-years-old that are recovering from past harvest actions would provide cover for travel and foraging between the older stands. Forest Service lands adjacent to the Project Area in the Evans Creek fifth field watershed also provide late-successional habitat for fisher denning, foraging, and resting.

Proposed actions are not expected to substantially affect denning or resting habitat. Because of the large home ranges, the removal of 267 acres of potential denning habitat would be negligible and would not affect the persistence of fishers in the local population and in the watershed.

Lewis' Woodpecker—Lewis' woodpeckers have been observed during the winter foraging in oak woodlands in the southeast portion of the Project Area, but they appear to be absent during the spring and summer. Very few have been found nesting in the Rogue Valley since 1975 (Marshall, Hunter and Contreras 2003). There are 11 acres of regeneration harvest of conifers proposed adjacent to the area where the woodpeckers have been observed overwintering. An additional 100 acres of conifers in the area would be thinned. While potential winter foraging would not be removed or altered, there may be short-term noise disturbance associated with harvest activities.

White-tailed Kite—White-tailed kites can be seen foraging in open fields, meadows, and agricultural lands throughout the Rogue Valley. They also may be present along the southern edge of the Project Area. They nest in trees adjacent to the fields they forage in. There are 20 acres of regeneration harvest proposed near meadows that may harbor potential nest opportunities; however, nesting kites are not tied to any specific size or species of trees. Potential nest trees would remain adjacent to harvest units and management activities under Alternative 2 would not affect the persistence of the species in the Rogue Valley.

Neotropical Migratory Bird Species of Conservation Concern and Game Birds below Desired Condition

Band-tailed Pigeon—Closed-canopy conifer, or mixed hardwood and conifer forests are the primary nesting habitat. Their nests are mainly in Douglas-fir, but they also will nest in hardwoods and shrubs within closed-canopy conifer, or mixed hardwood and conifer stands. Band-tailed pigeons build loosely constructed nests in the forks and horizontal branches or near the trunk of conifer or oak trees (Erlich, Dobkin and Wheye 1988), and visit mineral springs at least once per week while nesting (Marshall, Hunter and Contreras 2003). The project wildlife biologist observed band-tailed pigeons foraging next to a road in the Evans Creek fifth field watershed in 2010. They may also be nesting within the Project Area. Under Alternative 2, foraging habitat would not be lost, but the 267 acres of regeneration harvest would degrade potential nesting habitat until the mixed-conifer stands grow back.

Olive-sided Flycatcher—Olive-sided flycatchers are Neotropical migratory birds associated with large green trees within early-successional forests. They use coniferous woodlands, burns, and clearings. Retention of large trees increases structural variety within the developing forest and may provide habitat for species such as the olive-sided flycatcher that are associated with late-successional forest structure within early-successional habitat (Rich, et al. 2004). They are often encountered on the Butte Falls Resource Area and occur in coniferous forests where they use tall trees and snags for nesting and foraging. There also is evidence that olive-sided flycatchers respond positively to burned landscapes following wildfires (Smucker, Hutto and Steele 2005) (Hutto and Gallo 2006). The 442 acres of prescribed burning and 1,115 acres of small diameter thinning would have a positive effect on the species by retaining larger trees and snags and creating a more open understory for foraging. The 267 acres of regeneration harvest would remove some potential nest trees, but the harvested stands could still be used for foraging.

Purple Finch—A bird species that may benefit from forest thinning and fuels reduction treatments, the purple finch breeds in open, mixed conifer-hardwood forests, riparian corridors, edge habitat, and vigorously regenerating clearcuts (Marshall, Hunter and Contreras 2003). Post-breeding, purple finches can also be found in meadows, brush fields, and riparian vegetation, while choosing a wide variety of habitats during the winter, from woodlands to residential areas. Diet primarily consists of vegetative items such as berries, buds, and seeds. Under Alternative 2, the regeneration harvest units may degrade nesting and foraging habitat in the short term, but as new vegetation returns, there would be new opportunities for foraging. Proposed small diameter thinning and density management are not anticipated to have a negative effect on the species.

Rufous Hummingbird—With a preference shown toward wooded areas with a developed understory of deciduous shrubs or trees with low branches for nesting, rufous hummingbirds likely breed in portions of the Project Area. Not all proposed harvest units currently provide ideal nesting and foraging habitat for these hummingbirds, but some locations may be affected until shrub and flowering vegetation returns after harvest. The 9 acres of spotted owl NRF habitat removed during timber harvest may downgrade potential hummingbird habitat for a few years after harvest. While they are not tied specifically to spotted owl NRF habitat, the 440 acres of NRF maintained habitat would continue to provide nesting and foraging opportunities for the hummingbirds. There are approximately 2,100 acres of spotted owl dispersal habitat proposed to be treated through thinning, harvest, and small diameter thinning prescriptions. Harvest of those acres is not anticipated to have a negative effect on the hummingbird population. After a few years following harvest, those more open units would begin to fill in with understory vegetation and provide additional habitat for this species.

Willow Flycatcher—Closely associated with shrub-dominated communities during nesting and migration, willow flycatchers almost exclusively use riparian habitat in southwest Oregon (Marshall, Hunter and Contreras 2003). They nest within a few feet of the ground, typically in shrub vegetation. In conifer-dominated landscapes, such as is found within the Project Area, they prefer nesting in areas 4 to 15 years following a harvest that removed most of the canopy cover and there is a vigorous regeneration of shrubs. Under Alternative 2, riparian areas will be buffered, continuing to provide nesting and foraging habitat for this species. Regeneration harvest units near riparian zones may provide additional nesting habitat during the early successional phase following harvest. There may be temporary noise disturbance during harvest operations, but there is not expected to be a negative effect on the ability of the flycatchers to persist in the watershed.

Big Game Winter Range and Elk Management Area

No new road construction is proposed on lands designated in the 1995 ROD/RMP as Big Game Winter Range and Elk Management Area. There are 1.5 miles of existing roads within the Management Area that would be used for hauling logs. The roads are currently closed to the public and will remain closed following harvest. There will be 46 acres of density management thinning and 16 acres of southern GFMA regeneration harvest in the area under Alternative 2. The harvested trees would be moved out of the units using a helicopter. Deer and elk would likely move away from the action area during harvest.

New vegetation for browsing is expected to increase for a few years following harvest, most dramatically in the acres of regeneration harvest. Deer and elk are likely to take advantage of the new foraging opportunities for three or four years as new growth returns (Skovlin, Bryant and Edgerton 1989). Adjacent mixed-conifer and hardwood stands of trees would continue to provide cover for the herds. As the harvested areas begin to mature, foraging use would return to preharvest levels.

Cumulative Effects

See also section 3.6.4.1 Effects of Alternative 1 (No Action) on Wildlife, Cumulative Effects.

There are 14 known spotted owl sites that have been unoccupied for the past 5 years or more, whose home ranges overlap proposed project units. Only 4 of those unoccupied sites had confirmed nesting pairs of owls. The others had detections of either single or nonbreeding pairs of owls in the past. It is not known for certain why those sites have become unoccupied. Each of the owl sites is a combination of private and public lands. A combination of forest fires, timber harvest on private and BLM, and the spread of barred owls has occurred in the watershed.

Barred owls have been detected within the Evans Creek fifth field watershed during spotted owl surveys. Their total numbers in the area are unknown, however. The range of the barred owl does completely overlap that of the northern spotted owl. Barred owls may take advantage of spotted owl habitat disturbance (Courtney, et al. 2004), although it is unclear how the proposed action would affect barred owl presence in the watershed. Even though barred owls are rapidly expanding their range in North America, Courtney, et al. (2004) concluded that "habitat loss to timber harvest is often postulated to be a major factor in spotted owl decline, but habitat is still present in the study areas (indeed some areas where spotted owls are in the worst decline, such as Olympic National Park, have never been harvested)."

There are varied opinions among biologists concerning the possible negative effects barred owls may have on spotted owls. Several authors have addressed the effects of barred owls on spotted owl occupancy, persistence, and reproductive success (Courtney, et al. 2004). The report by Courtney et al. indicated studies on the Olympic Peninsula in Washington found no difference in the reproductive success of spotted owls with and without the presence of barred owls within 1.5 miles of spotted owl activity centers. Other modeling studies, however, found that the presence of barred owls was negatively correlated with spotted owl presence in Coastal Oregon (Weins, et al. 2007). While neither study was able to conclusively determine effects, Courtney, et al. concluded that further study of the demographic consequences of barred owl presence or competition is needed.

The updated methodology presented in the *2011 Protocol for Surveying Proposed Management Activities that May Impact Northern Spotted Owls* (2011 NSO Survey Protocol) is meant to increase the likelihood of detecting the presence of spotted owls in areas where there may be barred owls. Biologists with the BLM will survey NRF habitat where spotted owl occupancy in the Project Area is unknown in accordance with current protocol standards and will minimize habitat disturbance within active home ranges. Additionally, Recovery Action 32 in the Draft 2010 Recovery Plan is meant to provide refugia for spotted owls from barred owls. Stands that were identified as RA32 habitat would be preserved, decreasing the competition between

barred and spotted owls for shared resources. Approximately 1,100 acres that were originally proposed for harvest were identified as highly suitable, structurally complex forest and dropped from consideration. The RA32 stands would contribute to maintaining forest with large diameter trees with high amounts of canopy cover and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees (Figure 3-6).

Cumulative effects to the current spotted owl population are anticipated to be minimal, as removal or downgrade of dispersal and NRF habitat would not occur within active home ranges. Late-successional forest and RA32 habitat would remain post-harvest, allowing opportunities for future dispersal and nesting. Additionally, 100-acre spotted owl activity centers make up 3,500 acres of suitable habitat within the Evans Creek fifth field watershed. Expansion of the owl population, however, would be slowed in the 267 acres of regeneration harvest for up to 80 years as suitable habitat begins to return.

Historical and future timber harvests cumulatively affect wildlife. The lands being analyzed for commercial harvest are matrix and riparian reserve allocations and all alternative proposals fall within the goals and guidelines of the Medford ROD/RMP and Northwest Forest Plan. Continued harvest in matrix lands would continue.

Within the BLM-administered lands in the Evans Creek fifth field watershed, 54,205 acres are forested; 24,608 acres are classified as late-successional forest (80 years old or more). The ROD/RMP and Northwest Forest Plan require that 15% of fifth field watersheds retain late-successional forests conditions. Currently, 45% of the 54,205 acres of BLM-administered forested land in the Evans Creek fifth field watershed is late-successional forest. Alternative 2 would reduce the late-successional forest by 267 acres, leaving the fifth field watershed with approximately 45% in late-successional condition.

Fisher could be using timber sale units, but they also forage in clearcuts. No habitat management guidelines have been established for fisher, relative to how much of what stand characteristics should be maintained. Patches of older seral habitat would remain near the project within riparian management zones and spotted owl cores, and would provide ample corridors of cover for dispersal. Surveys for the highly mobile species are not practical on a harvest unit basis.

Photo by Dave Roelofs

Figure 3-6. Example of the 1,100 acres of RA32 habitat identified and retained in the Project Area. Stand contains large-diameter overstory trees, 3 tree layers, large coarse woody material, and large snags.

Impacts of the action alternatives on fishers are predicted to be low, since a patchwork mosaic of stand types and ages would remain and fishers have not been detected in the Project Area. Most coarse down wood and snags, except for those that present a safety hazard or are in new operator road spurs, would be maintained. Areas of closed canopy would remain in each section. The Northwest Forest Plan was designed with a network of reserves of late-successional forests surrounded by younger, managed forests. Although the Northwest Forest Plan may provide suitable habitat that is well-distributed on Federal lands, fisher populations may never respond and be well-distributed because of (1) their apparently low rates of recolonization of restored habitats after local extirpation, (2) the lower amount of Federal land at lower elevations, and (3) their natural rareness (Forest Service and Bureau of Land Management 1994, Appendix J2-470).

3.6.4.3 Effects of Alternative 3 on Wildlife

Direct and Indirect Effects

Connectivity/Diversity Blocks

The proposed actions under Alternative 3 meet Medford District ROD/RMP requirements for retaining 25% late-successional forest in connectivity/diversity blocks. Late-successional stands reserved from harvest at this time that contribute to meeting late-successional habitat requirements include 100-acre known northern spotted owl activity centers. Structurally complex RA32 stands, which are also late-successional forest, would also be reserved from harvest at this time. Within connectivity/diversity blocks, Alternative 3 proposes dry forest management on 284 acres and small diameter thinning in stands greater than 80 years of age on 76 acres. Dry forest management and small diameter thinning would retain the 80-year stand age. Table 3-17 shows percentage late-successional forest following harvest and small diameter thinning.

Table 3-17. Connectivity/Diversity Block Habitat Assessment—Alternative 3

Location	Late-Successional Forest Preharvest		Late-Successional Forest Post-harvest
	Acres	Percent	
T33S, R2W, section 29	431	71	71
T33S, R3W, section 3	476	82	82
T33S, R3W, section 5	404	65	65
T33S, R3W, section 27	409	67	67
T34S, R3W, section 17	357	58	58

Special Status Wildlife Species

Federally Listed Species

Northern Spotted Owl—Under Alternative 3, dry forest management would retain all trees 150 years and older, while also favoring tree species diversity and older hardwood trees. Under this alternative, 2,167 acres are proposed for timber harvest and 1,115 acres are proposed for small diameter thinning treatments. Of the 1,115 acres of small diameter thinning, 323 acres are proposed for harvest of hardwoods for firewood. Small diameter thinning units are comprised of 623 acres of dispersal habitat (type 2) and 492 acres of capable habitat (type 3). The harvest of special forest products is also being proposed under this

alternative; however, the project design features and seasonal restrictions would be followed to prevent these activities from downgrading or removing spotted owl habitat and from disturbing owls during the nesting season. No actions are proposed in the 100-acre known northern spotted owl activity centers or RA32 stands.

In timber harvest stands, approximately 440 acres of NRF would be treated and maintained. After harvest, these stands would have at least 60% canopy cover. Understory tree layers and existing snags and course woody debris would be retained.

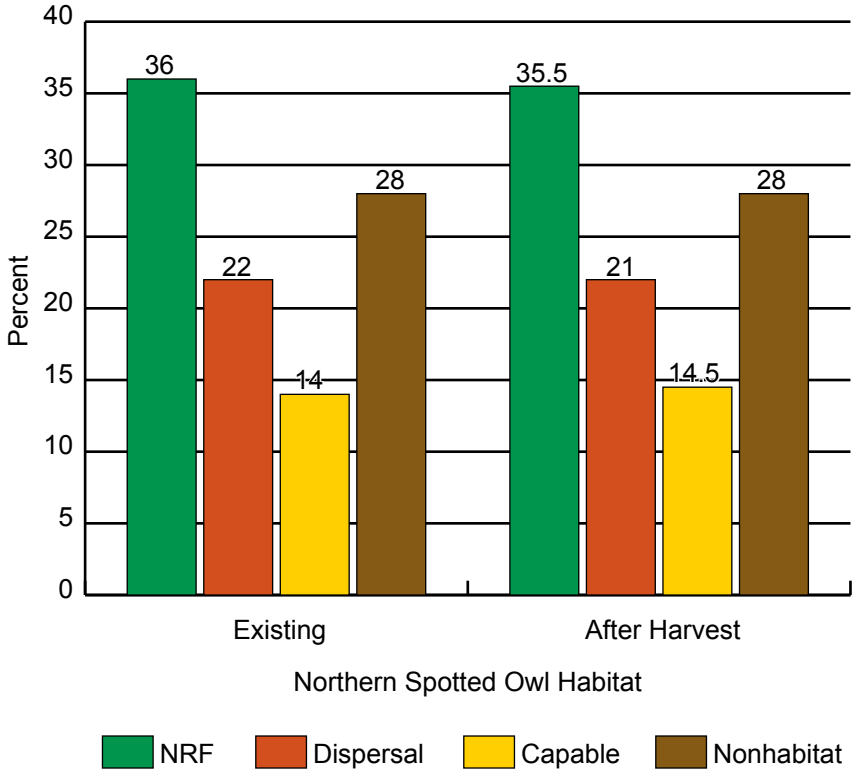
Spotted owl habitat on 55 acres would be changed from NRF habitat to dispersal habitat. The proposed dry forest management in NRF habitat would maintain at least 40% canopy cover and these stands could be used by dispersing spotted owls. Snags that do not have to be felled for safety reasons and large coarse woody debris would remain after the action.

The 2,160 acres of dry forest management, selection harvest, and small diameter thinning in dispersal habitat would leave 40% canopy and would retain the characteristics that allow owls to disperse through them.

The remaining acres of proposed timber harvest are in habitat capable of becoming dispersal or NRF.

Following proposed harvest, the amount of dispersal only habitat would increase and the amount of NRF would decrease slightly, although there would be no noticeable percentage change across the watershed (Figure 3-7). Spotted owls can use NRF and dispersal habitat for dispersing through the landscape. Spotted owls can disperse across a fragmented mosaic of nonforested areas and a variety of forest age classes (Forsman, et al. 2002).

Figure 3-7. Change in northern spotted owl habitat on BLM-administered lands in Alternative 3.

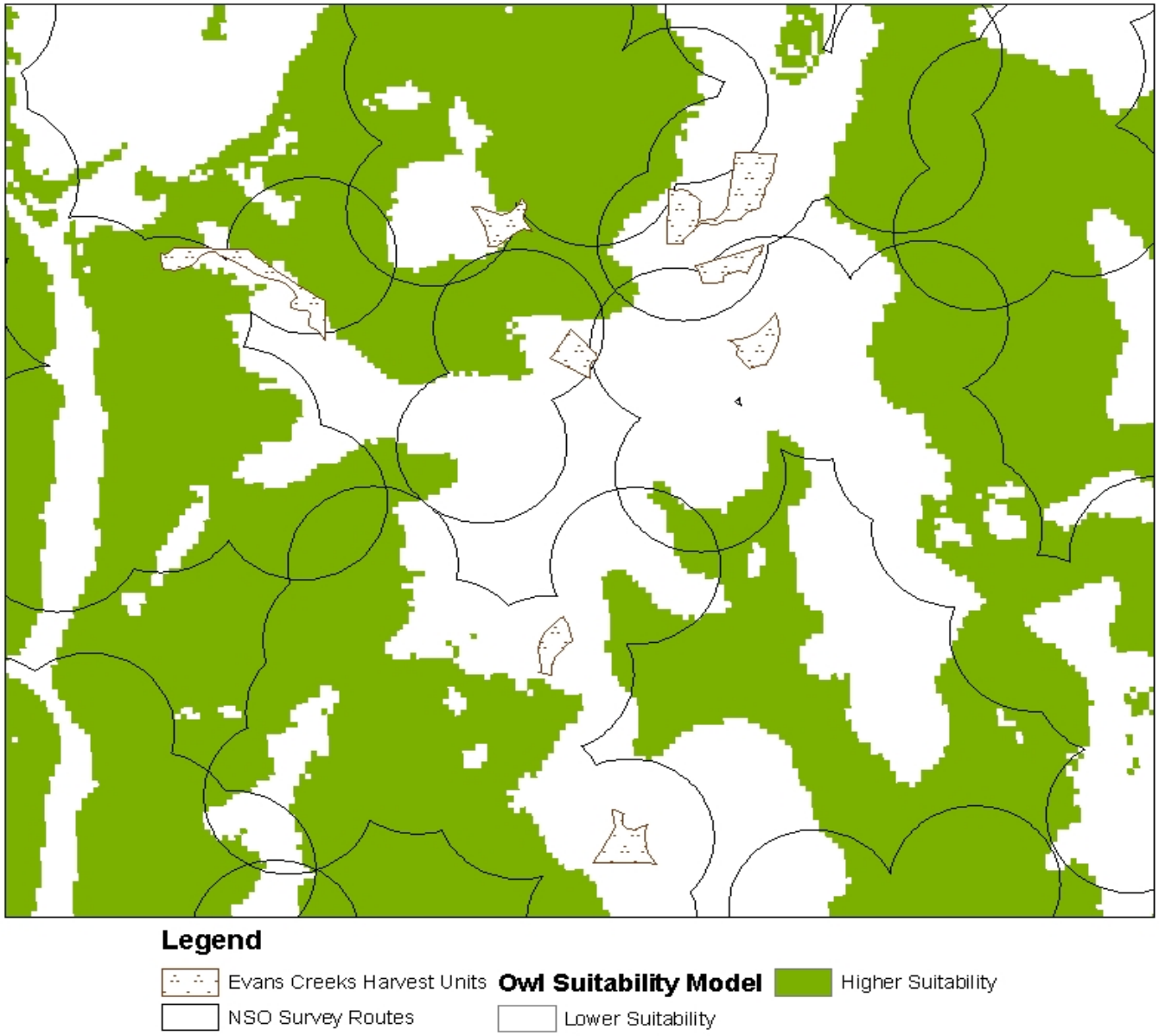


Proposed timber harvest in Alternative 3 may affect, is likely to adversely affect spotted owls because 55 acres of NRF habitat would be changed to dispersal habitat. None of the 55 acres of the NRF that would be changed to dispersal are located within active spotted owl home ranges. The BLM will conduct protocol surveys in the Project Area following the 2011 NSO Survey Protocol before forest management activities begin. Through protocol surveys and review of historic information, active spotted owl home ranges have been identified across the Project Area.

During the planning stages for Alternative 3, the BLM used the MaxEnt Model that was introduced in the *Draft 2010 Northern Spotted Owl Recovery Plan*, Appendix C. The model was used to identify areas of higher suitable versus lower suitable owl habitat. Variables considered during the formation of the MaxEnt model included tree species composition, habitat fragmentation, topography, elevation, climate, and data from thousands of telemetry points across the owl's range (U.S. Fish and Wildlife Service 2010, 118).

Downgrade of NRF habitat would occur in areas of lower suitability as displayed by the MaxEnt model. The areas will be surveyed to confirm there are no nesting owls in the project units. The diagram in Figure 3-8 displays NRF and dispersal units in low suitability and the owl survey coverage.

Figure 3-8. Northern spotted owl habitat suitability with Evans Creek harvest units.



Bureau Sensitive Species

Fisher—Effects to fishers under Alternative 3 would be similar as described in the effects under Alternative 2 except no regeneration harvest would occur and trees 150 years or older would be retained. Therefore, proposed harvest under Alternative 3 would have less disturbance to fisher habitat than Alternative 2.

Alternative 3 proposes forest management on 3,282 acres and includes dry forest management, small diameter thinning, firewood collection, and progeny test site thinning. An array of stand ages and structures would remain after completion of the proposed action. All snags that do not need to be felled for safety reasons or for temporary road construction and existing large coarse woody debris would remain in the stands.

Proposed dry forest management and small diameter thinning would maintain fisher constituent elements (e.g., canopy, snags, and large trees) within the stands and they could be used for denning, resting, and foraging. Trees 150 years or older would be retained and provide for potential den sites. The unharvested acres would continue to provide denning, resting, and foraging in the fifth field watershed after the proposed action is completed.

Noise disturbance from timber harvest and work activities would occur. Since fishers are highly mobile, they could move out of the area when the actions are occurring.

Alternative 3 would include 0.2 mile of permanent road construction and 16 mile of road decommissioning, resulting in a net loss in road miles. Temporary spur roads (6 miles) would be constructed and decommissioned after use. The impacts from new road construction are expected to be minimal, as fishers could move into another area when the disturbance occurs. The amount of road decommissioning versus road construction would lead to a net decrease in open roads.

Slash removal is proposed in Alternative 3. In units where there are heavy concentrations of remaining stems and branches that have broken off as they are harvested, slash would be burned in place or piled and burned. Fishers occasionally forage in logging slash piles. Activity slash on 442 acres of dry forest management and small diameter thinning are proposed for underburning to reduce the risk of fire posed by leaving dead wood on the ground. In units with light concentrations of slash (less than 11 tons per acre), stems and branches would be cut, scattered, and left on the ground.

Impacts will be mitigated through retention of no-cut buffers in riparian reserves, owl activity centers, and RA 2 habitat in the watershed. Approximately 24,563 acres (45% of forested land) of late- successional habitat on BLM-administered lands would remain after timber harvest. Dry forest management retaining 40% and 60% canopy cover and small diameter thinning, plus retention of snags and coarse wood, would maintain the forests for use by fishers for their daily activities. Younger stands 5- to 10-years-old that are recovering from past harvest actions would provide cover for travel and foraging between the older stands. Forest Service lands adjacent to the Project Area in the Evans Creek fifth field watershed also provide late-successional habitat for fisher denning, foraging, and resting.

Management actions proposed under Alternative 3 are not expected to substantially affect denning or resting habitat and would not reduce the persistence of fishers in the watershed.

Lewis' Woodpecker—Disturbance to winter foraging habitat would be less than would occur under Alternative 2. There are 148 acres of dry forest management proposed adjacent to the area where the woodpeckers have been observed overwintering. Trees would be thinned to retain at least 40% canopy cover, large hardwood trees, and older conifers. While potential winter foraging habitat would be retained, there may be short-term noise disturbance associated with harvest activities.

White-tailed Kite—White-tailed kites can be seen foraging in open fields, meadows, and agricultural lands throughout the Rogue Valley. They may also be present along the southern edge of the Project Area. They nest in trees adjacent to the fields they forage in. There are 20 acres of dry forest management proposed near meadows that may harbor potential nest opportunities. Potential nest trees would remain following harvest and persistence of the species would continue in the Project Area.

Neotropical Migratory Bird Species of Conservation Concern and Game Birds below Desired Condition

Band-tailed Pigeon—The project wildlife biologist observed band-tailed pigeons foraging next to a road in the Evans Creek fifth field watershed in 2010. They may also be nesting within the Project Area. Under Alternative 3, foraging and nesting habitat would not be lost; dry forest management and small diameter thinning would retain potential nest trees in large, older conifers. Short-term noise disturbance may occur during harvest, but the species is expected to persist in the watershed.

Olive-sided Flycatcher—They are often encountered on the Butte Falls Resource Area and occur in coniferous forests where they use tall trees and snags for nesting and foraging. There also is evidence that olive-sided flycatchers respond positively to burned landscapes following wildfires (Smucker, Hutto and Steele 2005) (Hutto and Gallo 2006). The 3,282 acres of dry forest management and small diameter thinning would have a positive effect on the species by creating a more open understory for foraging and retaining larger trees and snags.

Purple Finch—A bird species that may benefit from forest thinning and fuels reduction treatments, the purple finch breeds in open, mixed conifer-hardwood forests, riparian corridors, edge habitat, and vigorously regenerating clearcuts (Marshall, Hunter and Contreras 2003). Dry forest management and small diameter thinning are not anticipated to have a negative effect on the species.

Rufous Hummingbird—With a preference shown towards wooded areas with a developed understory of deciduous shrubs or trees with low branches for nesting, rufous hummingbirds likely breed in portions of the Project Area. While they are not tied specifically to spotted owl NRF habitat, the 440 acres of NRF-maintained habitat would continue to provide nesting and foraging opportunities for the hummingbirds. Approximately 2,160 acres of spotted owl dispersal habitat are proposed for dry forest management and small diameter thinning. Those areas were identified as dispersal because they lacked certain components like understory vegetation, large woody material on the ground, and 60% or more canopy cover. Harvest of those acres is not anticipated to have a negative effect on the hummingbird population. A few years following harvest, those more open units would begin to fill in with understory vegetation and provide additional habitat for this species.

Willow Flycatcher—Closely associated with shrub-dominated communities during nesting and migration, willow flycatchers almost exclusively use riparian habitat in southwest Oregon (Marshall, Hunter and Contreras 2003). They nest within a few feet of the ground, typically in shrub vegetation. In conifer-dominated landscapes, such as is found within the Project Area, they prefer nesting in areas 4 to 15 years following a harvest that removed most of the canopy cover and has a vigorous regeneration of shrubs. Under Alternative 3, riparian areas will be buffered, continuing to provide nesting and foraging habitat for this species. There may be temporary noise disturbance during harvest operations, but there is not expected to be a negative effect on the ability of the flycatchers to persist in the watershed.

Big Game Winter Range and Elk Management Area

No new road construction is proposed on Big Game Winter Range and Elk Management Area lands. There are 1.5 miles of existing roads within the Management Area that would be used for hauling logs. The roads are currently closed to the public and would remain closed following harvest. There would be 62 acres of dry forest management in the area under Alternative 3. The harvested trees would be moved out of the units using a helicopter. Deer and elk would likely move away from the action area during harvest. Little or no change to foraging opportunities is anticipated.

Cumulative Effects

The effects considered by the threat of the barred owl invasion in Alternative 2 also apply for Alternative 3.

Cumulative effects of the proposed harvest actions to the overall spotted owl population in the Project Area are anticipated to be low. Approximately 45 acres of NRF habitat would be downgraded to dispersal habitat inside an active owl home range where a single male has been detected several different times over the past eight years. Surveys were conducted at the site every year between 1990 and 2010. The last year a pair of owls was located at the site was in 1999 and the last year owls were confirmed breeding at the site was in 1992. Downgrade of NRF habitat would occur in the outer third of the home range. Currently, the NRF habitat within the home range is estimated to be 65%. Following timber harvest, remaining NRF habitat would be approximately 64%. Approximately five acres of NRF habitat would be downgraded to dispersal in the outer third of two overlapping active owl home ranges. One site has been a productive breeding site since its discovery in 1990. Currently, the NRF habitat within the home range is estimated to be 49%. Following harvest, remaining NRF habitat would be approximately 49%. The second owl site was discovered during protocol surveys in 2010. It contained a nonbreeding pair of owls. The NRF habitat within that home range is estimated to be 39%. Post-harvest, there would be approximately 39% NRF habitat remaining. No harvest would occur within 300 meters of any new owl nest and a seasonal restriction of 0.25 mile would be implemented if the owls are nesting. Nesting status would be determined before harvest activities began.

Late-successional forest and RA 32 habitat will remain post-harvest, allowing opportunities for future dispersal and nesting. Additionally, spotted owl 100-acre activity centers make up 3,500 acres of suitable habitat within the Evans Creek fifth field watershed.

Historical and future timber harvests cumulatively affect wildlife. The lands being analyzed for commercial harvest are matrix and riparian reserve allocations and all alternative proposals fall within the goals and guidelines of the Medford ROD/RMP and Northwest Forest Plan. Continued harvest in matrix lands would continue.

Within the BLM-administered lands in the Evans Creek fifth field watershed, 54,205 acres are forested; 24,608 acres are classified as late-successional forest (80 years old or more). The ROD/RMP and Northwest Forest Plan require that 15% of fifth field watersheds retain late-successional forests conditions. Currently, 45% of the 54,205 acres of BLM-administered forested land in the Evans Creek fifth field watershed is late-successional forest. Alternative 3 would not reduce the late-successional forest within the Project Area. Stand ages would be maintained at 80 years or older.

Fisher could be using timber harvest units, but they also forage in clearcuts. No habitat management guidelines have been established for fisher, relative to how much of what stand character units should be maintained. Patches of older seral habitat will remain near the project within riparian management zones and spotted owl cores that will provide ample corridors of cover for dispersal. Surveys for the highly mobile species are not practical on a timber harvest unit basis.

Impacts of the action alternatives on fishers are predicted to be low, since a patchwork mosaic of stand types and ages would remain and fishers have not been detected in the Project Area. Most coarse down wood and snags, except for those that present a safety hazard or are in new operator road spurs, would be maintained. Areas of closed canopy would remain in each section. The Northwest Forest Plan was designed with a network of reserves of late-successional forests surrounded by younger, managed forests. Although the Northwest Forest Plan may provide suitable habitat that is well-distributed on Federal lands, fisher populations may never respond and be well-distributed because of (1) their apparently low rates of recolonization of restored habitats after local extirpation, (2) the lower amount of Federal land at lower elevations, and (3) their natural rareness (Forest Service and Bureau of Land Management 1994, Appendix J2-470).

3.6.4.4 Effects of Alternative 4 on Wildlife

Direct and Indirect Effects

Connectivity/Diversity Blocks

The proposed actions under Alternative 4 meet Medford District ROD/RMP requirements for retaining 25% late-successional forest in connectivity/diversity blocks. Late-successional stands reserved from harvest at this time that contribute to meeting late-successional habitat requirements include 100 acres in the known northern spotted owl activity centers. Structurally complex RA32 stands, which are also late-successional forest, would also be reserved from harvest at this time. Within Connectivity Blocks, Alternative 4 proposes density management thinning on approximately 155 acres, selection harvest on 105 acres, and small diameter thinning on 140 acres of stands greater than 80 years of age. Stand ages of 80 years or older would be maintained in Alternative 4. Table 3-18 shows percentage late-successional forest following density management, selection harvest, and small diameter thinning.

Table 3-18. Connectivity/Diversity Block Habitat Assessment—Alternative 4

Location	Late-Successional Forest Preharvest		Late-Successional Forest Post-harvest Percent
	Acres	Percent	
T33S, R2W, section 29	431	71	71
T33S, R3W, section 3	476	82	82
T33S, R3W, section 5	404	65	65
T33S, R3W, section 27	409	67	67
T34S, R3W, section 17	357	58	58

Special Status Wildlife Species

Federally Listed Species

Northern Spotted Owl—Timber harvest proposed in Alternative 4 meets Medford District ROD/RMP and Northwest Forest Plan requirements for management on matrix and riparian reserve lands. Under this alternative, 2,076 acres are proposed for timber harvest and 1,115 acres are proposed for small diameter thinning treatments. Of the 1,115 acres of small diameter thinning, 323 acres are proposed for hardwood management. Small diameter thinning units are comprised of 623 acres of dispersal habitat (type 2) and 492 of capable habitat (type 3). The harvest of special forest products is also being proposed under this alternative. Project design features and seasonal restrictions will prevent these activities from downgrading or removing spotted owl habitat and from disturbing owls during the nesting season. No actions are proposed in the 100-acre designated northern spotted owl activity centers or RA32 stands.

Density management and selection harvest would treat and maintain approximately 480 acres of NRF habitat in timber harvest stands. After harvest, these stands would have at least 60% canopy cover. Understory tree layers and existing snags and course woody debris would be retained.

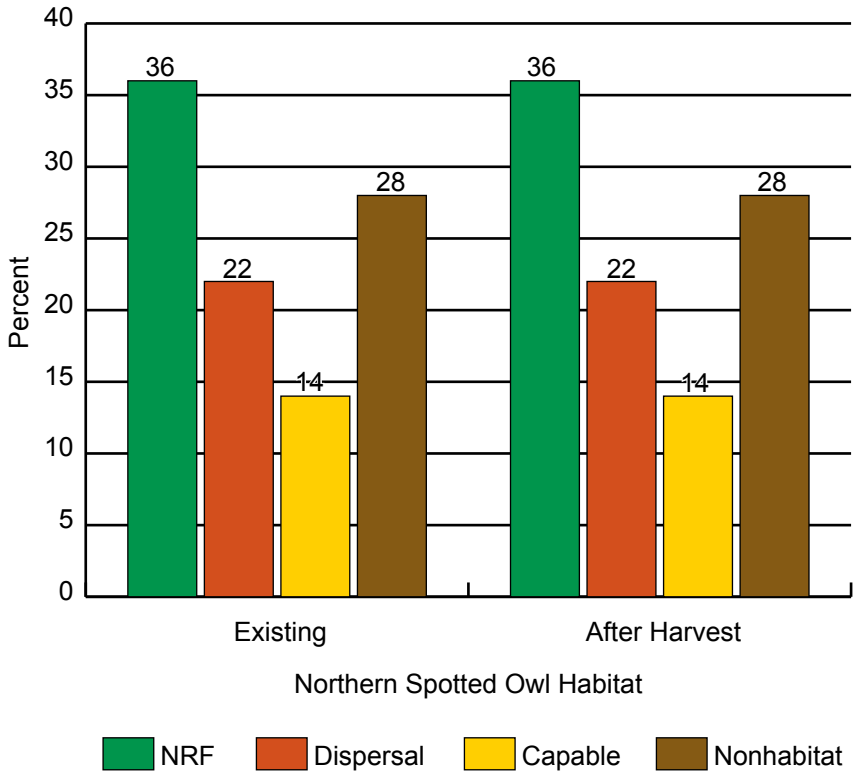
The 2,115 acres of timber harvest and small diameter thinning providing dispersal habitat would be leave 40% canopy cover and would retain the characteristics that would allow owls to disperse through them.

The remaining acres of proposed harvest and thinning are in habitat capable of becoming dispersal or NRF.

Following the proposed timber harvest and small diameter thinning prescriptions, there would be no change in percentage NRF and dispersal habitat after implementation (Figure 3-9).

Actions proposed in Alternative 4 may affect, is not likely to adversely affect spotted owls because all NRF and dispersal habitat in timber sale units would be treated and maintained. The BLM will conduct protocol surveys in the Project Area following the 2011 NSO Survey Protocol before forest management activities begin. Through protocol surveys and review of historic information, active spotted owl home ranges have been identified across the Project Area. Impacts to known spotted owls, and to future expansion of spotted owls into the Project Area, would be minimal because NRF and dispersal conditions would be maintained under Alternative 4.

Figure 3-9. Change in northern spotted owl habitat on BLM-administered lands in Alternative 4.



Bureau Sensitive Species

Fisher—Under Alternative 4, timber harvest and small diameter thinning treatments would not have a negative effect on potential fisher habitat.

Alternative 4 proposes forest management on 3,191 acres and includes density management, selection harvest, small diameter thinning, hardwood management, and progeny test site thinning. An array of stand ages and structures would remain after completion of the proposed action. All snags not felled for safety reasons or temporary road construction, and existing large coarse woody debris would remain in the stands.

Proposed density management, selection harvest, and small diameter thinning would maintain fisher constituent elements (e.g., canopy, snags, and large trees) within the stands and they could be used for denning, resting, and foraging. Canopy cover in stands would be maintained at 40 or 60%. The Evans Creek fifth field watershed would continue to provide potential denning, resting, and foraging habitat if fishers expand their range into the Project Area.

Noise disturbance from timber harvest and work activities would occur. Since fishers are highly mobile, however, they could move out of the area when the action is ongoing.

Alternative 4 would include 0.2 mile of permanent road construction and 16 miles of road decommissioning, resulting in a net loss in road miles. Temporary spur roads (5.5 miles) would be constructed and decommissioned after use. The impacts from new road construction are expected to be minimal, as fishers could move into another area when the disturbance

occurs. The amount of road decommissioning versus road construction would lead to a net decrease in open roads.

Slash removal is proposed in Alternative 4. In units where there are heavy concentrations of remaining stems and branches that have broken off as they are harvested, slash will be burned either in place or piled and burned. Fishers occasionally forage in logging slash piles. Approximately 442 acres of timber harvest and small diameter thinning units are proposed for underburning to reduce the risk of fire posed by leaving dead wood on the ground. In units with light concentrations of slash (less than 11 tons per acre), stems and branches would be cut, scattered, and left on the ground.

Impacts will be mitigated through retention of no-cut buffers in riparian reserves, owl activity centers, and RA32 habitat. Approximately 24,563 acres (45% of forested land) of late-successional habitat on BLM-administered lands would remain after the proposed action. Canopy cover of 40% and 60% in timber harvest and small diameter thinning areas, plus retention of snags and coarse wood, would maintain the forests for use by fishers for their daily activities. Younger stands 5- to 10-years-old that are recovering from past harvest actions would provide cover for travel and foraging between the older stands. Forest Service lands adjacent to the Project Area in the Evans Creek fifth field watershed also provide late-successional habitat for fisher denning, foraging, and resting.

The Proposed Action is not expected to substantially affect denning or resting habitat. The proposed action would not reduce the persistence of fishers in the watershed.

Lewis' Woodpecker—Disturbance to winter foraging habitat would be less than proposed under Alternative 2. There are 148 acres of density management and selection harvest proposed adjacent to the area where the woodpeckers have been observed overwintering. Trees would be thinned to maintain at least 40% canopy cover. While potential winter foraging habitat would be retained, there may be short-term noise disturbance associated with harvest activities.

White-tailed Kite—White-tailed kites can be seen foraging in open fields, meadows, and agricultural lands throughout the Rogue Valley. They also may be present along the southern edge of the Project Area. They nest in trees adjacent to the fields they forage in. No harvest is proposed adjacent to possible meadows or agricultural areas near the southern portion of the Project Area. Potential nest trees would remain following harvest and persistence of the species would continue in the Rogue Valley.

Neotropical Migratory Bird Species of Conservation Concern and Game Birds below Desired Condition

Band-tailed Pigeon—The project wildlife biologist observed band-tailed pigeons foraging next to a road in the Evans Creek fifth field watershed in 2010. They may also be nesting within the Project Area. Under Alternative 4, foraging and nesting habitat would not be lost; timber harvest and small diameter thinning treatments would retain potential nest trees in large, older conifers. Short-term noise disturbance may occur during harvest, but the species is expected to persist in the watershed.

Olive-sided Flycatcher—They are often encountered on the Butte Falls Resource Area and occur in coniferous forests where they use tall trees and snags for nesting and foraging. There is evidence that olive-sided flycatchers respond positively to burned landscapes following wildfires (Smucker, Hutto and Steele 2005) (Hutto and Gallo 2006). The proposed underburning treatments following harvest may have a positive effect for the species. There may be temporary noise disturbance during harvest activities, but existing nesting and foraging habitat would be retained.

Purple Finch—A bird species that may benefit from forest thinning and fuels reduction treatments, the purple finch breeds in open, mixed conifer-hardwood forests, riparian corridors, edge habitat, and vigorously regenerating clearcuts (Marshall, Hunter and Contreras 2003). The proposed harvest and small diameter thinning treatments are not anticipated to have a negative effect on the species.

Rufous Hummingbird—Rufous hummingbirds likely breed in portions of the Project Area with a preference shown towards wooded areas with a developed understory of deciduous shrubs or trees with low branches for nesting.

While they are not tied specifically to spotted owl NRF habitat, the NRF maintained would continue to provide nesting and foraging opportunities for the hummingbirds. The spotted owl dispersal habitat that is proposed to be treated and maintained were identified as dispersal because they lacked certain components like understory vegetation, large woody material on the ground, and 60% or more canopy cover. Harvest of those acres is not anticipated to have a negative effect on the hummingbird population. A few years following harvest, those more open units would begin to fill in with understory vegetation and provide additional habitat for this species.

Willow Flycatcher—Closely associated with shrub-dominated communities during nesting and migration, willow flycatchers almost exclusively use riparian habitat in southwest Oregon (Marshall, Hunter and Contreras 2003). They nest within a few feet of the ground, typically in shrub vegetation. In conifer-dominated landscapes, such as is found within the Project Area, they prefer nesting in areas 4 to 15 years following a harvest that removed most of the canopy cover and there is a vigorous regeneration of shrubs. Under Alternative 4, riparian areas will be buffered, continuing to provide nesting and foraging habitat for this species. There may be temporary noise disturbance during harvest operations, but there is not expected to be a negative effect on the ability of the flycatchers to persist in the watershed.

Big Game Winter Range and Elk Management Area

No new road construction is proposed on lands designated in the 1995 ROD/RMP as Big Game Winter Range and Elk Management Area. There are 1.5 miles of existing roads within the Management Area that would be used for hauling logs. The roads are closed to the public and would remain closed following harvest. There would be 96 acres of density management and selection harvest in the area under Alternative 4. The harvested trees would be moved out of the units using a helicopter. Deer and elk would likely move away from the action area during harvest. Little or no change to foraging opportunities is anticipated.

Cumulative Effects

The effects considered by the threat of the barred owl invasion in Alternative 2 also apply for Alternative 4.

Cumulative effects of the proposed harvest actions to the overall spotted owl population in the Project Area are anticipated to be low. Treat and maintain thinning prescriptions would retain NRF and dispersal spotted owl habitat in the Project Area.

Late-successional forest and RA32 habitat would remain post-harvest, allowing opportunities for future dispersal and nesting. Additionally, spotted owl 100-acre activity centers comprise 3,500 acres of suitable habitat within the Evans Creek fifth field watershed.

Historical and future timber harvests cumulatively affect wildlife. The lands being analyzed for commercial harvest are matrix and riparian reserve allocations and all alternative proposals fall within the goals and guidelines of the Medford ROD/RMP and Northwest Forest Plan. Continued harvest in matrix lands would continue.

Within the BLM-administered lands in the Evans Creek fifth field watershed, 54,205 acres are forested, with 24,608 acres classified as late-successional forest (80 years old or more). The ROD/RMP and Northwest Forest Plan require that 15% of fifth field watersheds retain late-successional forests conditions. Currently, 45% of the BLM-administered forested land in the Evans Creek fifth field watershed is late-successional forest. Alternative 4 would not reduce the late-successional forest within the Project Area. Stand ages would be maintained at 80 years or older.

Fisher could be using timber sale units, but they also forage in clearcuts. No habitat management guidelines have been established for fisher, relative to how much of what stand character units should be maintained. Patches of older seral habitat will remain near the project within riparian management zones and spotted owl cores that will provide ample corridors of cover for dispersal. Surveys for the highly mobile species are not practical on a sale unit basis.

Impacts of the action alternatives on fishers are predicted to be low, since a patchwork mosaic of stand types and ages would remain and fishers have not been detected in the Project Area. Most coarse down wood and snags, except for those that present a safety hazard or are in new operator road spurs, would be maintained. Areas of closed canopy would remain in each section. The Northwest Forest Plan was designed with a network of reserves of late-successional forests surrounded by younger, managed forests. Although the Northwest Forest Plan may provide suitable habitat that is well-distributed on Federal lands, fisher populations may never respond and be well-distributed because of (1) their apparently low rates of recolonization of restored habitats after local extirpation, (2) the lower amount of Federal land at lower elevations, and (3) their natural rareness (Forest Service and Bureau of Land Management 1994, Appendix J2-470).

3.7 Fuels

This section analyzes the potential impacts from the proposed forest management activities on fuels. Terms used in this section are defined as follows:

Canopy base height. The lowest height above the ground with sufficient understory canopy fuel to propagate fire vertically through the canopy. Canopy base height determines whether surface fires can climb into tree crowns.

Canopy bulk density. The weight of fine canopy fuels (leaves, needles, smaller branches) divided by the total canopy volume. It determines whether crown fire spread, or the horizontal transfer of fire between crowns, can occur.

Fire regime. The natural frequency, severity, and extent of fires occurring in an area. The five natural (historical) fire regime classes are based on the average number of years between fires (fire frequency) combined with the severity (amount of stand replacement) of the fire on the dominant overstory vegetation.

- **Fire Regime 1:** 0- to 35-year frequency; low severity to mixed severity. Frequent low intensity surface fires are the norm. Typical climax plant communities include ponderosa pine, dry-site Douglas-fir, mixed conifer, and oak woodlands.
- **Fire Regime 2:** 0- to 35-year frequency; moderate to high severity. Typical plant communities include true grasslands and savannahs, ceanothus, and Oregon chaparral.
- **Fire Regime 3:** 35- to 200-year frequency; low to mixed severity. This regime usually results in a mixed landscape. Lower severity fire tends to predominate in many events. Typical plant community is mixed conifer.
- **Fire Regime 4:** 35- to 200-year frequency; replacement severity. Plant communities arise from or are maintained by stand-replacement fires. Typical plant communities include lodgepole pine, aspen, western larch, and western white pine.
- **Fire Regime 5:** 200+ year frequency; any severity. Natural ignitions are very rare or virtually nonexistent; environmental conditions rarely result in large fires. Typical plant communities include Douglas-fir, noble fir, and mountain hemlock.

3.7.1 Methodology

- The Fuels analysis area is the Evans Creek fifth field watershed where the majority of proposed treatment acres exist.
- Data on fire hazard and risk was taken from the Jackson County Integrated Fire Plan assessments.
- Data on FRCC (Fire Regime Condition Class) was taken from LANDFIRE data, using prioritized and stand FRCC.
- Fuel models and expected fire behavior were determined from *Standard Fire Behavior Fuels Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model* by Scott and Burgan

3.7.2 Assumptions

- Fire regime condition classes were analyzed for only BLM-administered lands because stand age identification for other land ownerships is not available.
- Private industrial forest lands will be intensively managed on commercial economic rotations averaging 60 years (Forest Service and Bureau of Land Management 1994, 4-5), so the actual percentage of FRCC 3 within the fifth field watershed could be higher than the percentage found on BLM-administered lands.

3.7.3 Affected Environment

The Evans Creek Forest Management Project is located mainly in the Evans Creek fifth field watershed. A small amount of BLM managed acres occur in the Cow Creek (586 acres) and Trail Creek (663 acres) fifth field watersheds. The fuels management analysis will focus on the Evans Creek watershed. The stands in the Project Area are overstocked and have high stem densities. Overstocked stands have a greater potential for severe, stand-replacing wildland fires. Currently, the proposed treatment stands represent timber-litter and timber-understory fuels types. As fuel loadings increase in these fuel types, resultant fire behavior also increases. Appendix F-Fuels, contains general descriptions of fuels types and expected fire behavior.

Fire behavior describes how a wildland fire burns based on environmental characteristics such as surface fuels, vegetation, canopy base height, density or closure, slope, aspect, weather, and elevation. The identification of fuel models helps to describe the fuels available to a fire based on the amount, distribution, and continuity of the vegetation and wood. Fuels combined with weather and slope can be used to predict potential surface fire behavior characteristics such as rate of spread, flame lengths, and fire line intensity.

Historically, fire was a normal occurrence and has played a key role as a natural disturbance process throughout southwestern Oregon. However, fire suppression and forest management activities have altered the historic vegetative patterns within this fifth field watershed.

3.7.3.1 Fire History and Risk

Wildland fires in the Fire and Fuels analysis area predominately occur from mid-July through mid-October, due to low relative humidity, low precipitation, and high ambient temperatures. Fire history analysis shows a total of 569 wildland fires occurred throughout the Fuels analysis area from 1960 to 2009. The total area of the watershed that burned during this time period was 33,334 acres.

Of the 569 wildland fires, 22% of the fires occurred on federally-administered lands and nearly 78% of the fires occurred on private lands. On BLM-administered lands, 40% of the wildland fires were human-caused and generally started along roads or abandoned campsites, while more than 60% of the fires were started by lightning, usually in higher elevations and along ridgelines.

On private lands, nearly 79% of the wildland fires were human-caused. The three main causes of fire on private lands include debris burning, equipment use, and juveniles. Most of the fires on private land occurred in the wildland urban interface or more populated areas.

Approximately 95% of the past wildland fires were suppressed at less than 10 acres. Only 5% of the fires were greater than 10 acres; however, those fires burned over 85% of the total acres burned between 1960 and 2009. Notable among the large, high intensity-high severity wildland fires are:

- Sykes Fire (1987)—10,313 acres, mainly within in the Middle Evans Creek sixth field watershed, burning primarily in old-growth conifers. That fire was lightning-caused.
- East Evans Creek Fire (1992)—10,135 acres, with approximately 10% of the northwest corner of the fire falling into the Lower Evans Creek watershed. The fire burned mainly in brush, and was human-caused, attributed to equipment use.
- Hull Mountain Fire (1994)—8,000 acres, burned a portion of the Middle Evans Creek sixth field watershed. That fire was determined to be the result of arson, largely burning through second-growth conifer.

3.7.3.2 Fire Regime and Condition Class

Climate and topography combine to create the fire regime found throughout the Project Area. Research suggests that variable fire history, complex geology, land use history, and steep environmental gradients in the Douglas-fir/hardwood forests of the southwest Oregon and northern California Siskiyou Mountains prevent generalizations about fire and its ecological effects (J. Agee 1993). However, plant association groups are a credible link to historical ecological processes, including fire regimes that occurred on sites in the past (Agee and Franklin 2003). Historical fire regimes and the subsequent departure from them are correlated with the change from historical to current vegetative structure. The change in vegetation also helps to describe the difference in fuel loading from historical to current conditions.

All five historic fire regimes are present in the Evans Creek fifth field watershed. According to LANDFIRE data, 79% of the watershed is Fire Regime 1; 21% is Fire Regime 3; and only trace acres make up Fire Regimes 2, 4, and 5. This data suggests that historically the majority of the Evans Creek fifth field watershed burned with frequent low- to mixed-intensity surface fires.

Condition classes are a function of how much the current fire regimes have departed from historical fire regimes, resulting in alterations of components such as species composition, structural stage, stand age, and canopy cover. There are three condition classes:

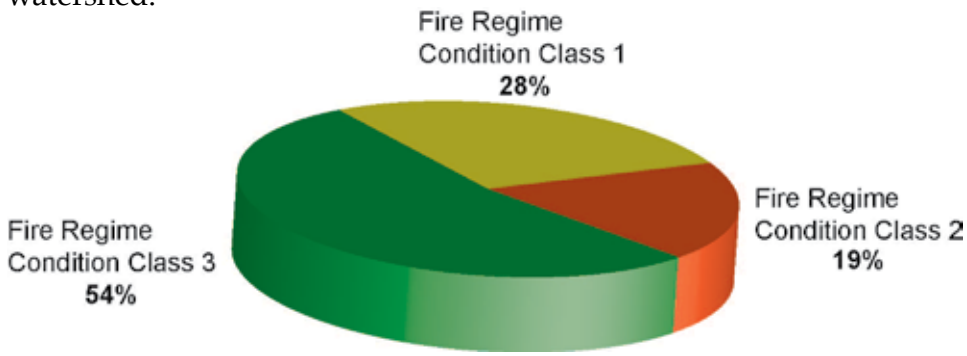
Condition Class 1 - Fire regimes are within or near an historical range. The risk of losing key ecosystem components is low. Vegetation species composition and structure are intact and functioning within an historical range.

Condition Class 2 - Fire regimes have been moderately altered from their historical range (more than one return interval). This change results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns.

Condition Class 3 - Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. This change results in dramatic changes to fire size, frequency, severity, or landscape patterns.

Within the Evans Creek fifth field watershed, 73% of BLM land falls into fire regime condition class 2 or 3 (Figure 3-10).

Figure 3-10. Fire regime condition classes for the Evans Creek watershed.



This departure from the historic fire regime is often attributed to fire exclusion, but also includes all human practices that would affect the extent, severity, or frequency of fires compared to historical accounts. These human practices include road building, livestock grazing, forest management practices, and fire suppression.

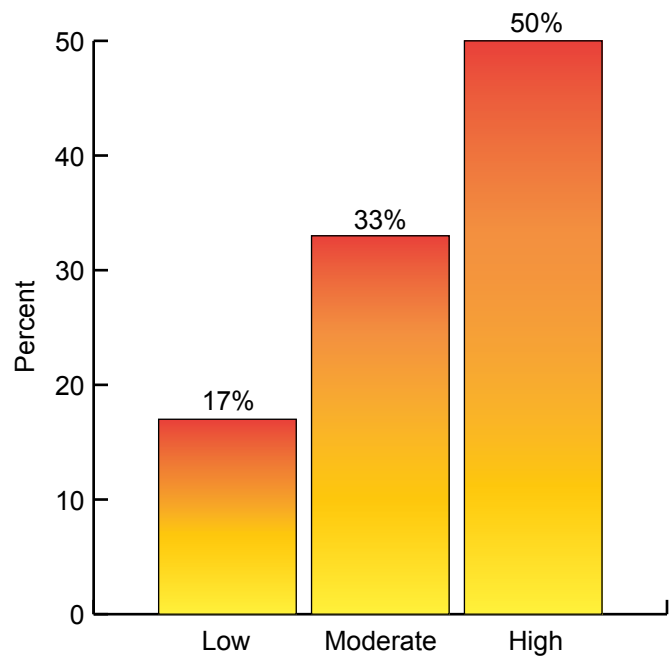
Changes in vegetation and fuel conditions help to determine the expected change in fire behavior and its effects. This data suggests that fires (which would have historically burned with low to moderate severity) would now burn with higher intensities and greater severities. These numbers indicate the area could benefit from treatment to reestablish the historical fire regime.

3.7.3.3 Fire Hazard

Fire hazard assesses vegetation by type, arrangement, volume, condition, and location. These characteristics combine to determine the threat of fire ignition, the spread of a fire, and the difficulty of fire control. Fire hazard is a useful tool in the planning process because it helps in the identification of broad areas within a watershed that could benefit from fuels management treatment. Hazard ratings were developed for the watershed using data from the 2009 Jackson County Fire Risk Analysis and FLAMMAP (Figure 3-11). Hazard ratings were assigned by combining the predicted attributes of flame length, rate of spread, and crown fire activity.

In general, the existing fuel profile within the watershed represents a moderate to high fire hazard under average climatic conditions.

Figure 3-11. Fire hazard in the Evans Creek watershed.



3.7.4 Environmental Consequences

3.7.4.1 Effects of Alternative 1 (No Action) on Fuels

Direct and Indirect Effects

Under the No Action Alternative, existing surface, ladder, or canopy fuels would not be treated. Fuels would continue to accumulate on the forest floor. Stands would remain in the current timber understory fuel type and continue to trend towards increasing fuel loading and resultant increasing fire behavior. The departure from the historical fire regime would continue to trend toward condition classes 2 and 3. The majority of the Project Area would remain in moderate to high fire hazard. Nearby private land would also be at greater risk for high severity fire effects. Tactical opportunities for firefighting resources would be reduced and average fire size may increase. Firefighters would continue to be challenged by dense vegetation, overgrown and degraded water sources and road systems.

Cumulative Effects

Fire suppression activities would continue on Federal and non-Federal lands. The BLM has a master cooperative fire protection agreement with the Oregon Department of Forestry (ODF). This agreement gives the ODF responsibility for fire protection on all lands within the Project Area. The agreement directs the ODF to take immediate action to control and suppress all fires. Their primary objective is to minimize total acres burned while providing for firefighter safety. The agreement requires the ODF to control 94% of all fires before they exceed 10 acres.

Hazardous fuels reduction work would continue within the Evans Creek watershed. Since 1998, over 3,200 acres of hazardous fuels thinning and prescribed burning have been completed on BLM managed land in the Evans Creek watershed. In 2009, the BLM completed an environmental assessment (EA) that will allow approximately 4,800 acres of BLM wildland urban interface lands to be thinned and prescribed burned within the next 10 years. In addition, the local Seven Basins Watershed Council, Oregon Department of Forestry, and private landowners will continue similar hazardous fuels reduction on private land. With sufficient funding, another 1,500 acres could be completed on private land in the next 10 years in the wildland urban interface areas of the Evans Creek watershed. Ongoing fuels reduction on private and federally managed public lands would result in the beneficial effect of increasing the landscape scale effectiveness of fuels reduction treatments.

3.7.4.2 Effects on Fuels Common to the Action Alternatives

Preliminary fuels treatments after timber harvest were recommended by alternative (Appendix F-Fuels) The BLM would conduct a fuels assessment within each unit following harvest activity. This assessment would determine the fuel hazard and fire risk based on surface fuel loading, aspect, slope, access, and location of each unit. At the discretion of the fuel management specialist, planned fuels treatments may be modified to meet the objective of fuel hazard reduction. The majority of fuels treatments would begin within 30 days after completion of harvest activities. Prescribed fire treatments may take another year to complete due to the environmental parameters required for implementation.

Immediately following forest management activities and prior to slash disposal, fire behavior potential could increase from the current condition due to increased surface fuels. Following slash disposal treatments, a reduction in potential fire behavior would occur due to the reduction in surface fuel loading and change in horizontal and vertical fuel arrangement.

Forest management activities generally increase the surface fuels within a stand. However, whole tree harvesting with disposal of the tops at the landings is the most effective method of preventing surface fuel increases within the residual stand (Agee and Skinner 2005). At the landings, slash could be piled, chipped, removed for biomass, sold for firewood, or prescribed burned. Slash remaining within the stands could be lopped and scattered or hand piled and burned or underburned. Surface fuel loads would be reduced because a majority of the slash would be removed from the unit.

Lopping and scattering would reduce the vertical height and horizontal continuity of the fuel bed. However, it would temporarily increase the surface fuel loads. This would put the stand into a slash fuel model resulting in higher predicted flame lengths, fire duration, and intensity. In 10 to 15 years after lopping and scattering, the effect of the slash on fire behavior would be overcome by the effects of decomposition and new vegetation growth (McIver and Ottmar 2006).

Hand piling and burning would decrease fuel loading of material 1 to 6 inches in diameter by 85 to 95%. Fuels greater than 6 inches in diameter would be left on the surface and would contribute to the coarse woody debris load. This treatment would move stands from a slash fuel type into a timber fuel type, which would result in a reduced rate of fire spread and average flame length.

In identified timber sale and small diameter thinning units with less than 5 tons per acre of activity slash, prescribed fire in the form of underburning would reduce the fuel loading and maintain the stands in a desired condition. Underburning would remove at least 60% of slash less than 3 inches in diameter and a lesser amount of larger fuel size classes. This treatment would move the stands from a timber understory to a timber litter fuel type. Underburning is proposed on 400 acres following forest management activities associated with this project.

Renovation and restoration of water sources would increase tactical firefighting capability and potential success for wildland fire suppression objectives within the watershed. More available water would enhance the protection private property and improvements and forest resources from wildland fire effects. Resultant fire size may be decreased.

Renovation of approximately 120 miles of road and roadside brushing on 25 miles of road would enhance firefighter access and egress during wildland fire suppression activities. Road renovation would improve firefighter and public safety. Improved access would shorten response time and could reduce resultant fire size.

3.7.4.3 Effects of Alternative 2 on Fuels

Direct and Indirect Effects

In Alternative 2, proposed forest management actions are regeneration harvest (northern GFMA and southern GFMA), commercial thinning, density management, and selection

harvest. Proposed activity slash treatments under this alternative include slashing damaged conifers, lopping and scattering, hand piling and burning, underburning, or removing biomass.

Regeneration harvest creates a new stand. For the first one to five years, these stands would remain a slash fuel type until the shrubs, grasses, and planted trees become established. After establishment of regeneration, these units would move into a brush fuel type. Brush fuel types are extremely volatile and are susceptible to high rates of fire caused mortality. Stands could exhibit high flame lengths, rates of spread, and fire intensity. Fires started within these stands could be difficult to initially attack and control. For 5 to 20 years following planting, overall fire hazard and fire risk would increase in these stands. Regeneration harvest would also move stands towards a FRCC 3 condition. This is due to the conversion of the age class from 80 years and greater back to an age class less than 10 years and the further departure from the historic range.

Commercial thinning, selection harvest, and density management promotes the development and maintenance of large healthy trees. These prescriptions would result in stands in a more fire resilient condition. Within one to five years of slash disposal treatments, these units would move from a slash fuel type into a timber litter fuel type, which would result in a reduced rate of fire spread and flame length. Canopy cover would range from 40 to 60% following treatment. Thinning treatments would reduce torching and crown fire potential by increasing average canopy base height and decreasing overall canopy bulk density. Commercial thinning, selection harvest, and density management units could cause a reduction in potential fire behavior and an increase in suppression capability. Thinning units could experience a decrease in fire hazard and risk for 5 to 15 years.

The initial stand level FRCC of commercial thinning, selection harvest, and density management units would remain virtually unchanged after harvest. These units would continue to represent a change in condition characterized by FRCC 2 and 3. After additional thinning of small diameter (<8 inches dbh) trees and removal of slash and thinned trees, the stand may represent a FRCC 2 condition. With a subsequent prescribed fire treatment such as underburning, the stand would gradually move toward FRCC 1.

Cumulative Effects

See section 3.7.4.2 Effects of Alternative 1 (No Action) on Fuels, Cumulative Effects.

The cumulative effect of Alternative 2 of the proposed action and ongoing hazardous fuels reduction work by BLM, ODF, Seven Basins Watershed Council, and private landowners on FRCCs within the watershed would begin to move towards the historic fire regime and condition class on a landscape level. However, departure from the historical fire regime would continue to trend toward FRCCs 2 and 3 on unmanaged public land and most private industrial timber land.

Fire hazard and risk within the watershed would also be reduced. Past, current, and future fuels reduction on private and federally managed public lands would result in beneficial effect of increasing the landscape-scale effectiveness of fuels reduction treatments.

3.7.4.4 Effects of Alternative 3 on Fuels

Direct and Indirect Effects

In Alternative 3, proposed forest management activities are dry forest management leaving 40 or 60% canopy cover. Proposed fuels treatments under this alternative include lop and scatter, hand pile and burn, prescribed underburn, or biomass removal.

Dry forest management would create multi-aged and multilayered stands. Stands would be left in a condition more resilient to environmental stressors such as fire, drought, and insects. Canopy cover would range from 40 to 60% following treatment. The largest and most resilient trees would remain. Thinning of noncommercial (<8 inches dbh) trees would also occur to reduce tree density. Structural diversity would be provided by retaining small openings and unthinned areas within the stand. Isolated unthinned areas could exhibit isolated and group torching of trees during a wildland fire; however, the reduced canopy bulk density of the stand and openings would limit large-scale crown fire potential. Because of the structural diversity, these stands would still represent timber understory and timber litter fuel types but with reduced surface fuel loading. Stands would exhibit a decrease in overall potential fire behavior and an increase in suppression capability when compared to Alternative 2 and Alternative 4.

The initial stand level FRCC of dry forest management units would remain virtually unchanged after harvest. These units would continue to represent a change in condition characterized by FRCC 2 and 3. After additional thinning of small diameter (<8 inches dbh) trees and removal of slash, the stand would represent an FRCC 2 condition. With a subsequent prescribed fire treatment such as underburning the stand would gradually move toward FRCC 1.

Treated stands would experience a decrease in fire hazard and risk for 5 to 15 years or until vegetation density returned to existing levels.

Cumulative Effects

See section 3.7.4.2 Effects of Alternative 1 (No Action) on Fuels, Cumulative Effects.

The cumulative effect of Alternative 3 and ongoing hazardous fuels reduction work by BLM, ODF, Seven Basins Watershed Council, and private landowners on FRCCs within the watershed would begin to move towards the historic fire regime and condition class on a landscape level. However, departure from the historical fire regime would continue to trend toward FRCC 2 and 3 on unmanaged public land and most private industrial timber land.

Fire hazard and risk within the watershed would also be reduced. Past, current, and future fuels reduction on private and federally managed public lands would result in the beneficial effect of increasing the landscape-scale effectiveness of fuels reduction treatments.

3.7.4.5 Effects of Alternative 4 on Fuels

Direct and Indirect Effects

In Alternative 4, proposed forest management activities are density management and selection harvest. Proposed fuels treatments under this alternative include lop and scatter, hand pile and burn, prescribed underburn, or biomass removal.

Direct and indirect effects of density management and selection harvest units are expected to be similar to Alternative 2 with the exception of the regeneration units.

Cumulative Effects

See section 3.7.4.2 Effects of Alternative 1 (No Action) on Fuels, Cumulative Effects.

The cumulative effect of Alternative 4 and ongoing hazardous fuels reduction work by BLM, ODF, Seven Basins Watershed Council, and private landowners on FRCCs within the watershed would begin to move towards the historic fire regime and condition class on a landscape level. However, departure from the historical fire regime would continue to trend toward FRCC 2 and 3 on unmanaged public land and most private industrial timber land.

Fire hazard and risk within the watershed would also be reduced. Past, current, and future fuels reduction on private and federally managed public lands would result in the beneficial effect of increasing the landscape-scale effectiveness of fuels reduction treatments.

3.8 Carbon Storage

The purpose of the this section is to provide a basis for the decision maker to determine whether the proposed action or alternatives are likely to significantly impact the human environment with respect to greenhouse gas levels (i.e., atmospheric carbon levels). Changes in greenhouse gas levels affect global climate (Forster, et al. 2007, 129-234) which is incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change and concluded that human-caused increases in greenhouse gas emissions are extremely likely to have exerted a substantial warming effect on global climate. Because forests store carbon, they affect the atmospheric concentrations of carbon dioxide, a greenhouse gas. Forest management can change the amount of carbon stored in a forest.

Scientific knowledge on the interrelationship between greenhouse gas levels and climate change is rapidly changing, and substantial uncertainties and several key limitations remain. One limitation is the inability of current science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. This limitation was identified by the U.S. Geological Survey in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, which summarized the latest science on greenhouse gases. That memorandum is incorporated here by reference.

Terms used in this section are defined as follows:

forest ecosystem carbon pools. Live trees, standing dead trees, understory vegetation, coarse woody debris, forest floor organic layer, and soil organic carbon (Smith, Heath and Birdsey 2006).

disposition of carbon in harvested wood. Defines where the carbon from harvested wood is stored and how it may be emitted (Smith, Heath and Birdsey 2006).

- Products in use–End use products that have not been discarded or otherwise destroyed, for example, residential and nonresidential construction, wooden containers, and paper products.
- Landfills–Discarded wood and paper placed in landfills where most carbon is stored long-term and only a small portion of the material is assumed to degrade, at a slow rate.
- Emitted with energy capture–Combustion of wood productions with concomitant energy capture as carbon is emitted to the atmosphere.
- Emitted without energy capture–Carbon in harvested wood emitted to the atmosphere through combustion or decay without concomitant energy recapture.
- Sawlog–A log meeting minimum standards of diameter, length, and defect that is used in the manufacture of lumber.
- Pulpwood–Roundwood, whole-tree chips, or wood residues that are used for the production of paper, orientated stand board, particleboard or biomass for energy production.

metric tonne (MT). A measurement of weight equal to 2,200 pounds.

3.8.1 Methodology

- On July 16, 2009, the U.S. Department of the Interior withdrew the Records of Decision for the Western Oregon Plan Revision. The information contained in the Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (USDI 2008) is relevant since it examined recent and applicable science regarding climate change and carbon storage. That analysis concluded that effects of forest management on carbon storage could be analyzed by quantifying the change in carbon storage in live trees, storage in forests other than live trees, and storage in harvested wood. The discussion in Volume I (p. 220-224); Volume II (p. 537-543), and Volume III, Appendices (p. 28-30) are relevant to the effects analysis for this project and are incorporated by reference.
- The analysis of carbon stored in harvested wood in the 2008 FEIS used a factor for converting board feet of harvested wood to mass of carbon from Smith et al. (2006, 35). Based on information developed after the 2008 FEIS, this factor has been refined to better account for regionally specific conditions and the fraction of harvested volume that is typically milled into solid wood products and into processed wood products. Harvest volumes were converted to cubic feet, converted to pounds of biomass, and then to carbon content, yielding an overall conversion factor of 1,000 board feet = 1.326 metric tonnes of carbon. Of this total amount of carbon in harvested wood, 36.2% of harvest volume is considered as sawlogs and 63.8% as pulpwood (USDA 1999) for evaluation using the storage rates over time from Smith et al. (2006, 27). The improved conversion factor is used in this analysis to evaluate the amount of carbon stored in harvested wood. Information on the development of this conversion factor is on file in the BLM office and is available for review upon request and is incorporated here by reference.

- For the Evans Creek Project Area, the conversion factor has been adjusted further to reflect the mixed species composition of the stands to be treated. Rather than using the Douglas-fir factor of 35 pounds of biomass per cubic foot, 29 pounds per cubic foot was used, with a conversion factor of 1,000 board feet = 1.098 tonnes of carbon.
- Carbon was converted to carbon dioxide by multiplying the amount of carbon by 44/12 (the ratio of the molecular weight of carbon dioxide to carbon).

3.8.2 Assumptions

- In the absence of large disturbance events (e.g., wildfire, severe blowdown, or insect epidemics) carbon storage on about 70% of BLM-administered lands on the Medford District would increase. On the remaining 30% of BLM-administered lands designated as matrix, the RMP/EIS assumes an annual timber harvest of 3,000 acres. On those acres, timber harvesting would decrease carbon storage levels at varying rates and for varying lengths of time dependent upon the amount of vegetation removed and how quickly regrowth occurs. Because the vast majority of BLM-administered lands are not allocated to intensive or restricted forest management it is expected that continued vegetative growth on those lands would lead to more carbon capture and storage than the amount of carbon lost from timber harvesting, vegetative respiration, or disturbance events.
- Douglas-fir and white fir are the dominant species that would be harvested. Ground-based yarding systems (tractors, skidders, feller-buncher), skyline, and helicopter would be used with sawlogs the primary product.
- The carbon calculations are estimates based upon data from a representative stand of each silvicultural system proposed. The values are not absolute rather they are generalized estimates that allow a comparison between alternatives.
- Future management (regeneration harvest) may occur within the next 20-30 years in the proposed thinning and density management stands.
- The carbon storage and emission analysis period is based upon current stand age and the planned ROD/RMP rotation age of 120 years for southern GFMAs and northern GFMAs that have soil constraints. For this project, a 20-year analysis period was used for thinning, hardwood management, and selection harvest and a 120-year analysis period was used for regeneration harvests.
- Harvest operations (cutting, yarding, and hauling) result in short-term carbon emissions. For the Evans Creek forest management project, an average harvest volume of 10,000 board feet per acre was used to estimate a total emission of about 45 tonnes of carbon from harvest operations (Salem District, 2010). This value is common to Alternatives 2, 3, and 4.

3.8.3 Affected Environment

The 2008 FEIS described current information on predicted changes in regional climate (p. 488-490), and is incorporated here by reference. That description concluded that the regional climate has become warmer and wetter with reduced snowpack, and continued change is likely. That description also concluded that changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of

precipitation, but specific changes in the amount and timing of precipitation are too uncertain to predict at this time. Because of this uncertainty about changes in precipitation, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, streamflow, and wildlife habitat. The analysis in this EA therefore does not attempt to predict changes in the Project Area due to existing or potential future changes in regional climate.

In the Project Area, mixed-conifer, closed canopy stands of Douglas-fir, white fir, incense cedar, sugar pine, and ponderosa pine that are 20 to 300 years old are proposed for treatment. Within these forests, the quantity of stored carbon varies from stand to stand and is influenced by site quality and the amount, type, and size of vegetation present. The current amount of vegetation defines the existing levels of on-site carbon and is considered the baseline amount that would be affected by management actions.

3.8.4 Environmental Consequences

3.8.4.1 Effects of Alternative 1 (No Action) on Carbon Storage

This alternative would not implement the Medford District ROD/RMP management direction for general forest management areas and riparian reserves. No timber management actions would occur.

No forest vegetation would be removed; the current amount of onsite carbon would not be affected. In the long term it is expected that continued growth of forest vegetation would result in the increase of stored carbon. Limited reductions in carbon would happen as periodic mortality or decomposition from natural processes occurs. In the absence of catastrophic disturbance events, it is expected that continued forest growth would capture and store more carbon than would be lost from natural processes.

Under the No Action Alternative, small diameter thinning/hardwood management, thinning (commercial thin or density management), or selection harvest would not occur on 2,983 acres. This would result in a net carbon storage increase of 65,557 metric tonnes over the next 20 years (Table 3-19).

Table 3-19. Alternative 1 (No Action): Carbon Emissions and Storage for 20-year Analysis Period——No Thinning, Density Management, Selection Harvest, or Small Diameter Thinning/Hardwood Management

Silviculture Treatment	Acres	Emissions 2010-2030	Live Tree Storage			Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
			Current Conditions 2010	20-year Analysis Period	Net Change			
None	2,983	0	216,804	282,361	65,557	0	65,557	65,557

The following information was used to calculate the net carbon storage for the 20-year analysis period for Alternative 1:

- The average thinning stand age is about 80-90 years old. ROD/RMP direction provides for another entry when the stand reaches culmination of mean annual (CMAI). A 20-year analysis provides the timeframe until CMAI is reached
- Representative stands for each commercial thinning, density management, selection harvest, and small diameter/hardwood management treatment proposed in Alternative 2 were modeled in ORGANON (Hann 2003) to derive decadal cubic foot volume growth rates. The calculated values are applied as an average for all stands in each silvicultural treatment. The following representative stands were selected for modeling:
  - Commercial thinning/density management leaving at least 40% canopy cover (T33S, R3W, section 11, OI 005). The largest commercial thinning/density management unit (38 acres) was selected and has a current volume of 31,000 board feet per acre.
  - Commercial thinning/density management leaving at least 60% canopy cover (T34S, R3W, section 17, OI 007). The largest commercial thinning/density management unit (49 acres) was selected for analysis and has a current volume of 33,000 board feet per acre.
  - Selection harvest leaving at least 40% canopy cover (T35S, R3W, section 7, OI 005). The largest selection harvest unit (42 acres) was selected for analysis and has a current volume of 54,000 board feet per acre.
  - Selection harvest leaving at least 60% canopy cover (T33S, R3W, section 5, OI 018). The largest selection harvest unit (43 acres) was selected for analysis and has a current volume of 48,000 board feet per acre.
  - Small diameter thinning/hardwood management (T34S, R3W, section 15, OI 005). This unit (49 acres) is the most representative stand with available data that includes both treatments and has a current volume of 26,000 board feet per acre.
- The baseline acres (2,983) for the 20-year analysis period are from the acres for each silvicultural treatment proposed in Alternative 2: commercial thinning/density management–40% canopy cover (742 acres); density management–60% canopy cover (243 acres); selection harvest–40% canopy cover (679 acres); selection harvest–60% canopy cover (204 acres); and small diameter/hardwood management (1,115 acres).

For the 120-year analysis period, no regeneration harvests in stands would occur on 267 acres. This would result in a net carbon storage increase of 18,894 metric tonnes (Table 3-20).

Table 3-20. Alternative 1 (No Action): Carbon Emissions and Storage for 120-year Analysis Period——No Regeneration Harvest

Silviculture Treatment	Acres	Emissions 2010-2130	Live Tree Storage			Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
			Current Conditions 2010	100-Year Analysis Period	Net Change Live Trees			
None	267	0	25,977	44,871	18,894	0	18,894	18,894

The following information was used to calculate the net carbon storage for the 120-year analysis period for Alternative 1:

- Representative stands for each regeneration harvest treatment proposed in Alternative 2 were modeled in ORGANON (Hann 2003) to derive decadal cubic foot volume growth rates. The calculated values are applied as an average for all stands in each regeneration harvest treatment. The following representative stands were selected for modeling:
  - Southern GFMA regeneration harvest (T33S, R3W, section 1, OI 011). The largest southern GFMA regeneration harvest stand (63 acres) was selected and has a current volume of 48,000 board feet per acre.
  - Northern GFMA regeneration harvest (T33S, R3W, section 11, OI 006). The largest northern GFMA regeneration harvest stand (5 acres) was selected for analysis and has a current volume of 38,000 board feet per acre.

3.8.4.2 Effects of Alternative 2 on Carbon Storage

Alternative 2 implements the Medford District ROD/RMP management direction for general forest management areas and riparian reserves (Table 3-21). Structurally complex stands on matrix lands, as defined by Recovery Action 32 (U.S. Fish and Wildlife Service 2008), are reserved from management actions. Dispersal and nesting, roosting, and foraging habitat within active spotted owl home ranges (1.3-mile radius) would be treated and maintained.

Table 3-21. Proposed Silviculture Treatments in Alternative 2

Silviculture Treatment	Treatment Acres
Commercial Thinning	228
Density Management (40% canopy cover)	514
Density Management (60% canopy cover)	243
Selection Harvest (40% canopy cover)	679
Selection Harvest (60% canopy cover)	204
Northern GFMA Regeneration Harvest	9
Southern GFMA Regeneration Harvest	258
Small Diameter Thinning/Hardwood Management	1,115
Total	**3,250**

Commercial thinning and density management (40% canopy cover) would remove about 5,915 board feet of wood per acre; 5,915 board feet contains approximately 6 metric tonnes of carbon. The amount of live tree carbon in commercial thinning and density management (40% canopy cover) stands would be reduced from approximately 63 metric tonnes per acre to 51 tonnes per acre, resulting in the transfer of 12 metric tonnes per acre of live tree carbon to other pools (onsite dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

Density management (60% canopy cover) would remove about 6,411 board feet per acre; 6,411 board feet contains about 7 metric tonnes of carbon. The average stand treated using density management (60% canopy cover) would be reduced from 61 metric tonnes per acre of live tree carbon to 48 metric tonnes per acre, with 13 tonnes transferred to other pools. A carbon analysis period of 20 years is used.

Selection harvest (40% canopy cover) would remove approximately 22,393 board feet per acre; 22,393 board feet contains about 25 metric tonnes of carbon. The average stand treated using

selection harvest (40% canopy cover) would be reduced from 110 metric tonnes per acre of live tree carbon to 64 metric tonnes per acre, resulting in a transfer of 46 metric tonnes per acre of live tree carbon to other pools. A carbon analysis period of 20 years is used.

Selection harvest (60% canopy cover) would remove an estimated 13,253 board feet per acre; 13,253 board feet contains about 15 metric tonnes of carbon. Selection harvest 60% stands would be reduced from 98 tonnes per acre of live tree carbon to 71 tonnes per acre, resulting in a transfer of 27 tonnes of live tree carbon to other pools. A carbon analysis period of 20 years is used.

Northern GFMA regeneration harvest would remove approximately 15,621 board feet per acre; 15,621 board feet contains about 17.2 metric tonnes of carbon. Northern GFMA stands would be reduced from 77 metric tonnes per acre of live tree carbon to 45 metric tonnes per acre, resulting in a transfer of 32 metric tonnes per acre of live tree carbon to other pools. A carbon analysis period of 120 years is used.

Southern GFMA regeneration harvest would remove about 20,589 board feet per acre; 20,589 board feet per acre contains 22.6 metric tonnes of carbon. Southern GFMA stands would be reduced from 98 metric tonnes per acre of live tree carbon to 56 metric tonnes per acre, resulting in a transfer of 42 metric tonnes per acre of live tree carbon to other pools. A carbon analysis period of 120 years is used.

Small diameter thinning/hardwood management combined would remove approximately 4,877 board feet per acre, which contains about 5 tonnes of carbon. The average small diameter thinning/hardwood management stands would be reduced from 53 tonnes per acre of live tree carbon to 43 tonnes per acre, resulting in a transfer of 10 tonnes of live tree carbon to other pools. A carbon analysis period of 20 years is used.

Of the total amount of carbon in harvested wood, 36.2% of the volume is used as sawlogs and the remaining 63.8% as pulpwood (USDA 1999).

Harvested Wood Carbon Emissions

Commercial Thinning and Density Management (40% canopy cover), 20-year analysis period:

Wood harvested from these treatments would have a short-term (post-harvest to 10 years) carbon emission of 1.5 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.23 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 1.7 metric tonnes per acre. The balance of the carbon, 5 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Density Management (60% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 2.0 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.31 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 2.3 metric tonnes per acre. The balance of the carbon, five

metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Small Diameter Thinning/Hardwood Management, 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 1.2 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.19 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 1.4 metric tonnes per acre. The balance of the carbon, 5 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Selection Harvest (40% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of 6.7 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.94 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood are about 7.6 metric tonnes per acre. The balance of the carbon, 18 metric tonnes per acre would remain stored in products still in use or in landfills, or emitted with energy capture.

Selection Harvest (60% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 4.0 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.57 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 4.6 metric tonnes per acre. The balance of the carbon, 11 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Northern GFMA Regeneration Harvest, 120-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of 4.6 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted is 1.91 metric tonnes per acre. For the 120-year analysis period, carbon emissions from the harvested wood are about 6.5 metric tonnes per acre. The balance of the carbon, 11.1 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Southern GFMA Regeneration Harvest, 120-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 6.0 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 2.53 metric tonnes per acre. For the 120-year analysis period, carbon emissions from the harvested wood would be about 8.5 metric tonnes per acre. The balance of the carbon, 14.6 metric tonnes per acre would remain stored in products still in use or in landfills, or emitted with energy capture.

Carbon Dioxide Emission

The total carbon dioxide emitted during the 20- and 120-year analysis periods is considered negligible in the context of total U.S. carbon dioxide emissions of 6 billion metric tons (U.S. Department of Energy 2009).

Commercial thinning and density management (40% canopy cover) in Alternative 2 would result in the emission of about 1.7 metric tonnes of carbon per acre, or about 6 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Thinning 742 acres to a 40% canopy cover would result in the emission of 4,452 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000007% of current U.S. emissions.

Density management (60% canopy cover) in Alternative 2 would result in the emission of about 2.3 metric tonnes of carbon per acre or about 8 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Thinning 243 acres to a 60% canopy cover would result in the emission of 1,944 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000003% of current U.S. emissions.

Small diameter thinning/hardwood management in Alternative 2 would result in the emission of about 1.4 metric tonnes of carbon per acre or about 5 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Small diameter thinning/hardwood management of 1,115 acres would result in the emission of 5,575 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000009% of current U.S. emissions.

Selection harvest (40% canopy cover) in Alternative 2 would result in the emission of about 7.6 metric tonnes of carbon per acre or about 28 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Selection harvest of 679 acres to a 40% canopy cover would result in the emission of 19,012 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.000003% of current U.S. emissions.

Selection harvest (60% canopy cover) in Alternative 2 would result in the emission of about 4.6 metric tonnes of carbon per acre or about 17 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Selection harvest of 204 acres to a 60% canopy cover would result in the emission of 3,468 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000006% of current U.S. emissions.

Northern GFMA regeneration harvest would result in the emission of about 6.5 metric tonnes of carbon per acre or about 24 metric tonnes of carbon dioxide per acre during the 120-year analysis period. Northern GFMA harvest on 9 acres would result in the emission of 216 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.00000004% of current U.S. emissions.

Southern GFMA regeneration harvest would result in the emission of about 8.5 metric tonnes of carbon per acre or about 31 metric tonnes of carbon dioxide per acre during the 120-year analysis period. Southern GFMA harvest on 258 acres would result in the emission of 7,998 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.000001% of current U.S. emissions.

Live Tree Carbon Storage

Continued forest growth following commercial thinning and density management (40% canopy cover) would increase carbon storage approximately 800 cubic feet per acre per decade (Hann 2003), which is equal to about 9.8 metric tonnes of stored carbon per acre per decade or 1.0 metric tonnes per acre per year. Within 2 years after thinning, the carbon emission level (1.7 tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 25 years of tree growth.

Conifer regrowth following density management (60% canopy cover) would increase carbon storage approximately 400 cubic feet per acre per decade (Hann 2003), which is equal to about 4.9 metric tonnes of stored carbon per acre per decade or 0.5 metric tonnes per acre per year. Within 5 years after thinning, the carbon emission level (2.3 tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 35 years of tree growth.

Conifer and hardwood regrowth following small diameter thinning/ hardwood management would increase carbon storage approximately 500 cubic feet per acre per decade (Hann 2003), which is equal to about 6.1 metric tonnes of stored carbon per acre per decade or 0.6 metric tonnes per acre per year. Within 3 years after thinning, the carbon emission level (1.4 tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 20 years of tree growth (Table 3-22).

Table 3-22. Alternative 2: Carbon Emissions and Storage for 20-year Analysis Period—Commercial Thinning, Density Management (40 and 60%), Selection Harvest (60%), and Small Diameter Thinning/Hardwood Management

Silviculture Treatment	Acres	Emissions 2010-2030	Live Tree Storage			Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
			Current Conditions 2010	20-year Analysis Period	Net Change Live Trees			
CT/DM (40%)	742	1,261	46,746	50,456	3,710	3,710	7,420	6,159
DM (60%)	243	559	14,823	12,879	-1,944	1,215	-729	-1,288
SC (40%)	679	5,160	74,690	50,925	-23,765	12,222	-11,543	-16,703
SC (60%)	204	938	19,992	15,708	-4,284	2,244	-2,040	-2,978
SDT/HM	1115	1,561	59,095	64,670	5,575	4,460	10,035	8,474
Total	2,983	9,479	215,346	194,638	-20,708	23,851	3,143	-6,336

CT=Commercial Thinning DM=Density Management SC=Selection Harvest
SDT/HM= Small Diameter Thinning/Hardwood Management

Continued forest growth following selection harvest (40% canopy cover) would increase carbon storage approximately 600 cubic feet per acre per decade (Hann 2003), which is equal to about 7.3 metric tonnes of stored carbon per acre per decade or 0.7 metric tonnes per acre per year. Within 11 years after harvest, the carbon emission level (7.6 tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 65 years of tree growth.

Stand regrowth following selection harvest (60% canopy cover) would increase carbon storage approximately 500 cubic feet per acre per decade (Hann 2003), which is equal to about 6.1 metric tonnes of stored carbon per acre per decade or 0.6 metric tonnes per year. Within 8 years after harvest, the carbon emission level (4.6 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 45 years of tree growth.

In northern GFMA regeneration harvest, forest growth would increase stand volume about 80 cubic feet per decade, which is equal to 1.0 metric tonnes of stored carbon per acre per decade or 0.1 metric tonnes per year for the first 60 years. Additionally, 400 tree seedlings per acre would be planted in the understory. After age 60, stand growth would accelerate to an average of 1,200 cubic feet or 14.6 metric tonnes per acre per decade until the end of the 120-year analysis period. Within 65 years after regeneration harvest, the carbon emission level for the 120-year analysis period would be offset by carbon storage in tree growth. After 120 years of growth, the carbon stored in live trees would be about 131 metric tonnes per acre, well above the preharvest level of 77 metric tonnes per acre (Table 3-24).

In southern GFMA regeneration harvest, forest growth would increase stand volume about 400 cubic feet per decade, which is equal to 4.9 metric tonnes of stored carbon per acre per decade or 0.5 tonnes per year. Additionally, 400 tree seedlings per acre would be planted in the understory. Within 17 years after regeneration harvest, the carbon emission level for the 120-year analysis period would be offset by carbon storage in tree growth. After 120 years of growth, the carbon stored in live trees would be about 113 metric tonnes per acre, well above the preharvest level of 98 metric tonnes per acre (Table 3-23).

Table 3-23. Alternative 2: Carbon Emissions and Storage for 120-year Analysis Period —Regeneration Harvest

Silviculture Treatment	Acres	Emissions 2010-2130	Live Tree Storage			Harvested Wood Storage 2110	Total Storage Increase	Net Carbon (Storage or Emission)
			Current Conditions 2010	120-year Analysis Period	Net Change Live Trees			
Northern GFMA	9	59	693	1179	486	100	586	527
Southern GFMA	258	2,193	25,284	29,154	3,870	3,767	76,37	5,444
Total	**267**	**2,252**	**25,977**	**30,333**	**4,356**	**3,867**	**8,223**	**5,971**

3.8.4.3 Effects of Alternative 3 on Carbon Storage

Alternative 3 applies silviculture treatments that would increase landscape resiliency to environmental disturbances and increase stand structural diversity (Table 3-24). Dispersal and nesting, roosting, and foraging habitat within active northern spotted owl home ranges (1.3-mile radius) would be treated and maintained. Structurally complex stands on matrix lands, as defined by Recovery Action 32 (U.S. Fish and Wildlife Service 2008), are reserved from management actions. All trees 150 years and older would be retained.

Table 3-24. Proposed Silviculture Treatments in Alternative 3

Silviculture Treatment	Treatment Acres
Dry Forest Management <120 years old (40% canopy cover)	671
Dry Forest Management >120 years old (40% canopy cover)	1,055
Dry Forest Management <120 years old (60% canopy cover)	202
Dry Forest Management >120 years old (60% canopy cover)	239
Small Diameter Thinning/ Hardwood Management	1,115
Total	**3,282**

Dry forest management <120 years old (40% canopy cover) would remove about 5,915 board feet per acre; 5,915 board feet contains about 6 metric tonnes of carbon. The average stand treated using the dry forest management <120 years (40% canopy cover) system would be reduced from 63 metric tonnes of live tree carbon to 51 metric tonnes per acre, with 12 metric tonnes transferred to other pools. A carbon analysis period of 20 years is used to reflect the potential of another entry after 20 years.

Dry forest management >120 years old (40% canopy cover) would remove 15,308 board feet per acre; 15,308 board feet contains about 17 metric tonnes of carbon. Dry forest management >120 years old (40% canopy cover) stands would be reduced from 73 metric tonnes of live tree carbon to 42 metric tonnes per acre, with 31 metric tonnes transferred to other pools. A 20-year carbon analysis period is used to reflect the potential of another harvest entry after 20 years.

Dry forest management <120 years old (60% canopy cover) would have harvest volumes of 6,411 board feet per acre; 6,411 board feet contains about 7 metric tonnes of carbon. Dry forest management <120 years old (60% canopy cover) stands would be reduced from 61 metric tonnes per acre to 48 metric tonnes per acre, resulting in the transfer of 13 metric tonnes of live tree carbon to other pools (onsite dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

Dry forest management >120 years old (60% canopy cover) would have harvest volumes of 13,253 board feet per acre; 13,253 board feet contains about 15 metric tonnes of carbon. Dry forest management >120 years old (60% canopy cover) stands would be reduced from 98 metric tonnes per acre to 71 metric tonnes per acre, resulting in the transfer of 27 metric tonnes of live tree carbon to other pools (on-site dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

Small diameter thinning/hardwood management combined would remove 4,877 board feet per acre, which contains about 5 tonnes of carbon. The average small diameter thinning/hardwood management stands would be reduced from 53 tonnes per acre of live tree carbon to 43 tonnes per acre, resulting in a transfer of 10 tonnes of live tree carbon to other pools. A carbon analysis period of 20 years is used.

Of the total amount of carbon in harvested wood, 36.2% of the volume is used as sawlogs and the remaining 63.8% as pulpwood (USDA 1999).

Harvested Wood Carbon Emissions

Dry Forest Management <120 years (40% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of 1.5 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.23 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be 1.7 metric tonnes per acre. The balance of the carbon, 5 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Dry Forest Management >120 years (40% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of 4.4 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.64 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 5.0 metric tonnes per acre. The balance of the carbon, 13 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Dry Forest Management <120 years (60% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of 2.0 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.31 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 2.3 metric tonnes per acre. The balance of the carbon, 5 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Dry Forest Management >120 years (60% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 4.0 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.57 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be 4.6 metric tonnes per acre. The balance of the carbon, 11 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Small Diameter Thinning/Hardwood Management, 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 1.2 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.19 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 1.4 metric tonnes per acre. The balance of the carbon, 5 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Carbon Dioxide Emission

The total carbon dioxide emitted during the 20-year analysis period is considered negligible in the context of total U.S. carbon dioxide emissions of 6 billion metric tonnes (U.S. Department of Energy 2009).

Dry forest management <120 years old (40% canopy cover) in Alternative 3 would result in the emission of about 1.7 metric tonnes of carbon per acre or about 6 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Harvest in 776 acres would result in the emission of 4,656 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000008% of current U.S. emissions.

Dry forest management >120 years old (40% canopy cover) in Alternative 3 would result in the emission of about 5 metric tonnes of carbon per acre or about 18 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Harvest in 998 acres would result in the emission of 17,964 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.000003% of current U.S. emissions.

Dry forest management <120 years old (60% canopy cover) in Alternative 3 would result in the emission of about 2.3 metric tonnes of carbon per acre or about 8 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Harvest in 189 acres would result in the emission of 1,512 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000002% of current U.S. emissions.

Dry forest management >120 years old (40% canopy cover) in Alternative 3 would result in the emission of about 4.6 metric tonnes of carbon per acre or about 17 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Harvest of 204 acres would result in the emission of 3,468 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000006% of current U.S. emissions.

Small diameter thinning/hardwood management in Alternative 3 would result in the emission of about 1.4 metric tonnes of carbon per acre or about 5 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Small diameter thinning/hardwood management of 1115 acres would result in the emission of 5,575 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000009% of current U.S. emissions.

Live Tree Carbon Storage

Continued forest growth following dry forest management <120 years old (40% canopy cover) would increase carbon storage approximately 800 cubic feet per acre per decade (Hann 2003), which is equal to about 9.8 metric tonnes of stored carbon per acre per decade or 1.0 metric tonnes per acre per year. Within 2 years after treatment, the carbon emission level (1.7 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 25 years of tree growth.

Forest regrowth following dry forest management <120 years old (40% canopy cover) would increase carbon storage approximately 600 cubic feet per acre per decade (Hann 2003), which would be equal to about 7.3 metric tonnes of stored carbon per acre per decade or 0.7 metric

tonnes per acre per year. Within 11 years after harvest, the carbon emission level (7.6 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 65 years of tree growth.

Forest regrowth following dry forest management <120 years old (60% canopy cover) would increase carbon storage approximately 400 cubic feet per acre per decade (Hann 2003), which would be equal to about 4.9 metric tonnes of stored carbon per acre per decade or 0.5 metric tonnes per acre per year. Within 5 years after thinning, the carbon emission level (2.3 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 35 years of tree growth.

Stand regrowth following dry forest management >120 years old (60% canopy cover) would increase carbon storage approximately 500 cubic feet per acre per decade (Hann 2003), which is equal to about 6.1 metric tonnes of stored carbon per acre per decade or 0.6 metric tonnes per acre per year. Within 8 years after thinning the carbon emission level (4.6 metric tonnes per acre) for the 20 year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 45 years of tree growth.

Conifer and hardwood regrowth following small diameter thinning/hardwood management would increase carbon storage approximately 500 cubic feet per acre per decade (Hann 2003), which is equal to about 6.1 metric tonnes of stored carbon per acre per decade or 0.6 metric tonnes per acre per year. Within 3 years after thinning, the carbon emission level (1.4 tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 20 years of tree growth (Table 3-25).

Table 3-25. Alternative 3: Carbon Emissions and Storage for 20-year Analysis Period—Dry Forest Restoration (40% and 60% canopy cover) and Small Diameter Thinning/ Hardwood Management

Silviculture Treatment	Acres	Emissions 2010-2030	Live Tree Storage			Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
			Current Conditions 2010	20-year Analysis Period	Net Change Live Trees			
DFM <120 (40%)	776	1,319	48,888	52,768	3,880	3,880	7,760	6,441
DFM >120 (40%)	998	4,990	72,854	83,832	10,978	12,974	23,952	18,962
DFM <120 (60%)	189	435	11,529	10,017	-1,512	945	-567	-1,002
DFM >120 (60%)	204	938	19,992	15,708	-4,284	2,244	-2,040	-2,978
SDT/HM	1115	1,561	59,095	64,670	5,575	4,460	10,035	8,474
Total	**3,282**	**9,243**	**212,358**	**226,995**	**14,637**	**24,503**	**39,140**	**29,897**

DFM=Dry Forest Management SDT/HM=Small Diameter Thinning/Hardwood Management

3.8.4.4 Effects of Alternative 4 on Carbon Storage

In Alternative 4, density management and selection harvest are planned to reduce stand densities (Table 3-26). Northern spotted owl habitat that is currently defined as structurally complex; dispersal; or nesting, roosting, and foraging would not be altered to the extent that the current habitat designation is downgraded. Structurally complex stands, as defined by Recovery Action 32 in the 2008 Northern Spotted Owl Recovery Plan, are reserved from management actions. No regeneration harvests are proposed.

Table 3-26. Proposed Silviculture Treatments in Alternative 4

Silviculture Treatment	Treatment Acres
Density Management (40% canopy cover)	704
Density Management (60% canopy cover)	281
Selection Harvest (40% canopy cover)	880
Selection Harvest (60% canopy cover)	211
Small Diameter Thinning/Hardwood Management	1,115
Total	**3,191**

Density management (40% canopy cover) would remove about 5,915 board feet per acre of harvested wood; 5,915 board feet contains approximately 6 metric tonnes of carbon. The amount of live tree carbon in commercial thinning (40% canopy cover) stands and density management (40% canopy cover) stands would be reduced from approximately 63 metric tonnes per acre to 51 metric tonnes per acre, resulting in the transfer of 12 metric tonnes of live tree carbon to other pools (onsite dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

Density management (60% canopy cover) would remove about 6,411 board feet per acre; 6,411 board feet contains about 7 metric tonnes of carbon. The average stand treated using density management (60% canopy cover) would be reduced from 61 metric tonnes of live tree carbon to 48 metric tonnes per acre, with 13 metric tonnes transferred to other pools. A carbon analysis period of 20 years is used.

Selection harvest (40% canopy cover) would remove 22,393 board feet per acre of harvested wood; 22,393 board feet per acre contains about 25 metric tonnes of carbon. The average selection harvest (40% canopy cover) stand would be reduced from 110 metric tonnes per acre of live tree carbon to 64 metric tonnes per acre, resulting in a transfer of 46 metric tonnes of live tree carbon to other pools. A carbon analysis period of 20 years is used.

Selection harvest (60% canopy cover) would remove 13,253 board feet per acre; 13,253 board feet per acre contains about 15 metric tonnes of carbon. Selection harvest (60% canopy cover) stands would be reduced from 98 metric tonnes per acre of live tree carbon to 71 metric tonnes per acre, resulting in a transfer of 27 metric tonnes of live tree carbon to other pools. A carbon analysis period of 20 years is used.

Small diameter thinning/hardwood management combined would remove approximately 4,877 board feet per acre, which contains about 5 tonnes of carbon. The average small diameter thinning/hardwood management stands would be reduced from 53 tonnes per acre of live tree

carbon to 43 tonnes per acre, resulting in a transfer of 10 tonnes of live tree carbon to other pools. A carbon analysis period of 20 years is used.

Of the total amount of carbon in harvested wood, 36.2% of the volume is used as sawlogs and the remaining 63.8% as pulpwood (USDA 1999).

Harvested Wood Carbon Emissions

Density Management (40% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of 1.5 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.23 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 1.7 metric tonnes per acre. The balance of the carbon, 5 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Density Management (60% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 2.0 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.31 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 2.3 metric tonnes per acre. The balance of the carbon, 5 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Selection Harvest (40% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of 6.7 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.94 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 7.6 metric tonnes per acre. The balance of the carbon, 18 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Selection Harvest (60% canopy cover), 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 4.0 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.57 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 4.6 metric tonnes per acre. The balance of the carbon, 11 metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Small Diameter Thinning/Hardwood Management, 20-year analysis period:

Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 1.2 metric tonnes per acre. In the long-term (11-20 years), the carbon emitted would be 0.19 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 1.4 metric tonnes per acre. The balance of the carbon, 5

metric tonnes per acre, would remain stored in products still in use or in landfills, or emitted with energy capture.

Carbon Dioxide Emission

The total carbon dioxide emitted during the 20- and 120-year analysis periods is considered negligible in the context of total U.S. carbon dioxide emissions of 6 billion metric tons (U.S. Department of Energy 2009).

Density management (40% canopy cover) in Alternative 4 would result in the emission of about 1.7 metric tonnes of carbon per acre or about 6 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Density management on 704 acres would result in the emission of 4,224 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000007% of current U.S. emissions.

Density management (60% canopy cover) in Alternative 4 would result in the emission of about 2.3 metric tonnes of carbon per acre or about 8 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Density management on 281 acres would result in the emission of 2,248 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000004% of current U.S. emissions.

Selection harvest (40% canopy cover) in Alternative 4 would result in the emission of about 7.6 metric tonnes of carbon per acre or about 28 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Selection harvest of 880 acres would result in the emission of 24,640 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.000004% of current U.S. emissions.

Selection harvest (60% canopy cover) in Alternative 4 would result in the emission of about 4.6 metric tonnes of carbon per acre or about 17 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Selection harvest of 211 acres would result in the emission of 3,587 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000006% of current U.S. emissions.

Small diameter thinning/hardwood management in Alternative 4 would result in the emission of about 1.4 metric tonnes of carbon per acre or about 5 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Small diameter thinning/hardwood management of 1115 acres would result in the emission of 5,575 metric tonnes of carbon dioxide. The carbon dioxide emission represents 0.0000009% of current U.S. emissions.

Live Tree Carbon Storage

Continued forest growth following density management (40% canopy cover) would increase carbon storage approximately 800 cubic feet per acre per decade (Hann 2003), which is equal to about 9.8 metric tonnes of stored carbon per acre per decade or 1.0 metric tonnes per acre per year. Within 2 years after harvest, the carbon emission level (1.7 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 25 years of tree growth.

Conifer regrowth following density management (60% canopy cover) would increase carbon storage approximately 400 cubic feet per acre per decade (Hann 2003), which is equal to about 4.9 metric tonnes of stored carbon per acre per decade or 0.5 metric tonnes per acre per year. Within 5 years after harvest, the carbon emission level (2.3 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 35 years of tree growth.

Continued forest growth following selection harvest (40% canopy cover) would increase carbon storage approximately 600 cubic feet per acre per decade (Hann 2003), which is equal to about 7.3 metric tonnes of stored carbon per acre per decade or 0.7 metric tonnes per acre. Within 11 years after harvest, the carbon emission level (7.6 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 65 years of tree growth.

Stand regrowth following selective cut harvest (60% canopy cover) would increase carbon storage approximately 500 cubic feet per acre per decade (Hann 2003), which is equal to about 6.1 metric tonnes of stored carbon per acre per decade or 0.6 metric tonnes per acre per year. Within 8 years after harvest, the carbon emission level (4.6 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 45 years of tree growth.

Conifer and hardwood regrowth following small diameter thinning/ hardwood management would increase carbon storage approximately 500 cubic feet per acre per decade (Hann 2003), which is equal to about 6.1 metric tonnes of stored carbon per acre per decade or 0.6 metric tonnes per acre per year. Within 3 years after thinning, the carbon emission level (1.4 tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 20 years of tree growth (Table 3-27).

Table 3-27. Alternative 4: Carbon Emissions and Storage for 20-year Analysis Period—Density Management, Selection Harvest, and Small Diameter Thinning/Hardwood Management

Silviculture Treatment	Acres	Emissions 2010-2030	Live Tree Storage			Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
			Current Conditions 2010	20-year Analysis Period	Net Change Live Trees			
DM (40%)	704	1,197	44,352	47,872	3,520	3,520	7,040	5,843
DM (60%)	281	646	17,141	14,893	-2,248	1,405	-843	-1,489
SC (40%)	880	6,688	96,800	66,000	-30,800	15,840	-14,960	-21,648
SC (60%)	211	971	20,678	16,247	-4,431	2,321	-2,110	-3,081
SDT/HM	1115	1,561	59,095	64,670	5,575	4,460	10,035	8,474
Total	**3,191**	**11,063**	**238,066**	**209,682**	**-28,384**	**27,546**	**-838**	**-11,901**

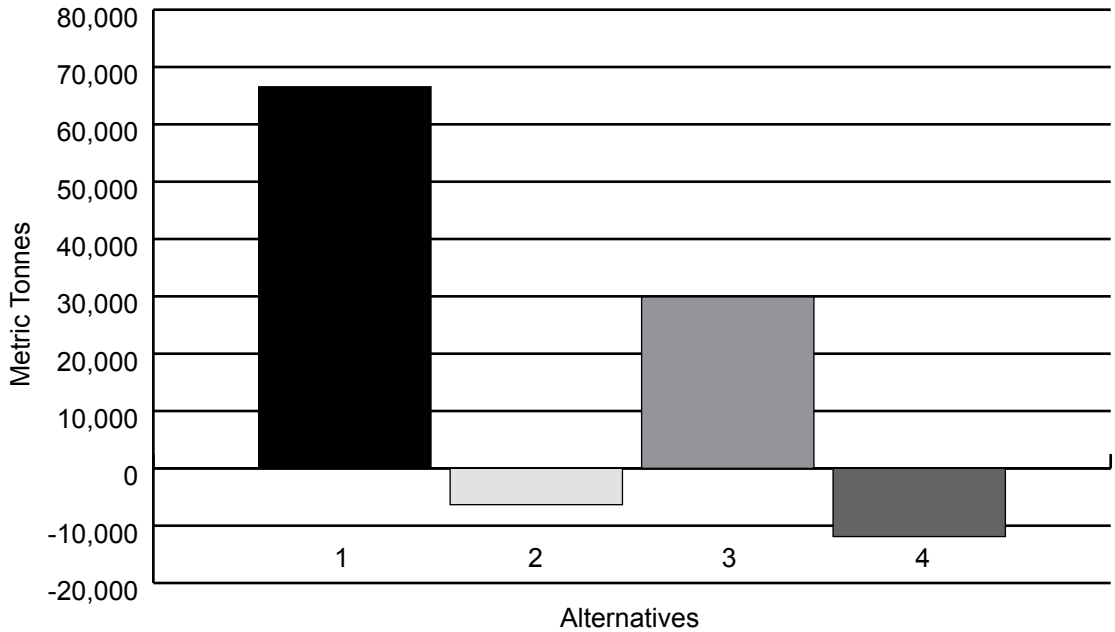
3.8.4.5 Summary—Comparison of Alternatives

The no action alternative would result in greater net carbon storage over the 20-year analysis period than Alternative 2 by approximately 71,893 metric tonnes, Alternative 3 by 35,660 metric tonnes, and Alternative 4 by 77,458 metric tonnes (Table 3-28 and Figure 3-12).

Table 3-28. Evans Creek Carbon Emissions and Storage in Metric Tonnes for 20-year Analysis Period

Alternative	Acres	Emissions 2010-2030	Live Tree Storage			Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
			Current Conditions 2010	20-year Analysis Period	Net Change			
1	2,983	0	216,804	282,361	65,557	0	65,557	65,557
2	2,983	9,479	215,346	194,638	-20,708	23,851	3,143	-6,336
3	3,282	9,243	212,358	226,995	14,637	24,503	39,140	29,897
4	3,191	11,063	238,066	209,682	-28,384	27,546	-838	-11,901

Figure 3-12. Net carbon storage or emission for the 20-year analysis period.

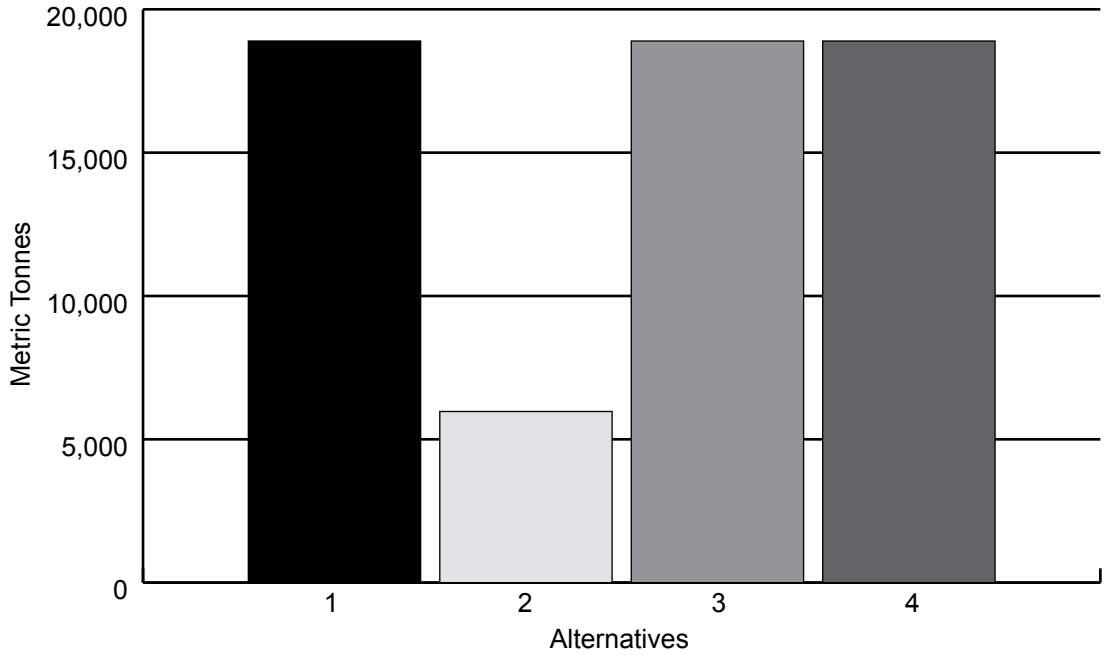


Alternative 1 (No Action) would result in greater net carbon storage over the 120-year analysis period than Alternative 2 by approximately 12,923 tonnes; Alternatives 3 and 4 would be the same as Alternative 1 (Table 3-29 and Figure 3-13).

Table 3-29. Evans Creek Carbon Emissions and Storage in Metric Tonnes for 120-year Analysis Period

Alternative	Acres	Emissions 2010-2130	Live Tree Storage			Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
			Current Conditions 2010	120-Year Analysis Period	Net Change			
1	267	0	25,977	44,871	18,894	0	18,894	18,894
2	267	2,252	25,977	30,333	4,356	3,867	8,223	5,971
3	267	0	25,977	44,871	18,894	0	18,894	18,894
4	267	0	25,977	44,871	18,894	0	18,894	18,894

Figure 3-13. Net carbon storage for the 120-year analysis period.



3.9 Economics

This section analyzes the potential impacts from the proposed forest management activities on economics. Terms used in this section are defined as follows:

Pond value. The amount a mill will pay for a log delivered to the mill location.

3.9.1 Methodology

- Economics focuses on the project objective of providing a sustainable supply of forest commodities from matrix lands to provide jobs and contribute to community stability (Bureau of Land Management 1995, 38). In addition to commodity supply, evaluation of the economic feasibility of management actions is a consideration in project design (Bureau of Land Management 1995, 179-180).
- Economic values that are assessed include total commodity output (wood fiber harvested), total dollar return to the Federal Treasury, and dollar value per unit of output. Units of output are measured as MBF (thousand board feet) of harvest for sawlog material and bone dry ton (BDT) for forest biomass that is used. The values used per MBF of harvest are based on December 2010 prices for Douglas-fir ($360 per MBF). The values used per BDT of forest biomass used are based on a January 2011 quoted price for delivered material to a Medford, Oregon biomass plant ($28 per BDT). Level of commodity output provides the basis for assessing commodity supply, resultant employment levels, and estimates of net revenue and revenue per unit of output to the Federal Treasury. Positive net revenue serves as an indicator of economic feasibility and revenue per unit of output indicates the level of economic efficiency.
- The economic effects of noncommodity-based activities are only assessed where there is a correlation to commodity supply. Use of forest biomass over traditional slash treatment is one such activity. Other management actions, such as habitat improvement

or fuel hazard reduction, have economic effects; however, the primary focus of these actions is not for inputs to the economy but to provide for resource enhancement. As a result, the economic effects of these actions are recognized but are not a primary decision factor in considering implementation of an action alternative.

3.9.2 Assumptions

- Affected employment levels per MMBF (million board feet) processed is 9.07 jobs in the solid wood products industry (USDA and USDI 1994, 3&4-293).
- Employment levels for forest residue utilization (biomass) are 6 jobs per megawatt of installed electrical generation capacity (Oregon Forests Resources Institute 2006, 2-44). For assessment purposes, this roughly equates to 7,500 BDT to produce 1 megawatt or 1,250 BDT per full-time equivalent jobs.
- Economic values are static and intended to provide for a relative comparison among alternatives.
- Average harvest levels are from historical yields of treatments in the Butte Falls Resource Area similar to those proposed in the Evans Creek Project Area. Assumed harvest levels range from 23 MBF per acre, for more intensive regeneration harvest prescriptions, to 3.5 MBF per acre for lower volume harvest areas such as density management and commercial thinning prescriptions.

3.9.3 Affected Environment

A regional perspective of the economic setting is provided in the Northwest Forest Plan (USDA and USDI 1994, 3&4 261-319). One primary variation from the economic setting regarding commodity production from Federal lands is that actual timber harvest levels have lagged behind levels projected in the Northwest Forest Plan (Bureau of Land Management 2005, 36). During the first 10 years of Northwest Forest Plan implementation (1995-2004), the total BLM timber volume offered for sale by the Medford District averaged 77% of the planned 571 MMBF levels. From 2005 to 2010, the Medford District BLM offered 49% of the target harvest level of 342 MMBF. The overall reduction in timber harvest across all ownerships in the region has resulted in a demand for logs in western Oregon that is being filled with log imports (Bureau of Land Management 2005, 35).

More recently there has been an identified need for increasing the utilization of forest biomass that is created as a by-product of management activities. Agency direction is to develop and supply market infrastructure that uses biomass for commercial purposes over more traditional disposal methods such as open burning. Recent legislation and executive policies addressing this include:

- Biomass Research and Development Act of 2000
- 2000 National Fire Plan
- 2001 National Energy Policy
- 2003 DOE/DOI/USDA Interagency Memorandum of Understanding (MOU) on Woody Biomass Utilization
- Sections 9006 and 9008 of the 2002 Farm Bill

- Energy Policy Act of 2005
- Biomass Crop Assistance Program (BCAP) 2008
- DOI–Renewable Energy Development Order 2009

Historical and current uses of the Evans Creek fifth field watershed are described in section 3.1.3, Other Actions in the Watershed containing the Project Area. Over the past 70 years, an estimated 42,335 acres of the 59,103 acres of BLM-administered land in the Evans Creek fifth field watershed have had some level of harvest activity. With implementation of the ROD/RMP in 1995, approximately 28,811 acres were designated as lands allocated for timber production (matrix).

Merchantable timber on matrix land is highly dispersed and variable in the stocking levels of merchantable-sized trees. Individual tracts of BLM ownership within the Evans Creek Project Area are fragmented by a mixed ownership pattern with private lands. Individual BLM tracts range from 40 acres up to 640 acres in size. Matrix lands within each tract are further fragmented by varying land use allocations under the ROD/RMP. This, in conjunction with past harvest treatments on these lands, has resulted in the existing stages of development with respect to potential timber supply. Stages of development by general age and merchantability class on BLM land within the Project Area are summarized in Figure 3-14.

Figure 3-14. Distribution of matrix land by stage of development.

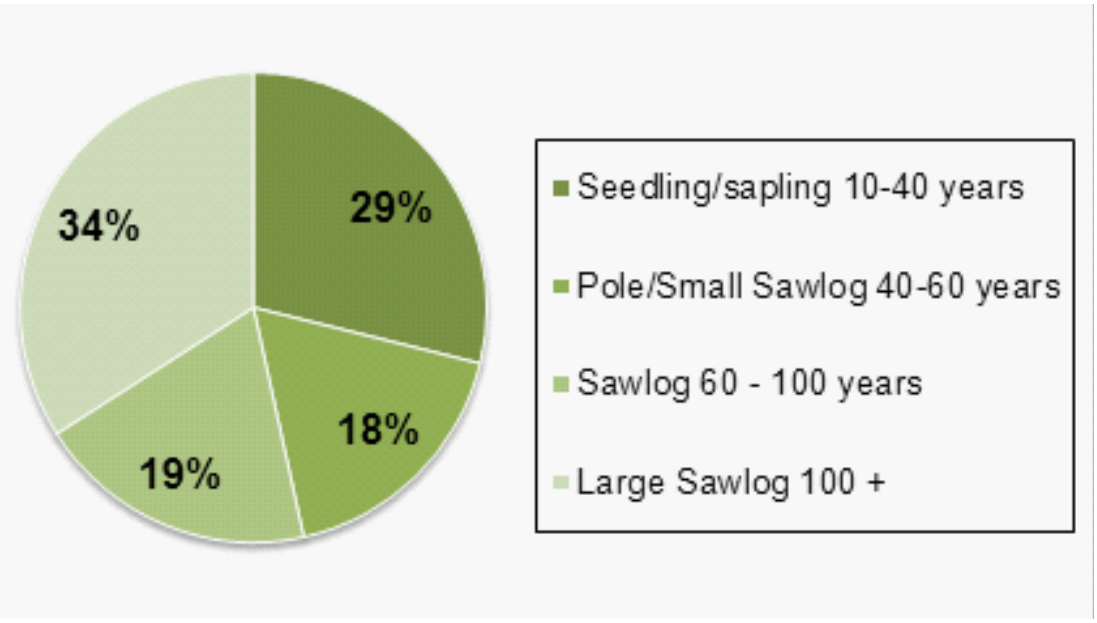


Figure 3-14 shows a fairly regulated condition with respect to commodity supply. Approximately half of the matrix land base exists in a precommercial (seedling/sapling) and developing commercial (pole/small sawlog) condition. Assuming no disturbance occurs, the larger size classes would be expected to increase in representation over time with younger-aged stands becoming less prevalent on the land base. Treatment under existing management direction would tend to accelerate growth to the next development stage through thinning of the younger size classes. The seedling-to-pole size class would be maintained through regeneration of the large sawlog component.

Economic factors that affect the supply of forest commodities in an economically feasible manner are the amount and distribution of material available for harvest, method of harvest, access to harvest areas, and associated costs to mitigate the effects of harvest such as slash treatment. These factors considered individually or collectively have an effect on the economic feasibility (positive net revenue) and economic efficiency (revenue per unit of harvest) of harvest proposals.

The amount and distribution of commercial forest products existing on matrix lands is interrelated with access and method of harvest. Harvest of timber stands with a relatively higher harvest volume per acre in a concentrated area will result in lower access and removal costs compared to stands with relatively lower harvest volumes located in a more dispersed pattern.

Common methods of harvest (yarding trees from stump to truck) are a primary factor affecting actual harvest costs. Tractor yarding is the least-cost method of removal, with cable yarding incurring a higher removal cost, and helicopter yarding the most costly removal method. Appropriate harvest methods vary and are generally based on management objectives in conjunction with site conditions such as access, topography, and available harvest volume. Where lower cost harvest methods can be used, economic efficiency is increased. Economic feasibility is affected when relatively lower harvest volumes or values are associated with higher cost yarding methods.

Tractor yarding is proposed in the Evans Creek project. Important factors to consider in determining economic feasibility of ground-based yarding systems (tractor, skidder) are the maximum yarding distance and the average yarding distance to the landing. Maximum yarding distance varies by the type of ground-based equipment used. Typical logging operations in this area would use either crawler tractors or rubber-tired skidders. The maximum yarding distances are 700 feet for tractors and 1,000 feet for skidders (Washington State University Extension 1999, 8). Optimum average yarding distance is in the 500- to 700-foot range for this equipment. Slope is a limiting factor for tractor logging in Evans Creek. Tractor logging is limited to slopes less than 20% on fragile soils and 35% on other soil types.

Cable and helicopter yarding are proposed on the steeper sloped units within the Project Area. Strategically located existing roads or new roads generally at the top of units are needed to feasibly harvest units using cable yarding systems. Optimum yarding distance for skyline cable yarding systems is 1,000 feet with a maximum yarding distance capability of 4,000 feet. Harvest volume per acre, size of harvest trees and move-in and move-out costs are other important factors that contribute to an economically feasible cable yarding operation.

Limited road access and other topographic features such as convex slopes, uneven terrain, and long constant slopes can present difficulties for cable yarding systems. Where these difficulties cannot be engineered around or where environmental issues limit road construction or ground disturbance then helicopter yarding can be considered if economically feasible. Optimum yarding distance for helicopter yarding is approximately 2,500 to 5,000 feet with a maximum distance of 3 to 4 miles. Local experience has shown that operations are optimum at 2,500 feet with a maximum distance of 1.0 mile. Harvest volume per acre and size and weight of harvest trees are other important factors that contribute to an economically feasible helicopter operation.

Access to harvest areas is a factor with respect to the number of road systems needed and the condition of those roads. Cost factors include the level of road improvement needed for hauling harvest material, road surface condition with respect to length of operating season, use restrictions during wet conditions, and move-in and move-out costs of equipment where multiple road systems are used for access. Economic feasibility and efficiency is reduced where road improvement costs and the number of road miles or road systems needed for harvest access increase.

Mitigation of harvest effects includes costs such as ripping compacted soils, decommissioning or closing roads, treating harvest slash, and operating under seasonal restrictions. The cost and level of mitigation needed is situation dependent.

Costs of removing biomass or other lower valued timber products (firewood, poles) from young stands would be relatively higher for all logging systems because of the lower value of the product removed. These costs, offset by the value of the product removed, would have to be considered in regards to the overall benefits of the treatments as compared to other options where removal of the product is not achieved or no treatment occurs.

3.9.4 Environmental Consequences

3.9.4.1 Effects of Alternative 1 (No Action) on Economics

Direct and Indirect Effects

Under the No Action Alternative, management action would be deferred. There would be no timber volume from the Project Area in fiscal years 2011-2014 to contribute toward the District's annual allowable sale quantity and there would be no return to the Federal Treasury. Under this alternative timber harvest would not provide any forestry-related jobs. This would include jobs directly related to the timber harvest such as timber fallers, logging crews, log truck drivers, road crews, and sawmill employees.

The small diameter thinning project and the special forests products program would not provide additional timber volume, biomass, or special forest products resulting in both direct and indirect loss of jobs. Forestry-related jobs for both commercial and noncommercial thinning would not be provided. A variety of special forests products for individual use or independent small businesses would not be available from the Project Area. Jobs associated with the harvest of these products would not be provided. Firewood would not be provided for the public from these activities contributing to potentially higher energy costs for individuals who would normally depend on available firewood for heating their home.

Indirectly, fire suppression costs would be higher because fuel loads on planned timber harvest and small diameter thinning treatments would not be reduced. Also, water source restoration would not occur which would limit access and water availability if a fire occurred in the Project Area. No action would cause the potential for increased fire suppression costs because of higher severity fires, limited safe access to areas, and reduced water availability.

Cumulative Effects

Under the No Action Alternative, there would be no contribution to the Medford District's Allowable Sale Quantity for fiscal years 2011-2014 from the Project Area. Given the management direction to produce a sustainable supply of timber from matrix lands, the supply and resulting economic affects would fall short of projected levels for these fiscal years. Opportunities for future timber harvest in the short- and long-term would remain unchanged in the Evans Creek fifth field watershed. With no action, there would be a lost opportunity in maximizing or improving growth potential in mature stands (100 years and older) and in younger stands where densities are high (Section 3.2, Forest Condition).

No known future timber harvest, small diameter thinning, or restoration projects are planned within the Project Area. Fuels treatment projects proposed in the Butte Falls Hazardous Fuels Reduction project would continue to occur on identified areas. These projects are currently under contract with anticipated treatments to occur within the next 3 years.

3.9.4.2 Effects of Alternative 2 (Proposed Action) on Economics

Direct and Indirect Effects

Under Alternative 2, approximately 17 MMBF would be harvested on 2,135 acres resulting in an estimated harvest of 8 MBF per acre. The economic factor that varies by alternative and influences logging costs is volume harvested per acre. Volume harvested per acre is a critical consideration in determining feasibility of logging systems. All action alternatives consider tractor, skyline, and helicopter yarding systems with only slight differences in acres per alternative. Alternative 2 has the estimated maximum harvest volume per acre of the three action alternatives. Direct employment as a result of timber harvest and processing a commodity would result in approximately 154 full-time equivalent jobs. The estimated return to the Federal Treasury for timber harvest would be $52.31 per MBF for a total value of approximately $893,520 for this alternative.

Due to current market conditions, the estimated cost of helicopter yarding exceeds the value of the timber delivered to the mill (pond value). At this time, the return to the government would be greater from harvesting only the skyline and tractor units and deferring the helicopter units until economic conditions are more favorable to helicopter logging. Proposed harvest of the tractor and skyline units would result in approximately 9 MMBF being harvested with an estimated return to the Federal Treasury of $147.08 per MBF for a total value of approximately $1,463,760.

Small diameter thinning would remove an estimated 1.5 MMBF and 10,800 BDTs of biomass. The estimated employment resulting from the combined thinning and biomass utilization would be equivalent to 23 jobs. Although economic values are assumed to be static for this analysis, positive net revenue from biomass utilization is sensitive to price fluctuations in the biomass market.

Individuals and small businesses would have a local supply of special forest products available, which would contribute to the local sustainable community. Increased supply of public and commercial firewood would contribute to keeping local energy costs down.

The economic effects of the proposed small diameter thinning, special forest products, and firewood projects would be the same for all action alternatives.

Indirectly, fire suppression costs would be lower due to the reduced fuel load on 1,868 acres of commercial thinning, density management, and selection harvest and 1,115 acres of small diameter thinning, along with the associated activity fuels treatment. Regeneration harvest of 267 acres is not expected to reduce fuel loading. Water source restoration would aid in reducing fire suppression costs by supplying firefighters with better access to larger quantities of water.

Cumulative Effects

Alternative 2 would meet ROD/RMP requirements to provide for harvest activity on approximately 1,174 acres in the Project Area. Harvest prescriptions such as commercial thin, regeneration harvest, and selection harvest would maximize harvest volume and net revenue to the Treasury from commercial stands, and improve future timber supply potential in developing stands through thinning and regeneration treatments. Approximately 961 acres would have modified ROD/RMP treatments; volume growth capability would not be maximized but would be increased on the areas treated. Harvest under Alternative 2 would contribute 18.5 MMBF to the Medford District's Allowable Sale Quantity for fiscal years 2011-2014 and supply an estimated 10,800 tons of biomass.

Future timber supply from the 267 acres of proposed regeneration harvest would not be provided again until an initial commercial thinning treatment in 40 to 60 years. The remaining 1,868 acres of proposed timber harvest treatments on matrix lands could be available for harvest again in 10 to 20 years. Increased growth resulting from the small diameter thinning projects would also be accelerated and move these stands to more economical commercially viable treatments in 10 to 20 years.

In the long-term, volume growth capability would be maximized on approximately 1,174 acres and increased, but not maximized, on the remaining areas treated (see section 3.2, Forest Condition).

3.9.4.3 Effects of Alternative 3 on Economics

Direct and Indirect Effects

Under Alternative 3, approximately 16 MMBF would be harvested on 2,167 acres resulting in an estimated harvest of 7.5 MBF/acre. Direct employment as a result of timber harvest and processing a commodity would result in approximately 145 full-time equivalent jobs. The estimated return to the Federal Treasury for timber harvest would be $51.34 per MBF for a total value of approximately $834,375 for this alternative.

Due to current market conditions estimated costs of helicopter logging exceeds the value of timber delivered to the mill (pond value). At this time the return to the government would be greater from harvesting only the skyline and tractor units and deferring the helicopter units until economic conditions were more favorable to helicopter logging. Proposed harvest of the tractor and skyline units would result in approximately 9 MMBF being harvested with an

estimated return to the Federal Treasury of $146.96 per MBF for a total value of approximately $1,382,175 for this alternative.

For this analysis the same pond value was used to compare all alternatives. Pond value is influenced by the size and grade (quality) of the logs. Alternative 3 would not harvest any trees over 150 years old. Typically these older larger trees are of greater value because they would have a greater percentage of higher grade wood than the smaller, younger trees. The economic value of this higher valued wood would not be recovered in this alternative. This is likely to reduce the pond value of this alternative and lower the estimated return to the Federal Treasury.

Indirectly, fire suppression costs would be lower due to reduced fuel loads on 2,167 acres of dry forest management and 1,115 acres of small diameter thinning along with associated activity fuels treatment. Water source restoration would aid in reducing fire suppression costs by supplying firefighters with better access to larger quantities of water.

Cumulative Effects

Alternative 3 timber sales and small diameter thinning projects would contribute an estimated 17.5 MMBF to the Medford Districts Allowable Sale Quantity for fiscal years 2011-2014 and an estimated 10,800 tons of biomass. Dry forest management harvest proposed in this alternative would not maximize volume growth capability but growth would be increased in the areas treated.

Future timber supply from 2,167 acres of proposed dry forest management could be available for harvest again in 10 to 20 years. Increased growth resulting from the small diameter thinning projects would also be accelerated and move these stands to more economical commercial treatments in 10 to 20 years.

3.9.4.4 Effects of Alternative 4 on Economics

Direct and Indirect Effects

Under Alternative 4, approximately 14 MMBF would be harvested on 2,076 acres resulting in an estimated harvest of 7 MBF/acre. Direct employment as a result of timber harvest and processing a commodity would result in approximately 127 full-time equivalent jobs. The estimated return to the Federal Treasury for timber harvest would be $52.42 per MBF for a total value of approximately $761,768 for this alternative.

Due to current market conditions estimated costs of helicopter logging exceeds the value of timber delivered to the mill (pond value). At this time, the return to the government would be greater from harvesting only the skyline and tractor units and deferring the helicopter units until economic conditions are more favorable to helicopter yarding. Proposed harvest of the tractor and skyline units would result in approximately 8 MMBF being harvested with an estimated return to the Federal Treasury of $147.01 per MBF for a total value of approximately $1,246,168 for this alternative.

Indirectly, fire suppression costs would be lower due to reduced fuel loads on 2,076 acres of density management and selection harvest and 1,115 acres of small diameter thinning along

with associated activity fuels treatment. Water source restoration would aid in reducing fire suppression costs by supplying firefighters with better access to larger quantities of water.

Cumulative Effects

Under Alternative 4, timber sales and small diameter thinning projects would contribute an estimated 15.5 MMBF to the Medford Districts Allowable Sale Quantity for fiscal years 2011-2014 and an estimated 10,800 tons of biomass. Treatments proposed in this alternative would not maximize volume growth capability but growth would be increased in the areas treated.

Future timber supply from 2,076 acres of proposed treatments could be available for harvest again in 10 to 20 years. Increased growth resulting from the small diameter thinning projects would also be accelerated and move these stands to more economical commercially viable treatments in 10 to 20 years.

3.10 Summary of Effects on Other Resources

The following resources did not pertain to the issues identified and analyzed in the EA. Possible effects to Botanical Resources and Air Quality from the actions proposed in each alternative were included in the appendices for this document. A summary of those effects is included below. See the appendices for a complete discussion.

3.10.1 Botanical Resources

For a complete discussion of existing conditions and analysis of possible impacts from the proposed project, please see Appendix B-Botanical Resources.

3.10.1.1 Effects of Alternatives on Rare Plants

Rare plant categories include Special Status (Federal and State Threatened and Endangered, and Bureau Sensitive) and Survey and Manage vascular plants, lichens, bryophytes, and fungi. The Evans Creek Project Area is partially within the range of the federally endangered *Fritillaria gentneri*. Botanical surveys in or adjacent to timber harvest units have documented nine Special Status or Survey and Manage vascular and nonvascular species, including one *Fritillaria gentneri* site (see Table B-2, Appendix B-Botanical Resources). One incidental sighting of a Survey and Manage fungi was also reported.

The *Fritillaria gentneri* site is located 100 feet from a timber harvest unit proposed for commercial thinning in Alternative 2, dry forest management in Alternative 3, and density management in Alternative 4. Timber harvest would not affect this endangered species because the site is located outside the timber harvest unit. Surveys have been or will be completed prior to implementing any of the proposed projects located within the range of *Fritillaria gentneri.* If sites are discovered, protection measures would be applied. Protection measures would include buffering the site or revising the project to avoid impacts. Implementing the action alternatives would be **"no effect"** to the T&E species *Fritillaria gentneri*.

Other Special Status and Survey and Manage vascular and nonvascular plant sites would be protected with no treatment buffers based on the type of treatment proposed, the species,

current environmental and ecological conditions at the site, and available management recommendations. Because surveys would be completed and rare vascular plant sites protected from direct or indirect effects, the proposed actions would not trend Sensitive plants toward listing or threaten the persistence of S&M plants.

Surveys for Bureau Sensitive and Survey and Manage fungi have not been completed in the Evans Creek Project Area. Fungi surveys will be completed in stands 180 years or older before a decision is signed for activities in those stands. The BLM assumes that conducting surveys for Survey and Manage fungi in stands 180 years or older, protecting known and future found populations, and the presence of late-successional forest stands in reserves across the landscape would prevent Bureau Sensitive species from trending toward listing or threaten a Survey and Manage species' persistence.

3.10.2 Effects of Alternatives on Noxious Weeds

Noxious weeds are plants growing outside their native lands or habitats that are injurious to public health, agriculture, recreation, wildlife, or public or private property. Twelve noxious weed populations have been reported in the Evans Creek watershed (see Table B-6, Appendix B-Botanical Resources).

Soil disturbance and vegetation removal during timber harvest and other proposed management activities could result in the spread or introduction of noxious weeds in the Project Area. PDFs and other mitigation measures would reduce that risk (Table B-7, Appendix B-Botanical Resources). Ongoing weed monitoring, treating noxious weeds as populations are detected, and continuing collaborative weed treatment with outside groups would increase the chances of containing or reducing noxious weeds in the Project Area.

3.10.2 Air Quality

For a complete discussion of existing conditions and analysis of possible impacts from the proposed project, please see Appendix C-Air Quality.

Under Alternative 1, no proposed forest management activities or associated burning would occur. However, the potential of smoke impacts from wildfire events would remain. Impacts to air quality from wildfires are closely related to the amount of biomass material consumed and atmospheric conditions. A high intensity wildfire with heavy fuel loading would cause a high level of emissions.

In Alternatives 2, 3, and 4, proposed activity slash treatments include slashing damaged small trees, lop and scatter, hand-pile and burn, underburn, or biomass removal. Effects from activity slash burning would be short-term and localized. All units are not burned at the same time or even in the same year. There would be negligible direct or indirect effects on air quality within the Project Area.

3.10.3 Visual Resources

BLM-administered lands in the Evans Creek Project Area were identified in the 1995 ROD/RMP for management as VRM Classes III and IV (Bureau of Land Management 1995, 70 and

Map 10). Of the 59,259 acres of BLM-administered lands in the Evans Creek watershed, 10,429 acres are managed as VRM Class III and 48,830 acres are managed as VRM Class IV.

The objective of VRM Class III is to partially retain the existing character of the landscape (Bureau of Land Management 1986, 7). The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. The ROD/RMP allocated matrix lands managed as southern general forest management areas to VRM Class III (Bureau of Land Management 1995, 70).

The objective of VRM Class IV is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. However, the BLM should make every attempt to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements. VRM Class IV was allocated in the ROD/RMP to lands in the Project Area managed as northern general forest management areas (Bureau of Land Management 1995, 70).

The characteristic landscape in the Evans Creek fifth field watershed can be described as varied. On the valley floors and lower slopes, the area is modified by human alterations including roads, clearings, homes and outbuildings, fences, and power and phone lines. The intermingled private lands with their associated developments and past harvest treatments provide a variety of visual contrast. Evidence of past wildfires in the watershed has also added variety to the landscape by providing openings in the vegetation. The town of Rogue River is located at the southwest edge of the watershed and Project Area. The main paved roads that provide access to the Project Area are East Evans Creek Road, West Evans Creek Road, Pleasant Creek Road, and short stretches of Antioch Road and Meadows Road. The smaller communities of Wimer and Pleasant Valley are located along these roads. Individual residences are scattered along these and other additional minor roads.

The majority of the proposed units is managed as VRM Class IV (3,452 acres) and is located away from main roads and local residences. A few of the units would be partially visible to travelers on the West Fork Evans Creek Road for short periods of time as they drive north or south on the road.

The proposed projects located on lands managed as VRM Class III (295 acres) are primarily situated northwest of the town of Rogue River and south of East Evans Creek Road in the southern and southeast portion of the Project Area. The units nearest to the town of Rogue River are either fairly well screened from view by topography and vegetation or, where visible, are located in the background. The unit at the southeast end of the Project Area, between Antioch Road and Meadows Road, is visible from several areas along East Evans Creek Road.

The units located east of Wimer on East Evans Creek Road in the general area south of the confluence of May Creek and Evans Creek are visible to local residents and travelers along East Evans Creek Road. These units are located on steep slopes in the foreground/ middleground and serve as a visual backdrop to an elongated, pastoral valley adjacent to

East Evans Creek Road. Many private residences are located along this portion of the road, and the proposed units are located on slopes that dominate the valley viewshed. Because of public interest in these units during the initial scoping effort in 2008, a visual contrast rating was completed in this area from three Key Observation Points along the road. However, the proposed harvest for this area has since been changed from NGFMA and SGFMA regeneration harvest to commercial thinning and selection harvest leaving a 60% canopy cover. A second VRM contrast rating showed that the changes to the landscape from these new proposed treatments would still meet VRM Class III management objectives.

3.10.4 Recreation

Recreational use in the Project Area is generally dispersed, consisting of off-highway vehicle (OHV) use, swimming and water play, hunting, camping, and sightseeing. Recreational use takes place year-round, but the majority occurs during the spring, summer, and fall months. Streams in the Project Area, particularly West Fork Evans Creek, provide excellent opportunities for shallow swimming and water play by families during the hot summer months. Several mining claims are located along the creek, and recreational gold panning activity increases when gold prices go up. All of the streams in the Project Area are closed to fishing.

The 1995 ROD/RMP considers the off-highway vehicle designation for the Project Area as "open" (i.e., motorized vehicles are not required to stay on existing roads and trails). OHV use is occurring throughout the area on existing roads, as well as cross-country where terrain and vegetation allow. All OHV classes use the area: motorcycles, four-wheelers, and full-size vehicles. Larger vehicles tend to stay on the wider routes, while the motorcycles, four-wheelers, and smaller vehicles are able to access steeper, tighter terrain. The BLM inventoried the user-created routes in the Project Area for the 2008 Western Oregon Plan Revision process. Routes appear to be more concentrated along the PacifiCorp electrical transmission line, on private industrial timber lands, and near the BLM's Elderberry Flat Campground.

Elderberry Flat Campground, a developed campground with 11 campsites, is located in the north end of the Project Area next to West Fork Evans Creek. The campground has been improved over the last few years with road chipsealing, installing informational bulletin boards, blocking OHV trails, planting trees and shrubs, and occasionally using campground hosts to discourage problems. The campground and adjoining day-use area are closed and gated shut from mid-November to mid-March. Use of the campground is estimated at 1,200 visitors annually, both for camping and day-use activities.

Approximately 25 user-created campsites are located along 14 miles of the West Fork Evans Creek Road, from Evans Creek to Cedar Creek; 17 campsites are located on BLM-administered lands and the remainder are on lands owned by Coast Range Resources, Silver Butte Timber Company, and Perpetua Timber Company. The campsites typically consist of an access route down to a flat area next to the creek with no developed facilities. Use at these sites is currently unrestricted; at many of the sites vehicles can directly access or cross the creek. Vehicles and camping activities on the banks of the creek are contributing sediment to the stream. Sites that were once relatively small have expanded over the years as vehicles have enlarged the impacted areas.

Associated recreation-related problems in the Project Area, particularly near Elderberry Flat, include trash dumping, large parties, underage drinking, transients, and proliferation of OHV trails on steep slopes and into fish-bearing streams.

4.0 Consultation

This section describes any public participation and interagency coordination that occurred during the preparation of this project.

4.1 Public Involvement

4.1.1 Scoping

Scoping is used to promote public involvement in BLM projects. The public includes individuals, agencies, and organizations that might be interested in or affected by the proposed actions. The BLM conducted scoping to identify the desires, expectations, and concerns of interested and affected publics regarding the proposed use of available resources in the Evans Creek watershed

4.1.1.1 2007 Evans Creek EA Scoping

The BLM began outreach for this project in October 2007 by mailing a letter initiating the scoping period. This letter was mailed to 600 individuals, businesses, organizations, tribes, and government agencies. Legal notices announcing the scoping period were published in the Grants Pass *Daily Courier*, *Rogue River Press*, *Upper Rogue Independent*, and Medford *Mail Tribune*. The scoping letter was published on the BLM Web site and the Evans Creek project was listed in the Medford Messenger planning update. The BLM received a total of 14 letters in response.

4.1.1.2 2010 Evans Creek EA Scoping

On April 24, 2008, the BLM decided to temporarily delay the Evans Creek project in order to concentrate on the salvage of trees blown down during winter storms. The Evans Creek project was resumed when the BLM mailed a second letter to reinitiate scoping for the Evans Creek Forest Management Project. This letter was mailed in July 2010 to 151 individuals, businesses, organizations, tribes, and government agencies. The BLM received a total of 11 comment letters in response to this mailing. In addition, the BLM received 244 nearly identical e-mail comments.

4.1.2 Other Outreach

4.1.2.1 Public Meeting

The BLM hosted a public meeting in Wimer, Oregon on February 28, 2008 to present preliminary project proposals to the public. Invitations were mailed to 91 people. The meeting was attended by 27 people and generated 2 comment letters.

4.1.2.2 Focus Group

In December 2010, the BLM met with representatives from American Forest Resources Council, Klamath-Siskiyou Wildlands Center, The Nature Conservancy, Seven Basins

Watershed Council, Southern Oregon Small Diameter Stewardship Collaborative, Oregon State University Extension Service, and US Fish and Wildlife Service. The intent of the meeting was for the BLM to present the Evans Creek project proposal to the group and solicit feedback regarding the project. The meeting resulted in a March 2011 field trip with the Focus Group to review proposed project sites and discuss forest management, habitat management, project design considerations, and operational aspects of project implementation. Another field trip is scheduled for June 6, 2011.

4.1.2.3 Evans Creek Project Web Site

In February 2011, the BLM posted a Web site for the Evans Creek project to provide the public with current and background information. The Web site contains links to a project summary, timeline, and maps. It supplies the scoping letter and scoping comments, photographs, and links to recommended reading. The Web site also provides an opportunity for the public to submit comments at any time during the Evans Creek project. The Web site address is http://www.blm.gov/or/districts/medford/plans/evans/index.php.

4.2 Interagency Coordination

4.2.1 ESA Consultation

Section 7 of the ESA requires the BLM to work with the US Fish and Wildlife Service (T&E plant and wildlife species) or NOAA Fisheries (T&E fish species) for actions the BLM funds, authorizes, or proposes to ensure the project is not likely to jeopardize the continued existence of listed plant, wildlife, or fish species or destroy or adversely modify their designated critical habitat.

Before requesting consultation, the BLM determines whether or not the project may affect the listed species or critical habitat. If the project would affect the species but the effects would be relatively minor, consultation is informal and the Federal agency submits a written request for informal consultation. If the US Fish and Wildlife Service/NOAA Fisheries agrees with the BLM's determination, then informal consultation concludes with the US Fish and Wildlife Service/NOAA Fisheries issuing a letter of concurrence.

If the BLM determines a project is likely to adversely affect a listed species or critical habitat, then formal consultation is required and the BLM submits a written request, or biological assessment, for formal consultation. During formal consultation, the US Fish and Wildlife Service/NOAA Fisheries analyzes the project to determine if the project is likely to jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat. The results of the analysis are explained in a biological opinion.

4.2.1.1 T&E Wildlife

The federally threatened northern spotted owl is the only T&E wildlife species in the Evans Creek Project Area. The project wildlife biologist submitted a biological assessment for the five timber sales that could be implemented from this project and the small diameter thinning

project. The biological assessment included a request for formal consultation on the three timber sales that "may affect, are likely to adversely affect" the northern spotted owl and concurrence on the two timber sales and the small diameter project that "may affect, but are not likely to adversely affect" the northern spotted owl. The BLM received a biological opinion from US Fish and Wildlife Service on May 31, 2011. The remainder of the proposed projects would have a "no effect" determination.

4.2.1.2 T&E Plants

The Evans Creek Project Area is partially within the range of the federally threatened *Fritillaria gentneri*. One site located within the Project Area is outside all proposed treatment units. The project botanist concluded the project would have a "no effect" ESA determination on T&E plant species; therefore, consultation was not required.

4.2.1.3 T&E Fish

The Evans Creek Project Area contains one T&E fish species, the federally threatened Southern Oregon/Northern California coho salmon. The project fish biologist determined the actions proposed in this project would have a "no effect" determination on coho salmon, coho critical habitat, or essential fish habitat; therefore, consultation was not required.

4.2.2 Tribal Coordination

The BLM mailed scoping letters to tribes with a connection to lands in southern Oregon. Letters were mailed to the Cow Creek Band of Umpqua Tribe of Indians, Confederated Tribes of Siletz, and The Confederated Tribes of Grand Ronde. These tribes will receive the Evans Creek Forest Management EA availability notification letter.

4.3 Document Availability

The Evans Creek Forest Management Project EA is available on the Medford BLM Web site at http://www.blm.gov/or/districts/medford/plans/index.php.

A letter announcing the availability of the EA for review will be mailed to those that submitted scoping comments and those that returned an Interest Response Form indicating an interest in receiving the EA.

A notice of the EA availability will be published in the Medford *Mail Tribune*, Grants Pass *Daily Courier*, and Eagle Point *Upper Rogue Independent*. Publication of the notice in the Medford *Mail Tribune* begins the 30-day public comment period for the Evans Creek Forest Management EA.

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This section lists the BLM staff involved in the preparation of this document.

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